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An Investigation of the Technological, Pedagogical and Content Knowledge Framework in Successful Chinese Language Classrooms

Su-Ling Hsueh
Brigham Young University - Provo

AN INVESTIGATION OF THE TECHNOLOGICAL, PEDAGOGICAL AND CONTENT KNOWLEDGE FRAMEWORK IN SUCCESSFUL CHINESE LANGUAGE CLASSROOMS

by

Su-Ling Hsueh

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GRADUATE COMMITTEE APPROVAL

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Su-Ling Hsueh

This dissertation has been read by each member of the following graduate committee and by majority vote has been found to be satisfactory.

Date	Dr. Paul F. Merrill, Chair
Date	Dr. David Williams
Date	Dr. Charles Graham
Date	Dr. Dana Bourgerie
Date	Dr. Stephen Yanchar

BRIGHAM YOUNG UNIVERSITY

As chair of the candidate's graduate committee, I have read the dissertation of Su-Ling Hsueh in its final form and have found that (1) its format, citations, and bibliographical style are consistent and acceptable and fulfill university and department style requirements; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the graduate committee and is ready for submission to the university library.

Date	Dr. Paul F. Merrill Chair, Graduate Committee

Accepted for the Department

Date	Dr. Andy S. Gibbons Department Chair

Accepted for the College

Date	Dr. K. Richard Young Dean, David O. McKay School of Education

Dedication

To my dear deceased mother and brother

ABSTRACT

AN INVESTIGATION OF THE TECHNOLOGICAL, PEDAGOGICAL AND CONTENT KNOWLEDGE FRAMEWORK IN SUCCESSFUL CHINESE LANGUAGE CLASSROOMS

Su-Ling Hsueh

Department of Instructional Psychology and Technology

Doctor of Philosophy

This qualitative case study investigates whether technological, pedagogical and content knowledge (TPCK) is balanced and integrated in Chinese language classrooms. Three expert Chinese teachers in technology-enhanced classrooms, as well as their students, were observed and studied. Four and a half months of data were collected in the form of classroom observations, interviews, reflective journals, and document analysis. Four basic findings were derived from the study. First, the TPCK framework reflected an observable instructional process for communication between teachers and students. However, teachers did not knowingly integrate technology, pedagogy and content in technology-enhanced classrooms. Second, content was the focal point during the course preparation process, and teachers did not consciously attempt to negotiate a balance between technology, pedagogy, and content. Third, students preferred human interaction

with teachers and individualized learning with teachers' assistance in technology-enhanced learning environments. Fourth, educational context and culture did influence the way that teachers taught, selected content, and employed technology.

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Instructional technology has attracted a great deal of interest and emphasis in contemporary education. For example, the Apple Classroom of Tomorrow (ACOT) project has initiated one-to-one computer access for students and teachers in K-12 education over a period of 20 years. Colleges and institutions have introduced technology in every academic area.

The revolution of instructional technology in the classroom has changed from "one classroom, one computer" to "one student, one computer." To allow learning to occur anywhere, some institutions of higher learning such as Duke University and the United States Defense Language Institute Foreign Language Center in Monterey, California (DLIFLC) even provide iPods to students.

Students at DLIFLC are drawn almost entirely from the ranks of the United States Military, including the Air Force, Army, Marines, Navy, and constituent special forces units. The students receive intensive language training for 25 to 63 weeks (depending upon language difficulty). To graduate, students must attain a Level 2 in listening and reading on the Defense Language Proficiency Test 5 (DLPT 5) for their language, and a Level 1+ in speaking on an oral proficiency interview (OPI). As shown in Appendix A, the DLPT 5 test is heavily weighted toward comprehension of authentic reading and listening materials as evaluated in a multiple-choice format. In order to be qualified as linguists, DLIFLC students are required to pass the DLPT 5 test upon graduation.

The language proficiency levels are in accordance with the Interagency Language Roundtable (ILR) scale developed by the United States Foreign Service Institute. Sample descriptions and criteria for listening proficiency levels 0 (No Proficiency) to level 5

(Functionally Native Proficiency) are shown in Appendix B. DLIFLC has a goal to progress students beyond Level 2 ("limited working proficiency") to Level 3 ("general professional proficiency").

Technology-assisted learning has been introduced throughout the DLIFLC campus to assist learners toward Level 3 proficiency. Each DLIFLC classroom is equipped with one Desktop computer and an electronic white board (SMART Board). Teachers are strongly encouraged to use technology in the classroom to help optimize student learning outcomes. At the beginning of 2007, DLIFLC went one step further and provided each student with a tablet PC.

DLIFLC seeks to enhance students' language proficiency by providing students more individual learning opportunities, task-based activities, and communicative activities in technologically-enhanced classrooms. Yet despite such efforts, the "one classroom, one computer" initiative seems not to have fully remedied problems associated with instructors who choose to use more dated instructional methods. These instructors rely only upon PowerPoint presentations and electronic textbooks in Portable Document Format (PDF) format. During the instruction, it is common for some students to feel frustrated and lose their motivation. This can lead to a self-reinforcing problem because "motivation can lead to success; but success can also lead to motivation" (Johnson, p. 132). In order to help students succeed, it is crucial to keep them motivated and engaged. To maintain and protect motivation, teachers should foster learners' autonomy by using technology-based approaches with a facilitating style of instruction (Dörnyei, 2001). After all, humanware is more important than software or hardware (Warschauer and Meskill, 2000; Xie, 2005). Software and hardware tools are not

dynamic and should be utilized creatively by human instructors (He, 2000). In other words, carefully-designed and planned activities are crucial to in technologically-enhanced classrooms.

Technology might facilitate autonomy, but most teachers utilize only the synchronized listening method. This method entails teachers who play listening materials to students who all listen to the same sound file together. After the mass listening session, students answer questions printed in textbooks. Students may or may not learn precisely what teachers teach through synchronized listening methodology (Gass, 2000). Learners are unique and different, including their learning pace and attitudes. The synchronizing method might not be the best method for maximizing learning outcomes.

To minimize teacher-centered (i.e. synchronizing) instructional methods, one-to-one (i.e. a ratio of one computing device to each student) technology in learning is being employed to optimize learner-centered instruction and un-synchronized learning, introduce more authentic materials into the classroom, enhance students' performance, and increase learning autonomy at DLIFLC. Language learners at DLIFLC not only have iPods, but also tablet PCs to assist them in learning their language in and out of the classroom. Tablet PCs not only facilitate reading, listening, and speaking ability, but also allow students to handwrite notes in the target language. The language-recognition feature for tablet PCs can read hand-written Chinese characters and convert the input into an electric-type format. This capability enables students to focus on writing their characters with the precision needed for the tablet PC to recognize input. This is one of the tablet PC features that conventional laptop computers cannot replace.

Although tablet PC functionality may suit language learning, this fact alone will not ensure successful deployment. Successful deployment of a new technological device also requires sound institutional planning, teacher and student training, curriculum development, implementation planning, organizational accountability for tablet PCs and technical support, and so forth. During the transition to new instructional methods there are unavoidable challenges, stresses, and set-backs. Optimal technology use in particular classrooms can vary depending upon the adaptability of teachers and students. Computer skills, knowledge and perception of people in the classroom help determine the success of implementation.

Statement of Purpose

With the advent of advanced classroom technology, problems and concerns related to unsuccessful technology-integration in classrooms have garnered increased attention. Swan, Van't Hooft, Kratcoski, & Unger (2005) stressed the importance of classroom logistics, technical support, and professional development to improve technology-integration. Many schools, including the Defense Language Institute Foreign Language Center (DLIFLC), have noticed the importance of faculty professional development.

However, not every educational institution has been successful with faculty technology training, according to an American Productivity & Quality Center (APQC) survey (Bates, 2000). Faculty teachers sometimes find that technology training and workshops have not met their specific needs. Teachers frequently forget what they have learned soon after workshops and training sessions. Possible reasons for this might include a) not knowing how and why to apply the technological tools in their

instructional environments, b) not internalizing the knowledge learned from the workshops, and c) lack of timely, applied practice of new concepts. Obstacles could also result from insufficient faculty technology training and the lack of strongly coherent theoretical frameworks to help focus the effects of training. Mishra and Koehler (2003) argued that the prevailing reliance upon workshops and class courses for technology training tends to be insufficient to generate deep understanding of technological products.

For example, the Defense Language Institute Foreign Language Center (DLIFLC) encourages teachers to integrate technology into language teaching by providing several technology training opportunities. Most technology trainers/facilitators are in-house language technology specialists (LTS) in each school or specialists from the Faculty Staff Development Division. The Chinese LTS has tried many approaches to enhance faculty technological skills, including implementation of a technology training completion certificate as suggested by Green (1999). After one year of implementing the technology training, some concerns had surfaced. Even though language technology specialists introduced the concept of technology integration in the language classroom, they had tended to provide only generic views about technology integration. Technology trainers/facilitators apparently do not incorporate sufficient pedagogical content, due to their general lack of awareness about attendees' regular teaching days and a tendency to maintain an exclusive, laser-like focus on technological skill training.

The quality, practicality and applicability of teacher training may determine and influence teachers' commitment to use technology. Retention of technology knowledge may be impacted by the same considerations. Even though technology specialists may possess specific skills and knowledge in some fields, they do not regularly teach students

in the regular language classrooms that dominate a teacher's experience. Technology specialists sometimes fail to accumulate enough experience in practical language teaching, and consequently can fail to fully grasp the problems and needs confronted by the "front line" faculty members. In addition, the training tends not to include technology-integration training theory and models, insights which could help coordinate and focus the efforts of technology specialists and teachers.

To improve the quality, practicality and applicability of training, trainers should be aware of what faculty members experience in and out of the classrooms. Teachers have a profound influence upon technology integration. Some Chinese faculty members have taken the initiative to learn and implement the new technology in their classrooms, and as a result they have tended to quickly excel and create successful language learning environments. They have greatly influenced students' learning and classroom instruction. As Pierson (2001) noted, there is a profound need for exemplary teachers who know how to use technological tools to effectively benefit learning. Therefore, if technology trainers could investigate the approach used by exemplary (experienced) teachers who have been successful in integrating technology with effective pedagogy in the classrooms, the trainers might gain better insights and strategies for providing successful technology-integration training and workshops. Research of successful examples and approaches can also provide a more comprehensive context of fundamental knowledge and content for training.

Finding or developing a theoretical grounding in educational technology is not easy. Nevertheless, the theoretical technological pedagogical content knowledge (TPCK) model advocated by Mishra and Koehler (2006) and Koehler and Mishra (2005 & 2008)

might serve as an appropriate model to direct technology training. The TPCK model depicts "how teachers' understanding of technologies and pedagogical content knowledge interact with one another to produce effective teaching with technology" (Koehler & Mishra, 2008, p. 12). At the present time, however, the generalized TPCK framework might not be sufficiently tailored to the specific challenges pertaining to various academic areas. In other words, the standard model of TPCK is generic and describes the phenomena manifest in a wide variety of disciplines. TPCK frameworks might have a different meaning to a mathematics teacher, for example, than to a language teacher—and perhaps even to a Spanish language teacher compared to a Chinese language teacher. The general TPCK conceptual framework might need to be interpreted differently for use in the context of a very specific discipline, for instance Chinese language instruction.

By studying the TPCK framework in a specific environment (discipline), the researcher attempted to ascertain whether the adaptability and salience of the theoretical model could be refined and adopted for Chinese language instruction. Hopefully this effort will enhance faculty technology training at the Defense Language Institute Foreign Language Center by leading to the development of an effective, holistic**,** theoretically-grounded approach. In addition, it is anticipated that improvements in the quality and effectiveness of Chinese language learning in technology-enhanced environments will benefit learners and potentially expand to applications for other language areas.

In order to improve the quality of Chinese faculty technology training, therefore, it appears there is a need to a) examine and refine the technological pedagogical content knowledge (TPCK) framework relative to Chinese language instructors' face-to-face

classroom instruction and curriculum design, and b) provide "thick descriptions" of instructional processes in relation to the TPCK conceptual framework that teachers perform. It is possible that teachers who are active in integrating technology in the classroom have deeper insight about how to incorporate content, pedagogy and technology in effective ways to teach Chinese. Hopefully this study will contribute specific and practical refinements to the TPCK model as applied in actual Mandarin Chinese classrooms. Uncovering dynamic relationships between technology, pedagogy and content may eventually serve to implement a less static version of the TPCK framework.

Research Questions

As reflected in the statement of purpose and the literature review in the next chapter, the standard technological pedagogical content knowledge (TPCK) framework is generic and may not specifically describe the phenomena found in the various academic disciplines, for example, in Chinese Language Instruction. In addition, most studies only examined the effectiveness (as measured by quantitative research methods) of incorporating a specific technology or pedagogy. Not much literature discussed effective methods relative to technology-enhanced classrooms designed specifically for Teaching Chinese as a Second Language. The effective integration of TPCK in the area of Teaching Chinese as Second Language, with or without the use of in-depth qualitative research methods, was rare and difficult to find. The dearth of research focused on this specialized area reveals a need to probe more extensively and carefully into the details and considerations attending TPCK as applied precisely to Chinese Language instruction.

Therefore, the intent of the present (qualitative) study was to discover the dynamic relation between technology, pedagogy and content in order to restructure the static TPCK framework for successful Chinese language instruction. Also, students' preferences and needs were studied in an optimum technology-enhanced learning environment. Consequently, three research questions were utilized to guide the research:

1. What is the conceptual relationship among technology, pedagogy and content during teachers' course preparation process?
2. How can the technological pedagogical content knowledge (TPCK) conceptual model be modified by analyzing content, pedagogy and technology in the Chinese Classroom Instruction?
3. What were students' preferences in terms of content, pedagogy and technology in the technology-enhanced learning environment?

CHAPTER 2: LITERATURE REVIEW

This literature review will begin with studies concerning technology integration and its definition. Insights from the technological pedagogical content knowledge (TPCK) theory concerning the subject of technology integration will then be introduced and employed as a conceptual structure for exploring related literature. Finally, a new direction involving One-to-One Computing will be discussed, along with the researcher's reflections about the literature review as a whole.

Technology Integration and Technological Pedagogical Content Knowledge

"Technology integration is using computers effectively and efficiently in the general content areas to allow students to learn how to apply computer skills in meaningful ways" (Joint Jerome School District, 1999). Technology integration in language learning, also known as Computer-Assisted Language Learning (CALL), has existed for over four decades and is defined as "any process in which a learner uses a computer and, as a result, improves his or her language" (Beatty, 2001, p.7). In recent years, the terminology of CALL has been shifted to Technology-Enhanced Language Learning (TELL) (O'Leary, 1998). A possible explanation for the shift from CALL to TELL is the fact that "technology" includes "the specific methods, materials, and devices used to solve practical problems," a concept broad enough to include both "computers" and other innovations (Technology, n.d.). In any case, CALL or TELL materials are not only ideal for assisting students' self-learning, but also superlative for language teaching in technology-enhanced classrooms—including classrooms equipped with technological tools.

Learner interest tends to be enhanced in a CALL environment (Jones, 2001). Krentler & Willis-Flurry (2005) discovered that students learn better with the assistance of technology and suggested that instructors should make every effort to effectively incorporate technology in instruction. Even though technology can motivate learners and promote autonomy, teacher scaffolding and teacher monitoring of students' progress toward autonomy through the use of technology is the more crucial factor (Murray, 2005; Rüschoff & Ritter, 2001).

Researchers from several educational districts have acknowledged misconceptions about the meaning of "technology integration" among educational practitioners and administrative staff after technology was introduced on their campuses. A study from the Joint Jerome School District (1999) stated that technology integration is not putting computers in the classroom without teacher training. Similarly, the Office of the Washington Superintendent of Public Instruction (n.d.) published the following statement regarding technology integration on its website:

> The use of computer programs alone is not the full definition of integration, and the use of it does not mean that technology integration has fully occurred. Technology integration is occurring if:
>
> - teachers are trained in a full range of technology uses;
> - teachers and students routinely turn to technology when needed; and
> - teachers and students are empowered and supported in carrying out those choices.

Along with the emphasis on technology integration, teachers' training has also garnered attention from educational institutions. As noted with respect to the Joint Jerome School District (1999), it is essential to guide teachers in "how to integrate technology using a consistent and well-designed model of instruction" to add value to teaching and learning. Teachers' technology training should not mainly focus on

instructing functions and capabilities of technological hardware and software, but facilitate teachers to integrate technology into the curriculum (Joint Jerome School District, 1999). Mere understanding of the presence of new technological tools in isolation is insufficient (Egbert, Chao and Handson-Smith, 1999). Integrating good pedagogy and technology is a vital and vexing challenge (Beatty, 2001).

Harris, Mishra and Koehler (2007) criticized current technology training methods as unduly technocentric and as not considering "the dynamic and complete relationship connecting technology and pedagogy." They noticed that unsuccessful teacher technology training resulted from a mere emphasis on technological skills without adequate corresponding instruction about technology-integration methodology.

One current technology integration model, known as the technological pedagogical content knowledge (TPCK) has been advocated by Mishra and Koehler (2006). The TPCK model is an extension of Shulman's (1986) pedagogical content knowledge (PCK) model. Shulman (1986) argued that content should not be separated from pedagogy (Shulman, 1990). Dewey (1916) also believed that methodology (pedagogy) and subject matter (content) should not be isolated. Shulman (1986) insisted in order to help teachers learn content, teachers not only need to possess content knowledge, but also have pedagogical skills. Due to the prevalence of technology, Mishra and Koehler (2006) proposed an additional element to the PCK model. They argued that meaningful instruction and teacher training occurs when technology, pedagogy and content knowledge are connected. To further examine the utility of the TPCK framework, Koehler and Mishra (2005) employed an approach (learning-by-design) based on the TPCK model to train teachers about how to utilize education technology to design course

materials. Participants stated that the learning by design approach based on the TPCK framework was challenging and fun (Koehler & Mishra, 2005). Koehler and Mishra (2005) affirmed that design of online courses not only requires more time, modification of content, and modification of pedagogy, it is also different from face-to-face courses.

TPCK is knowledge about how to use technologies and pedagogical techniques to teach subject matter effectively (Mishra & Koehler, 2006). It enables educators of second language teachers to make technology-enhanced classrooms more culturally and linguistically valuable (Olphen, 2008). "TPCK framework describes how teachers' understandings of technology, pedagogy, and content can interact with one another to produce effective discipline-based teaching with educational technologies" (Harris, Mishra and Koehler, 2007). It is most useful for exploring the relationship between technologies and content in authentic learning contexts (Mishra & Koehler, 2006; Koehler & Mishra, 2005; 2008). There is no absolute sequence among the three main components of TPCK--content (C), pedagogy (P) and technology (T) -- as shown in Figure 1.

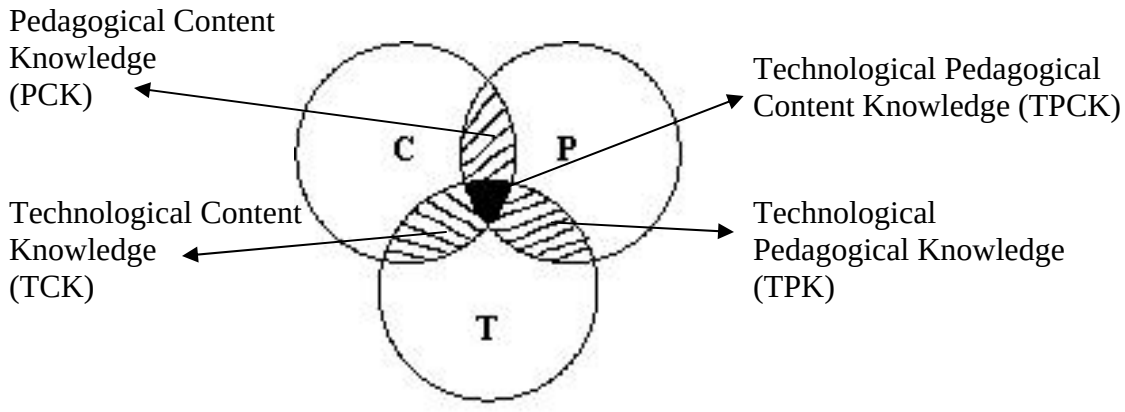


Figure 1. TPCK theory based on Mishra and Koehler (2006).

Mishra and Koehler (2006) explained Figure 1 as follows:

1. *Pedagogical Content Knowledge (PCK)* includes knowing what teaching approaches fit the content, and likewise, knowing how elements of the content can be arranged for better teaching.
2. *Technological Content Knowledge (TCK)* indicates that teachers need to know not just the subject matter they teach but also the manner in which the subject matter can be changed by the application of technology.
3. *Technological Pedagogical Knowledge (TPK)* is knowledge of the capabilities of various technologies and knowing how teaching might change as the result of using particular technologies.
4. *Technological Pedagogical Content Knowledge (TPCK)* requires an understanding of using technologies and pedagogical techniques in constructive ways to teach content, and how technology can help redress some of the problems that students face.

Understanding the relationship between the overlapping area - TPCK - for the three components is the key to successful and true technology integration (Koehler & Mishra, 2005). Based upon these important elements of technology integration (TPCK), the discussion of the literature below related to the field of Teaching Chinese as a Second Language is organized under the conceptual categories of content, pedagogy and technology.

Types of Knowledge

The three main components (types of knowledge) of TPCK --content (C), pedagogy (P) and technology (T) in Chinese language instruction are described below.

Content

Content, meaning subject matter knowledge, is about "what to teach," and is as important as pedagogy, meaning "how to teach" (Jiang, 2007). In other words, content knowledge (CK) "is knowledge about the actual subject matter that is to be learned or taught" (Mishra & Koehler, 2006). The content knowledge regarding language instruction includes morphology, language usage, language skills, communicative skills and relevant cultural knowledge (Lu, 1997). Moreover, many scholars have conducted studies concerning the Chinese language, and Zhou (2004) assigned such studies to the following categories: phonology, words and phrases, grammar, characters, rhetorical knowledge, sections and articles, and dialects according to Chinese language key elements.

Li (2004) pointed out that Hanyu pinyin, the Romanization system created by the Chinese government, is often considered only as a supplementary tool which helps students to master pronunciation and grammatical structure, and enhances learning efficiency. Li (2004) believed Hanyu pinyin is more than a supplementary tool and that it can help beginning students to master the Chinese pronunciation system. In addition to Hanyu pinyin, Mandarin Chinese also has four tones and "Chinese tone structures may contribute to the difficulty of learning Mandarin Chinese" (Tao & Bond, 2006). Even though tones and intonation are difficult for Chinese learners, mastery is essential for anyone seeking to excel in Chinese (Li, 2004). As to the teaching of words and phrases, students should be trained to use the most commonly used elementary words and phrases; increase the size of their lexicon in intermediate classes; improve comprehension of word and expression meanings; and correct word utilization in advanced classes (Li, 2004). Li

(2004) observed that words are constructive materials and grammar is structure. Grammar is always highly emphasized among practitioners, and the main method of teaching grammar is through analysis of sentence patterns and structures (Li, 2004).

Chinese characters are constructed by radicals (frequently used basic components), phonetics and sub-components (Xiao, 2002). Learners often struggle to associate the sound of a Chinese word with its written form (Lin, 2000). Lin (2000) stated that even though it is a challenge for Chinese learners to match the sounds with the written forms of Chinese words, sound and character identification association and character writing cannot be neglected in Chinese teaching.

The four language skills that Lu (1997) identified are listening, speaking, reading and writing. However, reading and writing have garnered more emphasis than listening comprehension and speaking in the first year of Chinese language classrooms (Chi, 1996). Chi (1996) pointed out the misconception that learners would be able to display a high level of speaking proficiency merely because they could read sophisticated materials from Chinese teachers. However, listening is a critical element to successful learning of a foreign language. Nunan (1997) highlighted the fact that listening is fundamental to speaking. Indeed, "listening competence is universally larger than speaking competence" (Brown, 2001). Feyten (1991) conducted an experiment and found that listening ability and foreign language acquisition are highly related. Listening plays an active role in the language acquisition process (Rost, 2001, Feyten, 1991). Rost (2001) stated that listening is still considered a mysterious "black box" and the best approach is "more practice." He suggested that more attention should be paid to "strategy development" in order to demystify the listening process.

However, the listening skill, which is often treated as the *least* important in the classroom (Elkhafaifi, 2005), should be considered the *fundamental* skill in second language learning because listening has a vital role in understanding and comprehending the world of the target language (TL). Johnson (2001) stated that the process of learning starts with declarative knowledge, which includes listening and reading. "It is normal for listening comprehension to precede spoken ability" (Noblitt, 1995). That is to say, language learning starts from listening and reading (declarative knowledge). Once students receive enough declarative knowledge, they can start reproducing and adapting what they have learned.

Learning language knowledge should not be divorced from real-world authentic contexts. "Authentic materials bring students into contact with language as it is used in the culture to meet actual communication needs" (Melvin & Stout, 1987). Authentic materials cover a variety of topics which provide rich context to enrich cultural knowledge and further enhance students' communicative skills. Such materials also contain commonly used morphology, language usage, information for enhancing language and communicative skills, and cultural knowledge of the target language. Authentic materials (e.g., a list of hotels, maps, advertisements, etc.) not only provide rich (cultural) background knowledge, but also motivate students (Melvin & Stout, 1987).

Pedagogy

Dewey (1916) stated that methods are not external in nature, but instead entail teaching subject matter knowledge in an effective manner. Pedagogical knowledge is "deep knowledge about the processes and practices or methods of teaching and learning, encompassing educational purposes, values, aims and more" (Harris, Mishra & Koehler,

2007). Price (1987) stated that listening to Japanese-language radio every day for many years without instructional methods and learning strategies will not reliably produce a speaker of Japanese. Instead, meaningful interaction and methodology is required. Pedagogy is not merely a means for delivering content knowledge to learners; pedagogy also plays a key role with respect to intertwining technology with the students' overall language-learning experience (Price, 1987). Along with the prevalence of technology use in teaching, Bedford (1991) warned instructional practitioners that technology is only a tool. Teachers have a pedagogical responsibility not to make technology the sole focal point of the learning experience.

Relative to Chinese-language curriculum, Walker (1996) proposed two types of instructional models: Learning Model Instruction (LMI) and Acquisition Model Instruction (AMI). According to Walker's LMI model, the vocabulary, grammatical patterns, culture and linguistic forms of the Chinese language include two modes: act (performance of Chinese language skills) and fact (imparting information about Chinese). LMI utilizes pedagogically-designed artifacts and is most effective at the elementary skill level, according to Walker (1996).

AMI focuses on language application by advocating accomplishment of performance tasks in Chinese and the use of authentic materials (Walker, 1996). Chi (1996) built on Walker's theory and promoted a proficiency-oriented program (communicative model) instead of textbook-oriented learning and overemphasis on reading pursuant to the Teaching Chinese as a Foreign Language (TCFL) program. Textbooks and pedagogically oriented teaching aids are utilized from the beginning, and additional authentic materials are introduced when learners become more proficient (Chi,

1996). According to the theories of Chi and Walker, fact (i.e., components such as grammatical structures) should be emphasized during the elementary level of knowledge acquisition, and act (i.e., components such as communicative ability applied in authentic contexts) should be conducted during advanced levels of knowledge acquisition.

The above-mentioned AMI and LMI models are suggested for use in overall Chinese curriculum design, and are not specific to Chinese language instructional approaches or methods. Most Chinese instructors have pursued advanced studies in education, applied linguistics, or Eastern-Asian Studies (Jiang, 2007). They utilize general second language approaches and methods in their language classrooms because there are no specific Chinese language instructional approaches. Frequently used language instructional approaches and methods are Grammar-Translation, Communicative Language Teaching, Cooperative Learning, Task-Based Language Teaching, Audiolingualism, Total Physical Response, and so forth (Richards and Rodgers, 2001).

The newer second-language instructional approaches and methods have evolved in a communicative and task-oriented direction. Application in real-world settings is emphasized instead of out-of-context drills and grammar-translation. The grammar-translation classes are taught in the students' mother tongue, whereas the Audiolingual Method is "the method that fosters dependence on mimicry, memorization of set phrases and over-learning" (Mora, 2002). It is still common to see the audiolingual method and the grammar-translation approach dominating in the Chinese language classroom.

Note that pedagogy itself can be categorized as content-driven (content determines pedagogy) or method-driven. In connection with a predominantly content-

driven pedagogy, teachers and students ostensibly know what content will be covered by means of a preselected/presequenced syllabus, while a method-driven (learner-centered) pedagogy emphasizing communicative methods affords more flexibility to teachers and learners (Kumaravadivelu, 1993). Hence, contemporary popular second-language teaching tends to rely upon Communicative Language Teaching (CLT) which holds to the view that language is best learned and taught through interaction involving expression of real-life messages (Pica, Kanagy & Falodun, 1993; Lee & Vanpatten, 1995). Language study is an interactive process between teacher and student, and CLT developed a variety of procedures designed to gear learning content to learners' real-world communicative needs (Tudor, 1996). Consequently, existing textbooks are typically not the focal point of contemporary learner-centered teaching and are subordinated to individualized materials (Tudor, 1996). In order to advocate and facilitate individualized instruction, independent study gained prominence and emphasized a flexible pace tailored to individual needs and variations (Disick, 1975).

Traditional grammar-focused instruction emphasizes linguistic forms instead of real interactions, but it is also true that the communicative approach focuses on communicative skills and can lead to fossilization of learners' language patterns in the wrong form (Yuan, 2007). In order to avoid language fossilization in the wrong form, Yuan (2007) advocated task-based approach that emphasizes both meaning and form in the business Chinese classroom setting. Task-based approaches require a lot of interaction among students to accomplish meaningful language tasks. Advocates of interaction-based pedagogy believe that students internalize target language forms (e.g. structures, vocabulary, etc.) better by interacting with teachers, classmates or online

interlocutors (Pica, Kanagy and Falodun, 1993). Even though there are several kinds of tasks, Pica, Kanagy and Falodun (1993) found jigsaw (aka information-gap) tasks are more effective than problem-solving, decision-making and opinion-exchange tasks. The jigsaw tasks that provide a cooperative learning environment where students learn by exchanging information were developed by Elliot Aronson in the early 1970s (Aronson, 2007). Aronson (2007) explained that "jigsaw requires learners to piece together a solution with information they did not share," and each student's role is essential. A jigsaw task has the greatest degree of psycholinguistic validity because it is "based on two-way interaction involving plenty of negotiation of meaning, creating the conditions needed for language acquisition" (Ellis, 2003, p. 216). Chapelle (2003) also discovered jigsaw tasks result in the most negotiation of meaning, both in face-to-face and CALL environments.

Perceiving the prevalence of the CLT approach, Zhou (2006) criticized contemporary Chinese teachers' tendency to reflexively embrace proficiency and communication approaches without devoting adequate attention to whether students' language usage was accurate. Zhou (2006) commented that practitioners tend to only focus on techniques and function, thereby neglecting content and structure in connection with teaching Chinese as second language, due to the advent of pedagogy-driven methods. Jiang (2007) defended CLT on the ground that CLT focuses on both accuracy and fluency, including form and meaning. Jiang (2007) further suggested that subject matter knowledge and instructional skill should be integrated to produce effective Chinese language instruction.

Even though CLT has advantages, some researchers disagree with this predominant method. Richards (1990) cited Good (1979), Elliot (1980), and Tikunoff (1985) and pointed out that teachers (rather than methods) do make a difference, and further asserted that all-purpose methods assume that "teachers cannot be trusted to teach well" (p. 37). He thought that teachers should be viewed as "performers" who apply prescribed methods or approaches in their teaching (Richards, 1990). Richards (1990) stated that effective teaching accrues from well-organized teacher classroom management (student behavior, movement, and interaction are organized), structuring (instructional activities are logically sequenced), tasks for attaining learning objectives, and the grouping of learners. Moreover, effective teachers communicate their intentions, "maintain students' engagement in instructional tasks, and monitor students' performances on task" (Richards, 1990, p. 42).

There is considerable contemporary sympathy for the view that "teachers need to be able to use approaches and methods flexibly and creatively based on their own judgment and experience" (Richards and Rodgers, 2001). In this post-method era, it is believed that "the post-method condition enables practitioners to generate location-specific, classroom-oriented innovative strategies" (Kumaravadivelu, 2003, p. 33). In other words, post-method era teachers should have the autonomy to theorize and put into practice their own theories (Salmani-Nodoushan, 2006). Practitioners are empowered and can freely construct and practice personal theories of practice (Kumaravadivelu, 2003).

Technology

Technology knowledge includes not only computer literacy, but also productive application of technology at work and in everyday life (Harris, Mishra & Koehler, 2007).

By 2002, more than one thousand schools had already started lap-top computer initiatives (Windschitl & Sahl, 2002). Apple and Microsoft have promoted and assisted the trend toward optimizing technology environments in educational settings. “One student one computing device will be the future and long-term trend” in education, according to many experts and scholars (Liang, Wang and Chan, 2005). But one-to-one technology learning environments typically entail a very large investment and can strain an institutional budget. Technology has not made learning cheaper, but raised the price of delivery, e.g., hardware upgrades and support (Bourgerie, 2003). No wonder Garrett (1991) questioned whether heavy technology use was really worth the time, effort and cost (Garrett, 1991; Salaberry, 2001).

Oppenheimer (2003), for one, openly asserted that technology is not worth the cost and effort. He stated that technology does not enhance students’ performance in test scores, but does overwhelm teachers who are already shouldering busy teaching schedules. He provided an example of students’ test scores from Belridge Elementary school in McKittrick, California, which declined during computerization years, so that “outraged parents picketed the school and elected a new school board.” Students’ test scores increased significantly after the school abandoned technology and reduced class size (Oppenheimer, 2003).

Even though the Belridge example of failure is discouraging, the transferable relevance of the anecdote is suspect because of the school’s apparently abrupt and irrational use of technology, failure to thoroughly investigate the source and nature of the problem, and evident mismanagement of a politically volatile situation. The conventional wisdom still seems to side with Beatty (2001), who stated that “computers appear to be

here to stay." Beatty believed that researchers should accentuate "how computers should be used and for what purpose" instead of whether of not to use computers. Beatty would likely argue that Oppenheimer's Belridge anecdote is a cautionary tale about the hazards of failing to make proper use of computers, not about the inadvisability of introducing computer use in any form.

Oppenheimer (2003) also underlined the importance of good teachers and quoted Bloom's notion that mentoring (tutoring) helps students perform better than other pedagogical or technological tactics. Unfortunately, however, the practical reality for most K-12 public schools and language departments is that there is a) a dearth of qualified teachers available for recruitment and b) a high teacher-to-student ratio because of economic limitations imposed by limited tax revenues and private school budgets. A high teacher-to-student ratio obviously impedes the kind of one-on-one tutoring that Oppenheimer advocated. Even though DLIFLC has a remarkably low teacher-student ratio (1:5 and 1:3, depending on the language) compared to most educational institutions, even DLIFLC is unlikely to support one-on-one tutoring all the time. Introducing technology into academic settings involves some high initial budgetary costs, but the cost is usually less than hiring enough additional human instructors to support equivalent customized interaction with each student.

García and Arias (2000) discovered that students performed better by using computer-oriented achievement tests, computer-facilitated self-learning, and computerized individualization. Technology enables teachers to detect students' individual learning styles because it encourages teacher-as-facilitator approaches to learning (McGrath, 1998). Technology's assistance provides more individual teacher-

student interaction for students who are falling behind in classrooms. Teachers are no longer the single-source provider, but facilitators, in a technology enhanced language learning environment. Teachers facilitate student learning, and students work collaboratively (Kosakowski, 2000). Students receive more interaction with students, teachers and machines.

Technology has great potential to enhance learners' autonomy; however, it is more important to guide students about how to use the autonomy productively (Skehan, 2003). Student learning from computers is optimal when it is under the supervision of teachers, and CALL cannot be effective without interaction between teachers and students (Jones, 2001). The teachers' role in TELL (Technology Enhanced Language Learning) is also vital (Stepp-Greany, 2002; McGrath, 1998; Becker, 1994). Rüschoff & Ritter (2001) emphasized that learners should play an active constructor role in knowledge acquisition. Teachers become monitors, facilitators and resource persons (Hadley & Sheingold, 1993). Stepp-Greany (2002) believed that the role of teacher as facilitator is an important variable in the success of computer-assisted instruction in the language classroom.

The current discussion of technology is focused on the newer digital technologies (Koehler & Mishra, 2005; Koehler & Mishra, 2008). The new technology provides several capabilities such as audio and video recording, speech recognition, online discussion, individual interaction, data management, etc, and can be considered to be a virtual teacher (Beatty, 2001). Most importantly, technologies make it possible to present verbal and nonverbal material via auditory and visual mediums (Price, 1987). Computers expand opportunities for learners to work at their own pace (Hoven, 1999). Technology

facilitates recording for later diagnosis, expanding available individual instruction settings. This kind of unsynchronized technological learning environment enables both learning and teaching to occur at any time and place. Price (1987) also added that technologies "permit us to see and hear language in a cultural context as well as observe the impact on language meaning of things like real time, word stress, and gestures."

Rifkin (2005) suggested that a total target language immersion learning experience with technological assistance might be a key to shattering the traditional classroom ceiling effect (i.e. learners unable to transcend their current language level). The traditional classroom, without enhancement from technology and total-target language immersion, will typically produce only a smaller incremental effect when students reach higher proficiency language levels. Electronic or online dictionaries might assist students the most. Garcia and Arias (2000) found that students using computers looked up explanations more often than learners in class asked clarification from their teachers. The convenience and perceived non-embarrassing, non-judgmental quality of a computer probably encourages the student to fill "gaps" in learning. Therefore, the computer might be an essential tool to assist students to breakthrough the ceiling effect.

Tao and Bond (2006) found that learners produce greater accuracy in producing Chinese tones with computer-generated questions and feedback. They also recommended further research on incorporating speech recognition technology in Chinese language instructional pedagogy. In a Technology Enhanced Language Learning (TELL) environment, students are "doing more discovery-type learning and relying more on their resources to gain new knowledge" (Hadley & Sheingold, 1993). Students often know

more about technology than the teacher, and they are able to assist the teacher with the lesson (Kosakowski, 2000).

Moreover, technology makes students want to learn, and technology should connect the students with education instead of just the computer itself (Louis, 1982). Bialo & Sivin-Kachala (1996) added that "using computer technology could motivate students, enhance instruction for special needs students, improve students' attitudes toward learning, and motivate teachers and free them from some routine instructional tasks."

Students' Perceptions on Technology Use

Students typically possess positive attitudes about using the internet to learn a foreign language (Osuna & Meskill, 1998; Kung & Chuo, 2002, Son, 2007). Kosakowski (2000) explained that higher-achieving students are more motivated and gain self-confidence when using computer-assisted instruction because of self-controlled learning; further, the effects are also noteworthy for at-risk students.

Bain and Rice (2006) discovered female learners are interested in technology, but they do not show the same level of confidence as male students. Females' perceptions in technology usage are more self-effacing. Thus, gender differences might not be as predominant a variable in student technology use as the variable of previous computer use in the student's educational or experiential background. Son (2007) reported that students viewed web-based language learning as helpful for achieving successful comprehension of language, and that students enjoyed learning in this way. Although Son's study revealed positive feedback, he echoed the concern that students' computer skills should be considered. For that reason, adequate students' computer proficiency

training should be needed. Fuller (2000) stated, a technology coordinator with teaching experience may improve teachers' technology support.

Teachers' Beliefs and Technology Training

Technology integration in the classroom is intertwined with three major factors: "(a) institutional expectations for technology use, (b) teachers' beliefs about learners and learning, and (c) the host of informal ways in which teachers learn to use technology" (Windschitl & Sahl, 2002). The institution's technology support, context and culture communicate institutional expectations to teachers and can motivate and encourage them to incorporate technology into the classroom (Windschitl and Sahl, 2002; Xie, 2005). "Once technology is truly integrated, teachers' beliefs and knowledge are changed as well" (Zhao, 2003, p. 10). Clausen (2007) asserted that if an institution supports new teachers and provides opportunities for professional growth, teachers are more likely to effectively integrate technology into instructional practice.

Some teachers and professors ban laptops from their classrooms because they view the devices as a distraction (Young, 2006; Windschitl & Sahl, 2002). Obviously, these instructors' mindset and instructional methodology have not moved from traditional teaching methods toward constructivist instruction (Windschitl & Sahl, 2002). Distraction is a real possibility. How can teachers deal with it? According to McGrail (2007), teachers should let go of their traditional authority role as solely knowledge providers and assume a new role as facilitators and coaches. Even if the teacher acts as a facilitator/coach, the teacher must remain in charge in the classroom. Constructive pedagogy supplemented with meaningful instructional activities can help students develop critical thinking and problem-solving skills (McGrail, 2007).

Technological advancement is faster than instructors' adoption, and scholars are still "far from being confident" about their ability to convince teachers that one-to-one technology enhanced learning can be effective in teaching (Chan, Roschelle, His, Kinshuk, Sharples, Brown, et al., 2006). Teachers' beliefs, knowledge, skills and attitudes toward technology obviously affect their willingness to integrate technology in the classroom (Windschitl & Sahl, 2002; Hadley & Sheingold, 1993). McGrail (2007) conducted a qualitative study to analyze why some English teachers had negative feedback concerning laptop technology in their classrooms. He found that teachers' pedagogies determine teachers' and students' experience in technology-enhanced classrooms.

Further, Donovan, Hartly and Strudler (2007) found that teachers were uncomfortable about modifying teaching methods to accommodate one-to-one technology class settings, and advocated effective professional development tailored to teachers' comfort level and their apparent concerns with the new technology. Green (2000) confirmed that the key information-technology challenges in higher education "involve people, not products." Similarly, training faculty so that they have adequate computer skills and the required knowledge to successfully incorporate technology is both crucial and challenging. Green (1998) identified "assisting faculty to integrate technology into instruction as the single most important information technology issue" (cited in Bates, 2000). Consequently, schools and institutions should offer technology training opportunities to elevate teachers' comfort level and help them see the potential uses of new technologies. According to the Office of Technology Assessment report titled Teachers and Technology: Making the Connection (1995), teachers are much

willing to invest their time and energy to learn teaching with the assistance of technology if they know technology can help students stay motivated and enhance achievement.

Fuller (2000) noted that supporting teachers as a user group is a more effective strategy than supporting students as a user group. Although most institutions provide faculty development courses to enhance instructors' technological acumen, the content and method used for that training does not always receive sufficient careful consideration. Professional development should focus more on effective teaching with technology than on mere computer skills in abstract isolation (Windschitl and Sahl, 2002; Bates, 2000). Bates (2000) lauded the importance of revealing the purpose of technology integration and advocated offering "show-and-tell demonstrations" by peer faculty (mentors) who "have developed good examples of technology-based teaching."

Zhao (2003) noted the importance of considering the depth (how much a teacher knows about one particular topic), and breadth (quantity of topics understood), of a teacher's technological knowledge. Faculty technology training is one of factors needed to help technology-based instruction succeed (Kosakowski, 2000), and will always be desirable in education (Hampel and Stickler 2005). As to the effectiveness of technology training, Bates (2000) hypothesized that "best-practice organizations focused on teaching and learning, and not on technology itself." Successful faculty training employs "a well-defined development process map, which emphasizes hands-on, problem-solving contexts, not what technology can do" (Bates, 2000). Moreover, institutions should remember that one of the key incentives for teachers to learn technology is "student accomplishment and students' being able to use the technology as a tool" (Hadley & Sheingold, 1993).

Nonetheless, “assisting faculty efforts ‘to integrate technology into instruction’ remains the single most important information technology (IT) challenge confronting American colleges and universities” according to The 1999 National Survey of Information Technology in Higher Education (Green, 1999). Green (1999) thought “recognition and reward remain essential yet widely ignored components of technology planning at most institutions.” Accompanying recognition and reward systems is a key to teachers’ positive participation and can also accelerate technology-integration processes (Xie, 2005).

Technology Integration in Chinese Language Teaching and Learning

Technology has become increasingly important in learning Chinese even though it may frustrate some users (Bourgerie, 2003). Computers and the internet bring convenience, and they enable learners to study languages anywhere and anytime, including in classrooms (Xie, 1999). He (2000) summarized five advantages of utilizing technology in Chinese instruction: a) enhance teaching and learning conditions; b) augment instructional efficiency and learning results; c) improve learning autonomy; d) promote higher order thinking; and e) reduce teachers’ workload if the right software is used.

Bai (2003) received positive feedback from learners when researching making multimedia an integral part of a successful Chinese language program. Learners enjoyed one-on-one tutoring online. Bai (2003) also highlighted the importance of incorporating strategies and techniques for creating optimal instructional environments with the assistance of technology in future research. Multimedia technology makes Chinese teaching more learner-centered because teachers don’t need to spend an enormous

amount of time explaining new words, and students can select parts of instructional content they would like to listen to and read (Liu, 2002).

Even though students at the University of California at Berkeley were satisfied with computer-aided listening exercises, when Chinese teachers adopted the WebCT program to create listening exercises, Zhang (2004) noted that technological and pedagogical problems needed to be solved for successful implementation. Zhang (2004) stressed that the adoption of computer technology should not be mistakenly treated as a panacea for language teaching and learning because it can also bring new problems. To prevent misuse of technology in language teaching and learning, language acquisition theory and computer-assisted learning activities should be integrated to make successful teaching and learning possible (Zhang, 2004).

Another resource for teaching and learning Chinese is the internet. Online internet resources could be used in and out of the classroom; for instance, online animated stroke order to teach Chinese characters could increase students' motivation (Xie, 2004). In addition, online rich Chinese learning sources become powerful for learners when combined with text-aid software such as Wenlin (Bourgerie, 2003). Wenlin is ideal Chinese software and a textbook-independent electronic dictionary (Xie, 2005). Dictionary software "represents one of the best uses of the computer technology", which is easy for sorting, retrieval and cross-referencing (Zhang, 1998). Wenlin has powerful dictionary functions which enable students to learn Chinese reading and writing independently by inputting pinyin, the Chinese Romanization system (Xie, 2005; Zhang, 1998.; Bourgeries, 2003). Chinese word-processors also play a positive role in assisting students to learn Chinese characters (Liu, 2002). With the assistance of Chinese word-

processing software, Xie (2002) found students make fewer pinyin mistakes, complete homework faster, increase familiarity and speed in reading, and expand the content of Chinese writing, etc. Nevertheless, Liu (2002) suggested Chinese word-processing software should not completely replace writing Chinese characters by hand. Gulek and Demirtas (2005) also noted that using computers not only motivates and engages students more in writing tasks, but also produces greater length and higher quality in English writing in their study. Although computer-assisted Chinese teaching and learning seems promising, Zhang (1998) suggested that technology use needs to be guided by pedagogy; otherwise, technology can be misused.

Ihde and Jian (2003) found that Chinese learners reported computers did not play a key role in Chinese learning because teachers did not promote the utilization of computers in learning Chinese and scarcely used computer facilities and software products. Zhang (2004) stated the possible reason teachers aren't willing to make full use of computers to assist teaching and learning is because great efforts and time are required, and this is beyond their capability. Ihde and Jian (2003) continued to note that teachers and students aren't very aware of existing technological learning materials, and learners aren't ready for a self-access learning environment.

Even though computers provide efficiency, effectiveness, and convenience in Chinese teaching, teachers usually spend more time in class preparation than traditional classroom with textbooks, chalks and blackboards (Xie, 2005). Technology constantly changes and updates, and it therefore takes time for teachers to adopt and continue learning technological skills (Xie, 2005). Moreover, using computers in teaching Chinese is quite time-consuming, energy-consuming, and money-consuming (Xie, 2000). As a

result, some teachers are not excited about applying technology in Chinese teaching and learning (Liu, 2002).

Schools should encourage Chinese teachers to learn modern technology and offer technical support, and teachers have a responsibility to apply effective methods and media in Chinese teaching (Liu, 2002; Xie, 2005). For Chinese teachers, technology utilization (practice & adoption) and the learning process should be combined and executed simultaneously instead of "utilization after learning" (e.g., practice what they've learned after learning technology) for better results (He, 2000).

One-to-One Computing

One-to-one (one student, one computer) computing provides an equal opportunity for each student to learn with assistance of a computer at home and at school. Computer labs are no longer the only places to provide access to the internet and software programs. One-to-one computing enables portable (mini) labs anywhere and anytime, and students no longer need to "wait for a lab, classroom, or home computer to become available" (Livingston, 2007, p. 26). One-to-one programs not only make students more technology savvy, but also increase student attendance and motivation (Livingston, 2007). Livingston (2007) listed three advantages accrued from a one-to-one technology environment to enhance learning:

1. Self-directed learning: The portable computer serves as a "digital assistant," which has unlimited access to the internet. With the assistance of a digital assistant, students can think and solve problems faster, as well as easily write, edit, revise, rewrite, and then submit their assignments to teachers from home.

2. Higher-order thinking: “The process of acquiring and manipulating information and ideas is shortened when every student has a digital assistant, which means analysis and higher-order thinking can happen more readily” (Livingston, 2007, p. 26).
3. More time on task: “Having a digital assistant in any form to take from school to home will mean better work in terms of research, writing, and presentation” (Livingston, 2007, p. 26).

Notwithstanding Livingston’s optimistic assessment, experiences like that at the Clovis Unified School District offer cautionary anecdotes to the contrary. Clovis Unified started using laptops to create an immersion learning environment in 1996, but the use of laptops subsequently declined because of the nature of high school teaching and class selection (McHale, 2007a). Similarly, Kansas Osawatomie school districts have initiated issuing students tablet PCs, but subsequent teacher feedback has indicated that teachers were not properly trained and that the new scheme ultimately succeeded only in necessitating more work (McHale, 2007b).

On the other hand, MacKinnon and Williams (2006) conducted a quantitative and qualitative research study of a one-to-one physics class and found that students appreciated the appropriate use of technology and thought the physics course became easier with the use of technology. Likewise, at the Polaris Career Center in Middleburg Heights, Ohio, students receiving online curriculum and laptops achieved a performance level almost twice that of previous students (Andrews, 2007). Andrews (2007) believed the gains resulted from teachers’ successful tool incorporation, network connectivity, effective software, and quality hardware. MacKinnon and Williams (2006) warned that

instructors should carefully reflect about how technology can promote learning objectives, because instructional technologies do not always enhance the learning experience and can result in "much less long-term retention of knowledge and process skills."

Successful technology integration has attracted attention from academia. Several scholars and academic institutions have researched technology utilization in the classroom. For instance, Indiana University researchers are conducting a study to "determine how teachers should use technology in the classroom" (Associated Press, 2007). Pierson (2001) has conducted a case study "Technology Integration Practice as a Function of Pedagogical Expertise" and found technology use was related to instructors' teaching expertise. Pierson (2001) concluded it is crucial to have exemplary teachers who can effectively use technological tools to benefit students' learning. Experienced and exemplary teachers set goals for lessons, time constraints and the curriculum (Berliner, 1986). Berliner (1986) advocated looking for expert pedagogy and performance, noting that experienced teachers spend more time to establish effective routines and problem solving. Expert teachers effectively utilize routines at the beginning of the class and build more complicated subsequent routines to expand students' knowledge (Leinhardt, Weidman & Hammond, 1987).

Pierson (2001) suggested that research in technology integration should not be restricted to a limited range of activities governed by a narrow set of rules, but should explore what expert teachers do with students on a more global basis. Using computer software in an exemplary way can result in students learning to think, write and solve problems more successfully, and thereby maximize students' learning outcomes (Becker, 1994). Teachers need to investigate methods such as social and community-related

activities to help facilitate student efforts to organize and internalize instructional laptop materials (Odhabi, 2007). Riley (2007) suggested "using skilled teachers as trainers" during the challenge of training instructors in one-to-one computing. It appears that understanding expert teachers are a critical piece of the puzzle.

Reflections on the Literature Review

TPCK knowledge is not typically held by subject matter experts, technologists who are expert computer technicians with excellent computer skills, or teachers who know little about a subject or technology, but instead by expert teachers (Mishra & Koehler, 2006). Nevertheless, the most commonly seen technology trainers are technologists, who generally do not possess or consciously pursue strong competence in skills or knowledge related to content and pedagogy. There is an unmet need to scrutinize expert teachers who have successfully incorporated technology into the Chinese-language curriculum and class design. It appears that technologists should specifically investigate how expert teachers introduce technology with pedagogy and content to yield productive instruction, so that teachers will be empowered to flexibly adjust effective pedagogy strategies and tactics to best meet students' needs. Observation of experienced or expert teachers who integrate technology in classroom instruction will eventually lead to more effective assistance for technology trainers and inexperienced teachers who are eager to successfully amalgamate technology and other classroom activities.

People who teach are also learning, and in our complex modern technological world, the roles reverse and shift constantly (Shulman, 2005). Shulman (1986) advocated "knowledge growth in teaching" and researched how knowledge grows alongside teaching. Dunn and Taylor (1990) similarly commented that teachers' expertise and

capabilities are learned from experience. Shulman (1990) utilized the method of "cases" to scaffold teachers into gradual integration of pedagogy in their subject-matter materials for foundational education courses. However, Pietig (1997) disagreed with Shulman's scaffolding metaphor for education and asserted that Dewey, the most influential thinker on education in the twentieth century, would oppose it. Pietig (1997) commented that Shulman diminished foundations of learning by linking foundations too closely with the subject matter being taught, and argued that teacher education programs must rest upon solid foundations instead of scaffolding.

The aforementioned argument calls to mind Zhou (2006), who believed it is important for Chinese teachers to root themselves in a solid foundation of Chinese Linguistics and Literature and to then learn necessary pedagogical skills. In contrast, Jiang (2007) suggested pedagogy and subject matter knowledge should be learned jointly. The statement of Jiang (2007) is similar to Shulman's scaffolding metaphor, and the comments of Zhou (2006) resemble Pietig's solid foundations of teacher education. It is difficult to prove which perceptions best suit teacher preparation in applied settings.

Shulman (2005) called attention to finding a "signature pedagogy" for teacher education after observing medical and law schools. According to Shulman (2005), signature pedagogy is pervasive and allows students to "do complex things habitually in routine ways that liberate the mind to concentrate on other things that make students feel deeply engaged" (p. 22). That is to say, students can spend less time learning new rules of engagement and more time concentrating on increasingly intricate subject matter by following the same pedagogical routines each day (Shulman, 2005). If medical and law schools are successful because of signature pedagogies, it is worth investigating what

signature pedagogy (if any) is being used for Teaching Chinese as a Second Language. Finding signature pedagogies might be a key to discovering whether a solid foundation leads to successful classroom instruction, or whether scaffolding (knowledge growth in learning) leads to better results. Variables relating to the qualifications of the most successful teachers can also likely be discovered by scrutinizing signature teachers' educational background and experience.

CHAPTER 3: METHODS

This chapter is divided into six sections: design, participants, instruments, procedures, data analysis, and study judging criteria. Detailed descriptions are provided below.

Design

The study used a qualitative case-study design to collect "thick descriptions" of context-related information. A qualitative case study requires researchers to spend "extended time on site, personally in contact with activities and operations of the case, reflecting and revising descriptions and meanings of what is going on" (Stake, 2005, p. 450). More specifically, the method of "instrumental case study" adopted by the study required constant analysis of data records to generate theoretical insights (Morse & Richards, 2002). In other words, the study examined a particular case to provide insight into an issue or to redraw a generalization (Stake, 2005; 2003). The theory of this study for framing the investigation was based on concepts of TPCK framework, as stated in the research questions.

The study utilized Patton's Purposive Sampling Intensity case, meaning use of "information-rich cases that manifest the phenomenon intensely, but not extremely, such as good students/poor students, above average/below average" (Patton, 1990). Purposive sampling allows researchers to choose a case which illustrates features or processes in which they are interested (Silverman, 2005). Through the purposive sampling of exemplary teachers, this study could explore the features and processes of the TPCK framework in comprehensive detail, with the goal of enhancing the adaptability of the TPCK framework. The sample size of case studies is usually not large enough to

constitute a representative sample; but on the other hand, a purposive sample provides opportunities to study specific people in a specific culture for important information in an in-depth study (Patton, 1990; Stake, 2005). By means of a purposive sampling intensity case, more rich information could be added to expand the technological pedagogical content knowledge (TPCK) framework relative to Chinese language instructors' face-to-face classroom instruction, curriculum design, and instructional processes.

Participants

In this section, the researcher/inquirer, subjects, and debriefers will be introduced.

Researcher

The researcher/inquirer for this study is Su-Ling Hsueh, the language technology specialist for the Asian 1 School in DLIFLC. My main job responsibility is to train faculty members and students in technology knowledge and skills. Training faculty about technology is not an easy task. Acquiring an in-depth knowledge about teachers' beliefs and the way they actually perform in classroom is of direct benefit to a language technology specialist. As an old Chinese saying goes, "Know the enemy and know yourself, and you can fight a hundred battles with no danger of defeat." Of course, teachers and students are not the "enemy" in this context; miscommunication, lack of coordination, inefficiency, and poor test results constitute a more abstract kind of opponent. In this situation, one must know the intended classroom audience in the context of their actual needs and behavior in real classrooms. This knowledge may help a technology specialists provide more of what teachers and students need, and thereby help teachers and students achieve higher levels of performance. A more detailed description about the researcher's background is provided in Appendix C.

Subjects

Participants included a) three exemplary Chinese Mandarin instructors who undertook the responsibility of serving as team leaders for different semesters of instruction at the Chinese Departments of DLIFLC, b) forty Chinese language learners in the instructors' classes, and c) one Chinese Mandarin academic specialist who is responsible for developing, designing, and supervising the use of Chinese Mandarin learning materials.

The participant teachers were selected based on the following criteria:

1. The first participant selection criterion was to choose teachers from each of the three semesters. The Chinese program lasts 63 weeks: weeks 1-21 are in the first semester; weeks 22-42 are in the second semester; and weeks 43-63 are in the third semester. At any time of the calendar year, there are always some students and teachers in each of the three semesters of the program.
2. The second criterion was that participant teachers should be team leaders who have full discretion to make the logistical plans for their own classes.
3. The third and most important criterion was that the participant teachers were known to be good instructors who were enthusiastic about attempting to integrate technology, pedagogy and content. In addition, the participants must have had an average score of 3.7 or above on the four-point scale of the Teacher Effectiveness portion of the End-of-Course Student Questionnaire (ESQ). The ESQ includes twenty items such as "used a variety of activities to make learning interesting," "encouraged student participation in class," etc. The teacher effectiveness ratings

are based on overall teacher performance, professionalism and helpfulness. A copy of the questionnaire may be found in appendix D.

4. Finally, the participant teachers had to agree to participate in the study by keeping reflective journals of their instructional performance and reflection, class preparation, etc.

The three teachers/team leaders who met the above four criteria were invited to participate in the study. Department chairpersons were consulted to ensure that participant teachers met the above criteria and approval was in place for the data collection. The three participant teachers were female, in the age range of 35-39, and originally from China or Taiwan. The three of them have had over ten years of language teaching experience. Two of the teachers have received more than two Excellent Teaching Awards apiece from the Defense Language Institute (DLI). One of them also received the Student Teaching Award and the Allen Griffin Teaching Award for Excellence. The three teachers were also qualified as Oral Proficiency Interview Testers in DLIFLC, which means the teachers had an advanced knowledge about precisely how their students would actually be evaluated. The teacher for the semester 3 class just completed the DLPT 5 and OPI tests in July 2008, and the class's performance surpassed the DLIFLC's requirements. That teacher received another Excellent Teaching Award.

The three teachers either majored in Teaching Chinese as Second Language or Teaching English to Speakers of Other Languages. This fact shows that the participants were not only content subject experts, but were also familiar with language teaching methods. They were keen about the notion of Chinese language teaching.

The participant students were adult language learners whose ages varied from 18 to 40. Some students were recent high school graduates, some had completed some previous college study, and some had bachelor or master degrees. All of the students served in the military: Air Force, Army, Navy, or Marine Corps. Some students were enlisted, and others were military officers. The majority of students were male. Learning Chinese was their job requirement and mandatory training in order to be Chinese linguists.

Debriefer

Peer debriefing is a technique employed to establish the credibility of qualitative research (Lincoln & Guba, 1985). "It is a process of exposing oneself to a disinterested peer in a manner paralleling an analytic session and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind" (Lincoln & Guba, 1985, p. 308). Debriefing may a) eliminate an inquirer's biases; b) test working hypotheses in the inquirer's mind; c) "provide an opportunity to develop and initially test next steps in the emerging methodological design" (Lincoln & Guba, 1985, p. 308); and d) clear the inquirer's mind for good judgment (Lincoln & Guba, 1985). To increase the credibility of the study, peer debriefing was conducted. Lincoln & Guba (1985) stated that "the debriefer must be someone who is in every sense the inquirer's peer, someone who knows a great deal about both the substantive area of the inquiry and the methodological issues." Thus, DLI Assistant Dean Timothy Berndt and the senior researcher in DLI Research & Analysis Division, Dr. Gordon L. Jackson, accepted invitations to be debriefers for the study. Mr. Berndt is fluent in both Chinese and English and has taught Chinese at DLIFLC for 5 years. He also previously served as a Language

Technology Specialist. Dr. Jackson's expertise is in editing and researching methods. He has assisted several scholars with conducting and designing research studies over the past few years.

Data Sources

Data sources of the study included interview questions for instructors, students, and the academic specialist (Questions are listed in Appendix E.); fieldnotes of class observations; guiding (interview) questions of focus groups; and instructors' reflection journals that were responsive to guided questions. More comprehensive information is set forth below.

Interview

Interview questions for teachers mainly focused on their knowledge about their job requirements, responsibilities, concepts of technology integration, routines, and thought process during class preparation, etc. The questions were designed to elicit details about the teachers' instructional planning and the roles of content, pedagogy and technology in their instruction. Interview questions for students were intended to find out if students had any routines which facilitated their learning, with respect to settings both in and out of the technology-enhanced classroom. In addition, the questions also elicited students' preferences and comments about their teachers and the technology-enhanced environments. Interview questions for the academic specialist were designed to understand requirements, culture and context regarding Chinese language instruction at the institute. All interview questions are listed in Appendix E.

All interview questions were reviewed by Dr. Gordon Jackson, a senior researcher in the Defense Language Institute Research & Analysis Division. He revised the

questions to make sure questions were clear enough for participants to answer. However, due to unavoidable time constraints surrounding the study, the interview questions were not pilot-tested.

Class Observation

The following information was collected in fieldnotes during class observations:

1. Date, time, class number and physical (classroom) setting.
2. Materials used in the classroom (textbooks, handouts, instructional aids, audio and video materials, etc.).
3. Pedagogy utilized in the classroom, including listening, reading, speaking and writing activities.
4. Technology used in the classroom.
5. Verbal dialogue and non-verbal communication.
6. Students' course projects, interaction, and performance.
7. Teachers' instructional procedures and behaviors (performance).

During or after the observation, the researcher recorded her reflections, experience, and analysis, all of which were used as memos during data analysis. Morse and Richards (2002) indicated that the inquirer's own experience in observation is intimately richer and more valid than secondhand experiences obtained by interviews. Thus, fieldnotes usually consist of descriptive (describing what the inquirer sees, hears and experiences) and reflective (reflect the inquirer's personal learning) writing (Bogdan & Biklen, 1982).

Focus Group

The focus group allowed instructors to share concerns, experiences, and in-depth instructional insights, and respond to the researcher's analysis of instructor's journals and class observations. Guiding questions included the following:

1. What kinds of skill training (reading, writing, listening and speaking) exercises/activities are more effective and efficient to carry out using technology?
2. What kinds of pedagogy do you implement and what kinds of content do you cover that you didn't before technology (e.g., iPods, tablet PCs, etc.) was introduced to the school?
3. Could you describe what roles course content, pedagogy (instructional approaches and methods) and technology knowledge play in your classroom instruction? What is their relationship?
4. The preliminary journal analysis tells me . . . [the researcher gives a summary of her journal analysis]. Have I missed anything? What can you add?
5. The preliminary classroom observation tells me… [the researcher gives a summary of her classroom observation]. Have I missed anything? What can you add?

Instructor's Reflective Journal

The reflective journal effort was aimed at collecting instructors' reflection regarding their teaching and class preparation. The following guiding questions were designed to direct teachers' input:

Instructions: you may audio-record, write or draw your weekly reflective journal. Please include but not limit yourself to the following guiding questions:

1. Date and class number.
2. How have you prepared your classes by considering course content, pedagogy and technology so far this week? For example, did the sequence of course content, pedagogy and technology come into play in your mind? In what ways (You may draw your mind map (thoughts)?
3. What are your goals for this week's instruction and preparation process?
4. What is your most successful class so far this week? What made it successful?
5. What is your least effective class so far this week? What made it ineffective? What are you planning to do to change it?
6. Your reflection on this week's instruction, your team's performance and anything relevant to your teaching.

Procedures

This section discusses data collection procedures. The procedures include interviews, class observations, reflective journals, a participant focus group; data sources to answer research questions; debriefing; and the member check.

Data Collection

In order to collect thorough data in every aspect, five data collection methods were adopted: interviews, class observations, teacher focus groups, teachers' reflective journals, and related documents. The use of multiple sources and methods was employed to "improve the probability that findings and interpretations will be found credible" (Lincoln & Guba, 1985; Williams, n.d.; Stake, 2005; 2003). In other words, the technique was regarded as *triangulation*, which could establish credibility for the study. More details regarding the data collection methods are described below:

1. Interviews. Interviews of participant teachers, students and the Chinese Mandarin academic specialist were conducted at the beginning of the research. The duration of interviews was 15-45 minutes. Interview duration varied depending upon interviewees' insight and answers. All of the interview sessions were audio-recorded, and no participants rejected audio-recording. All audio-recorded files were later transcribed for data analysis and then archived. A total of thirty-four interview sessions were conducted. Some participant students did not consent to be interviewed, could not find time to be interviewed, or were "recycled" in their class progression due to poor individual academic performance (a routine step that occurs in selected cases within virtually every class at DLI, even classes led by the best teachers).
2. Class Observation. The researcher conducted non-participatory observations of instructors' performance, classroom interaction and activities. Each participant teacher was observed for one class period per week. The researcher stood or sat in the back of the classroom. All participants agreed to be observed and were notified about each researcher visit. The researcher carried a paper-notebook to keep fieldnotes; this method was used to avoid disturbing participants with computer typing noises. All instructors agreed to be videorecorded, but some students did not consent to be videorecorded and agreed only to be audio-recorded. No individual student was videotaped without knowledge and consent. A camcorder was set at an angle to avoid visually videotaping any particular non-consenting individual. If the individual students were filmed because of class activities, the revealing segments of films were permanently deleted. If the

researcher had any questions or concerns regarding the observation, teachers were willing to address such points immediately after the observation. The three teachers would explain what they had done differently or any special incident immediately after class observation. There were a total of 44 class observation fieldnotes collected during the study.

3. Teacher Focus Groups. The first focus group was conducted, recorded and transcribed on April 24, 2008. Two participant teachers joined the focus group, and the researcher reported what she observed and followed up with more questions based on that observation. Since most observation questions were immediately clarified during class breaks, the focus groups proved to be unnecessary and were eventually eliminated. Focus groups also proved to be inopportune in light of the teachers' very busy schedules. Alternative feedback efforts proved to be more effective.
4. Teacher's Reflective Journals. Participating teachers were required to provide written, typed, or audio journals regarding their class preparation, lesson planning, successful and unsuccessful activities and class routines, etc. At first, two teachers kept audio-journals; however, it took too much time to transcribe the resulting audio files. Therefore, all of the teachers eventually chose to keep written journals. Twenty-two journal entries were received. Due to the busy schedule of the teachers, participants did not turn in their reflective journals weekly, but on a bi-weekly basis or as frequently as feasible under the circumstances.
5. Documents for Analysis. Class schedules, instructional PowerPoint files, and teachers' reports on course performance were analyzed. A total of 43 class

schedules and three Powerpoint presentations were analyzed. However, descriptions of most PowerPoint presentations were already included in fieldnotes of the class observations.

After data collection, there were a total of 22 reflective journals from three instructors, 44 observation fieldnotes, 33 interviews, one focus group, three extra presentation documents from one of instructors, and 43 weeks of course schedules received. All audio recordings of interviews involving teachers, students and the academic specialist were transcribed and recorded in Microsoft Word. All of the data was kept in electronic format.

Data Sources for Research Questions

Data sources used to address the research questions are shown in Table 1. Each research question is listed in the left hand column, while corresponding data sources are listed in the right-column. For instance, data sources for addressing question 1 included class observation; instructor's interview questions 1, 2, 4, and 8 (see Appendix E); reflective journal questions 2, 3, 4, and 5; student's interview questions , and 2; and so forth.

Debriefing

The first debriefing was conducted at 9:00am on May 07, 2008 with Mr. Timothy Berndt. The debriefing meeting lasted approximately 40 minutes. The debriefing meeting was audio-recorded. Mr. Berndt showed his interest in the preliminary findings of the class observations and asked several questions. The second debriefing meeting was conducted on August 29, 2008. The debriefing meeting was with Dr. Gordon Jackson and took 1.5 hours. The meeting was not audio-recorded. Dr. Jackson was briefed on the data

analysis, findings and conclusions. He had already reviewed the research questions and read the research prospectus. He communicated his concerns and questions regarding ambiguous interpretations associated with some of the research questions. Dr. Jackson also provided guidance on how to improve the structure of findings. The structure and organization of findings were modified based on his comments.

Table 1

Data Sources for Answering Research Questions

Research Question	Corresponding Data Sources
Question 1: How can the Technological Pedagogical Content Knowledge (TPCK) conceptual model be usefully modified by analyzing language content (e.g., course materials), pedagogy (e.g., approaches and methods) and technology (e.g., hardware and software) in the Chinese instructional context?	Class Observation Instructor's Interview Q 1, 2, 4 & 8 Reflective Journal Q2, 3, 4 & 5 Student's Interview Q1& 2 Academic specialist interview Q 1, 2, 3 & 6 Focus Group Document: course schedules, instructional aids, and teacher's report on course performance.
Question 2: What is the conceptual relationship among Technology, Pedagogy and Content during teachers' class preparation, class planning/design and instruction?	Instructors' Interview Q3, 5, 6, 7 & 9 Reflective Journal Q1 Academic Specialist Interview Q4 & 5
Question 3: What were students' perceptions of an ideal Chinese Mandarin class in terms of course materials, instructional approaches and methods, and technological tools?	Student's Interview Q3, 4 & 5

Note. Q= question.

Member Check

The first member check was conducted on April 04, 2008. Two teachers were present. A discussion was conducted about the researcher's summary of her classroom observations. The second member check was conducted on August 28, 2008 after data was analyzed. Three participant teachers were present for the meeting. The researcher reported the results of the data analysis. The teachers agreed with the data analysis and the tentative interpretations of the class observations, interviews, reflective journals, and class syllabi (i.e. class schedules). The teachers asked about the data reported in the tables because the percentages of each item did not have underlying quantity totals. The data was clarified with this information, and was later modified to include a detailed explanation about the findings to make interpretation easier for other readers. The participant teachers were interested in learning about students' preferences and perceptions about pedagogy, content and technology.

Data Analysis

Qualitative data analysis varies from explicit to implicit (descriptive to analytic coding). Morse and Richards (2002) provided instructions for conducting descriptive, analytic, and "theme-ing" coding in qualitative studies, manually and by computer software, and the steps of their coding system are quite similar to Spradley's (1980) ethnographic research data analysis methods (domain, taxonomic, componential and theme analysis for ethnographic studies). Spradley's data analysis approach is quite systematic; it involves first looking for small units (domains), then classifying the domains, and discovering themes in the analyzed data. Spradley's domain analysis is similar to descriptive coding; taxonomic and componential analysis is similar to analytic

coding, and vice versa. The three ways of coding were adopted in this study: descriptive, topic and analytical coding. Each of these techniques is described below (Richards, 2005).

1. Descriptive coding is quite similar to quantitative coding. It requires storing information (values of variables; attributes) about participants. The attributes are used to describe a case and can include gender, age, education, and so forth.
2. Topic coding is for labeling text early in a project in accordance with topical categories. This coding takes considerable time because many possibly relevant topics must be considered at the beginning of the data analysis.
3. Analytical coding is central to qualitative research. This coding is based on the researcher's interpretation of, and reflection upon the meaning of data. Theories emerge and are affirmed through this process.

During the data analysis procedure, NVivo 7.0, a computer software program designed to facilitate the analysis of qualitative research data, was employed to import, store, manage, code, and analyze electronic data. NVivo 7.0 allowed the researcher to create as many coding categories or nodes as were needed. In Nvivo7.0, a node is a topic label. These nodes can be grouped into tree nodes to form themes.

The first data analysis process started with descriptive coding by storing the attribute (semester 1, 2 & 3) in each imported document to describe cases. After entering descriptive code (i.e., semester 1, 2, or 3), topic coding was conducted. This was quite a long process because many free and tree nodes (categories/topics) were created after an analysis of the data. After nodes were labeled, several overlapping and related categories

were found. Even though NVivo 7.0 is equipped with auto-coding function and auto string queries, a decision was made to manually categorize all text and data. NVivo 7.0 recorded logs of all tree nodes (topics) with created and modified dates.

After topic coding was completed, the frequently-occurring codes were identified and analyzed in terms of their association with research questions. Several themes related to the research questions were identified during the process. To examine the themes, analytical coding was implemented to identify key themes by scrutinizing the researcher's memos regarding interpretation and reflection on meaning of data, which were retained during topic coding. The researcher also revisited the literature review and read additional literature to bring additional insight to bear upon the analysis of the data findings.

Criteria for Judging the Study to Establish Trustworthiness

Four Criteria standards (credibility, transferability, dependability and conformability) used to judge this study were derived from Williams' book, Educators as Inquirers: Using Naturalistic Inquiry (Williams, n.d.). The Criteria standards for naturalistic inquiries were also found suitable to critique this qualitative research. The checklist from Williams (n.d.) provided self-examined criteria to ensure all aspects were considered and addressed.

Credibility

To establish the credibility of the study, the following questions from Williams' checklist are used.

Is the prolonged engagement adequate?

The data collection started in March and ended at the beginning of August. The data collection period lasted around 4.5 months. Even though the collected data was adequate to address the research questions, a longer data collection period of time would have been ideal.

Is the persistent observation adequate to collect sufficient data?

One class for each participant teacher was observed every week. Every observation was videotaped so that it could be re-visited and clarified with regard to any uncertain points. The 4.5 months of class observation did seem to provide sufficient data to answer the first research question.

Is the triangulation used appropriately?

Triangulation was used in the study, including class observations, interviews, focus groups, reflective journals, and document analysis (i.e., instructional aids and reports). The triangulation was appropriately used to ensure several perspectives were considered in connection with questions 1 and 2. The answers for research question 3 were mainly based on students' interviews. I should have designed survey questions as well. Survey questions might have suggested slightly different results.

Will peer debriefing be used appropriately?

Peer debriefing was appropriately used for this research. During the second month of the study, the researcher performed a member-check focus group and reported preliminary findings to the teachers. The first debriefing was also conducted during the second month of the study. To ensure the findings were credible and objective, the researcher briefed Dr. Gordon Jackson, who has extensive research experience. He

provided suggestions to rectify the tables and clarify the research questions in light of the findings. Dr. Jackson was also interested in the research results. Research data was revisited and findings were revised to be more comprehensible in light of the debriefer's suggestions and questions.

Is negative case analysis used appropriately?

"Negative case analysis may be regarded as 'process of revising hypotheses with hindsight,' which is analogous to statistical tests for quantitative data (Lincoln & Guba, 1985, p. 309). Negative case analysis makes qualitative research systematic because it continually revises and retests hypotheses when a single negative case (similar to "outlier" in quantitative research) is found (Kidder & Judd, 1986). Therefore, when a negative case is found, hypotheses and research questions should be revised to integrate the new evidence until there is no more disconfirmation in the study. The revised hypotheses and questions should be tested for their consistency with other studies, observations and interviews.

Responses from students were quite straight-forward regarding their concepts for an ideal Chinese language classroom, teachers' technology use, etc. All students gave examples how their teachers used technology effective and helped them learn better, except for one participant. The exceptional case was not disregarded because her case would not have influenced the result of findings given the overwhelming positive feedback from the rest of the students in her classes. In addition, researcher observation of her performance during class instruction revealed that she usually did not pay attention to teachers' technology-integrated activities or instruction, even while other students were actively involved. She was often distracted and read only the content that interested

her. Therefore, her exceptional negative answer was attributed to her personal learning habits and learning style.

Another negative case occurred when the first teacher was interviewed regarding her views about technology, content and pedagogy. She provided an answer that was unexpectedly negative and her perception about technology, content and pedagogy was inconsistent with the TPCK framework. Yet the teacher involved had received many excellent teaching awards and her students had graduated with good scores.

Negative case analysis makes qualitative research systematic by continually revising and retesting hypotheses when a single negative case (similar to "outlier" in quantitative research) is found (Kidder & Judd, 1986). In response to the negative cases, the researcher revisited initial assumptions about the TPCK framework and considered the possibility that the TPCK framework might not be 100% applicable to the context of this study environment. Thus, the initial assumption was changed to acknowledge that teachers do not really apply TPCK framework when they prepare lessons. Further inquiry also revealed that the other two teachers' answers verified the new assumption after the first negative case was identified. Therefore, the negative cases were not actually negative, because they helped the inquirer revisit assumptions and research questions.

Is the emic perspective highlighted?

The etic perspective is that of the outsider who is not part of the culture group, whereas, the emic (insider) perspective is that of researchers who share the participants' culture (Morse and Richards, 2002). Since the researcher is a language technology specialist who works closely with teachers and students, it was easier to highlight emic

perspectives. Therefore, the culture-specific emic perspectives were consequently highlighted and stated.

Are member (participant) checks used appropriately?

The researcher performed two member-check meetings with teachers. However, in retrospect, it would have been useful to conduct member checks with students as well to help verify the accuracy of the data interpretation. Unfortunately, students had military duties after school hours or were occupied with after-hours special assistance efforts. Therefore, no member check was performed with the students.

The first member check was conducted in the second month of data collection. When the last member check was completed with the teachers at the end of the study (August 28, 2008), the researcher went through the research questions and showed them the results and analytical findings. The teachers did not identify any discrepancy with the findings and generally agreed with the data interpretation. The meeting lasted for an hour.

It would have been advantageous to conduct more member checks, but practical logistics prevented such a course. The three participant teachers and the researcher were busy and worked in several different buildings, and it was very difficult to find common times for meetings. In addition, in the middle of the study, the insufficiency of Microsoft Word and Excel for support of data analysis had a temporarily disruptive effect. Therefore, the data analysis did not progress very smoothly and hampered the effort to conduct member checking/focus groups once a month.

Transferability

In order to make the study transferable, the research design, procedures and instruments were carefully described in detail. During the study, transcriptions for audio-

recorded files, sound files, field notes, audit trails, and detailed descriptions of context and events were carefully categorized and stored in computers. The thick description was provided in the research writing to ensure the transferability.

Dependability

An audit trail was maintained and recorded throughout the study. The complete audit trail is shown in Appendix F. Date, time, and activity events were listed in the audit trail. During the beginning phase for keeping the audit trail, I also kept my reflections and actions concerning some activities. NVivo 7.0 software was used to keep researcher memos/reflections about topic and thematic coding. Content, activities and details listed in the audit trail should be adequate. Efforts were made to preserve the data for auditing in the form of audio/video recordings, transcripts from interviews, and field notes.

Confirmability

Even though the study was limited by its sample size, research context, and duration of study, the Confirmability of study result was valid. Efforts were made to ensure confirmability through comprehensive observation field notes, member checks, debriefing, audit trail, and interview recordings and transcriptions. All of the coded data and memos were kept and saved in NVivo 7.0 for examination. Findings of the study were shared and reported to participant teachers to obtain consent. The findings were also presented to a senior researcher who regularly works in the research context. The interpretations of data were reviewed and examined by participants and a qualified debriefer.

CHAPTER 4: RESULTS

Findings from the qualitative analysis will be presented in the following sequence: a) technology use by teachers, b) the Conceptual Relationship among TPCK during Teachers' Course Preparation Process, c) modify TPCK Conceptual Model by Analyzing Content, Pedagogy, and Technology in the Chinese Classroom Instruction, d) students' preferences in terms of content, pedagogy and technology in the technology-enhanced learning environment.

Implementation of Technology Use in Chinese Language Classrooms

This section describes how and why the teachers used technology in classroom instruction, along with narrative portrayals of typical, regular classroom instruction associated with three cases. Information regarding the purposes for using technology was collected from interviews with students and teachers, classroom observations, and reflective journals.

The standard classroom setup in DLIFLC included a desktop computer, a printer, a VHS machine, speakers, a SMART Board (the interactive white board), and a projector. Teachers used digitalized teaching materials, including internet authentic materials, PDF electronic files with embedded sound/video files, Word documents, and PowerPoint documents. Therefore, most of the instructional content could be easily displayed on a SMART Board. A typical (first) step for participant teachers when they walked into a classroom was to login to the classroom computer and display the course content (e.g., the electronic Chinese Basic Course textbook in PDF format) on the SMART Board. Teachers also sometimes carried their printed textbooks. All three teachers frequently used the SMART Board as a kind of "gigantic textbook" where they could display a wide

variety of instructional materials. The three participant teachers predominantly used the Chinese language while delivering lesson instruction in the classroom. Classroom conversations and interactions between teachers and students were also predominantly in Chinese. More descriptions from three illustrative cases are presented below.

Case One (Teacher One)

On June 06, 2008, Teacher One (T1) used PowerPoint (PPT) to create an interactive group game titled "Who Wants to be a Millionaire." She used PPT to present reading and listening questions on the SMART Board. Each slide had a question with the correct answer and three distracters. A sample slide is shown in Figure 2. Similar to the famous game show, student contestants could choose to ask for someone's help, or eliminate two distracters to improve the probability of a correct answer, or call a "lifeline" for help. It was designed to be a group game that engaged everyone in class as both spectator and participant.

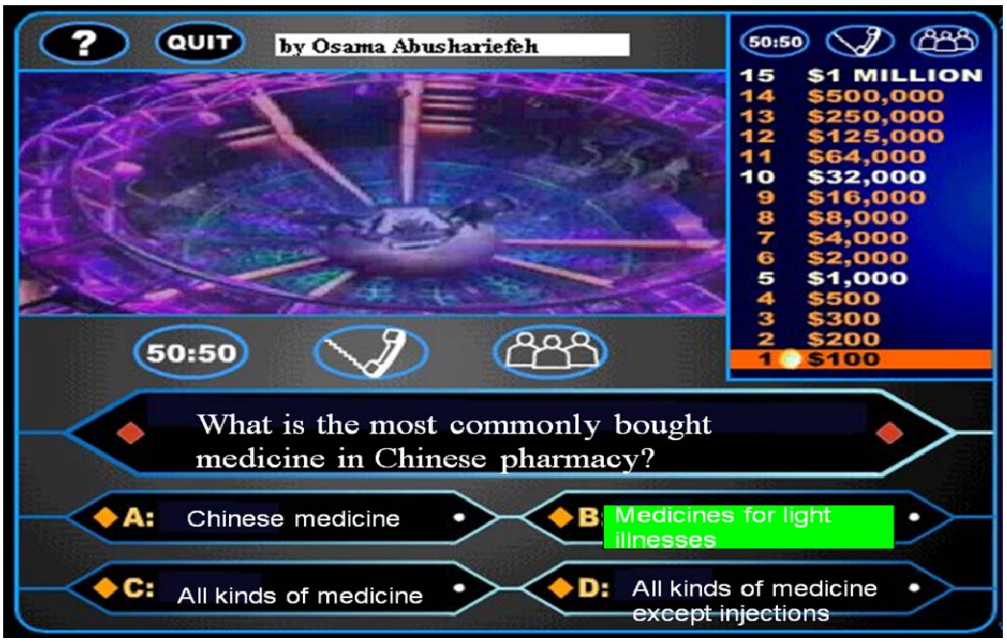


Figure 2. A sample page of the "Who Wants to be a Millionaire" PowerPoint file.

Before the game started, T1 distributed handouts with reading passages, their questions, and listening questions. She showed students the image of a game in PPT and used Chinese to explain the rules of the game. Then, T1 separated the class into two groups. Each group had a representative (contestant) answer each comprehension question. Students were required to write their answers on tablet PCs, notebooks, or their small regular whiteboard. T1 asked everyone to practice the questions even though their turns were not up. T1 showed the first comprehension multiple-choice question regarding the first reading passage in PPT on SMART Board and asked students to read the first passage on their handouts. She gave students two minutes to answer the question, and student five (S5) said she grasped the answer immediately. While students were reading, T1 quickly pulled up a Word document with the content (script) of the reading passages and minimized it for later access. All students worked on the reading assignments. T1 controlled the time and asked the contestant from each group to write their answers on a small whiteboard. After S10 (one contestant) correctly responded, T1 selected the corresponding answer on the screen using the mouse. The student's score (indicated by how much "money" had been earned) was then displayed. The class proceeded with the same sequence for the subsequent reading and listening passages.

When the class was working on the third question, T1 reminded all students to read the question and passage because they would need to help the person who answered the question for the group. T1 repeated the rule that students may get help from other students. S3 and S7 were assigned to answer the question and managed to do so correctly. Then, T1 minimized the PPT file and showed the Word document on the SMART Board. She pointed to the correct sentence of the passage and told the class that they not only

needed to give answers, but also shared with the class where they found the answer in the passage. For the next question, she mentioned to the class that they should read questions first and then find answers from the passage. S1 could not figure out the correct answer for the next question that arose, and said he would like to "call" his friend for help. S1 asked for S5's answer. S5 said the answer was "B." T1 crossed out the telephone sign for the team in PPT to indicate they had "used up" their "call" option. T1 asked for students' final answer to the question and the assigned contestants replied that the answer was "B." T1 then asked why and subsequently pointed out the key sentence of the reading passage in Word as depicted on the SMART Board.

Since Chinese students often regard grammar as a necessary but dull aspect of study, T1 would use technology to make the study of grammar more interesting. During the class on June 25, 2008, T1 showed students how to access a web-based "mixed-up sentence" exercise she had developed using HTML to strengthen students' knowledge of grammatical rules. Each web page contained a Chinese sentence with words in random order. Students were required to put the words in proper order using the mouse. The web pages included check, hint, undo and restart buttons. Since some students did not have their tablet PCs, T1 asked students to work in pairs. T1 walked around the class to ensure students could find the file and gain access to it. Students conferred in pairs in order to organize the sentence. After two minutes of student deliberation, T1 checked the sentences with the class on the SMART Board. She reminded students about a key rule of Chinese grammar: first come; first serve (e.g., 提前两个小时 "advance two hours"). The teacher used the same pattern and had students work on sequences of questions.

Teacher One thought that technology could be used to shorten the distance between students and textbooks. Technology brings more variety and excitement into the classroom. Its interactivity and versatility helps students to practice and stay on task. Teacher One's integration of content, pedagogy and technology is further revealed by her responses to interview questions:

> INTERVIEWER: Could you give me an example of your successful Chinese language instruction in technology-enhanced classrooms? What made it successful?
>
> TEACHER 1: I think we've already integrated technology, such as SMART Board integrated technology, that might not be used just for any specific classes. We can use technology to shorten the distance between students and textbooks. You can use some technology to find related pictures. You can bring it to discussions about grammar, or use some software programs, and using SMART Board notebook you can arrange things. You need to cut before, and now you can make the objects move or do some activities. There are several kinds of activities. Maybe it is to activate the class. For example, for teaching activities I can find something that students are interested in. For instance, some students in the class like playing soccer. I can find and bring information which is related to their daily life, especially in relation to the textbook. Now our students are very young, 19 or 20 years old, so I think the advantage of technology is to keep students mentally refreshed (clear minded). Technology is invigorating to them because they are very young. Therefore, if they can move around, the class might not be that boring. I think it is better than teacher's lecturing. Technology enables more time for students to practice and do. Teachers don't keep talking. My previous class had tablet PCs. I think teaching has become more versatile. No matter what class you teach, you can make it more versatile. I think the successful aspect of using technology is "saving time."

Teacher One compared the technology to having a "hand" and said she would not be able to fully live up to expectations without it. She considered technology as an important communicative platform between teachers and students as shown in her response to the following interview question:

> INTERVIEWER: What role do technology, content and pedagogy play in your current class?

> TEACHER 1: You saw that the classroom computer didn't work during your class observation. I felt like losing a hand. Because using Smartboard to display course materials, I can point here and there. But I had to write on whiteboard today. I had to express myself only in a verbal way and did not know if students knew what I was talking about. I felt it (technology) become very necessary because you rely on technology greatly to execute what you want to teach. Without it, don't know what to do. Of course, you may find an alternative way, but you cannot fulfill 100% of what you intended to do, or even 90%.

When certain technology does not work, teachers need to immediately look for an alternative vehicle. To adopt a new tool, teachers must confront the challenge of ensuring that the new technology is utilized in connection with a suitable pedagogy. For example, when Teacher One was caught off guard in class by an unexpected outcome from technology use, she struggled to figure out how to maintain an adequate class pace and help students perform in a limited time as stated below.

> TEACHER 1: In fact, I wasn't satisfied with myself because of some chaos. Say, half students of my class are fast learners, and the other half is slow. I was struggled to use iPods. It turned out half of students have not completed the tasks while the other half had finished. I wasn't sure if I should "go over"? Or should I wait for those who were behind? If I waited for them, what should those fast learners do? What kinds of tasks should I have them do? Therefore, sometimes not everyone progresses at the same pace (sync) in a technology-enhanced environment (I can use classroom computer to play the sound file). According to their pace, it turned out one is fast, and the other is slow. It is difficult to control or plan the next step. I feel I face this kind of difficulty if students are not at the same proficiency level. There is certain difficulty of using technology in this context. I don't think we can draw the conclusion that it is better to listen together or use iPods. I think there should be interval. Some students always need to listen again, or listen to what they could not understand initially. Everybody has difficulty in different parts. I think there are advantages of using iPods in classroom, but we can't do it all the time. Due to the time limitations and other considerations, we can't use iPods in each class.
> Technology can make it easy to pinpoint important concepts in different colors.

The visual emphasis was sometimes used to differentiate various grammatical structures, which in turn helps students to more intuitively grasp conceptual grammatical

structures. Teacher One noted this in a reflective journal entry on March 28, 2008, describing her most successful class of the week:

> Lesson 7 grammar class on page 25-27: My main goal for this lesson is to introduce related structures by comparing the difference between English and Chinese usage. In order to make this class more interesting, I use pictures to prompt them the structures and I colored the differences between English and Chinese structure to help them to observe the differences more easily. After introducing the usage and form of these structures, I want them to apply to what they learned. I first showed them an example to tell them what I want them to do. Since this is a big class and I want everyone to have an opportunity to actually do it, I chose a more traditional approach by cutting down phrases for them to assemble these words back to right order. I only use PowerPoint to provide them questions instead of having one group to come up to the SmartBoard and do it because in that way only one team can work on the structures instead of the entire class. After this exercise, I think students have a basic control of basic structure of this lesson and they also get the opportunity to recognize and review the words that they learned from this lesson. Before class ends, I did some listening exercise on the textbook. If I still have some time left, I would have them use their own daily schedule practicing speaking with these structures in mind.

Even though Teacher One prepared PowerPoint slides to assist grammar instruction, she observed students did not comprehend what she intended to teach because of her rushed instructional pace. Technology was not the answer to everything when teachers were prompted with questions that they could not explain on the spot. Teacher One stated the following in her reflective journal on March 28, 2008, describing the least successful class this week.

> The first session on Friday. This class is supposed to be a grammar lesson to introduce "就 (just)" "才 (only if)," but students have some questions related to the grammar structures they learned the day before. So I used some time to help them to review the structures again with PowerPoint slides. But in the mean time I was concerned that I would not have enough time to introduce the new grammar, so I kind of rushed through and did not give students too much time to digest material or have more practice on the old grammar. I felt after my explanation, some students still had troubles. Even though I had my old PowerPoint slides ready, I felt I was still a little bit caught off guard when students asked me to explain the structures. I probably did not explain it as clearly as I should have.

Teacher One used technology to display visual cues when students practiced speaking. By covering up important words and sentence structures, students could be induced to recall what they had learned. Student 1-1 enjoyed this kind of activity.

> INTERVIEWER: Could you describe the most successful class you have had in which the teacher used technology? How did the teacher make it successful?
>
> STUDENT 1-1: I think particular use of Smartboard as a visual aid, not just as an aid to go through our books which we have in front of us anyway. To incorporate Q&A sessions, for instance, when taking a passage and cover up certain words we will have to fill them in, and she rotates the blocks to another area. We have to fill in words and write it. I think it helps. And use that Smartboard with a game structure, depends on the game. When it is a visual cue type of idea like pictures of cars and pictures of beach and then pictures of people playing volleyball and you kind of know I am going to play balls. And audio files, we have to practice that. It is good. We use the audio stuff.

Student 1-2 appreciated the fact that Teacher One used PowerPoint to design interactive activities. The game was not only fun, but also worked well. With the interactive quizzes and activities, students indicated they could remember better and said the following:

> STUDENT 1-2: One of the things Teacher 1 uses has been fun and uses technology doing Jeopardy on the electronic whiteboard. She can display a PowerPoint presentation there and you can hit the category you want to select and play the sound file of listening exercises, can display the answers and characters on the board, and it is fun and get you to interact and it works really well. Also just being able to use the Smartboard as the web browser going on the web they have like military class we have a map there is a quiz on online where there is China what are provinces you have to decide you have to pick which one and put the name of provinces you go there and select it. It is very simple, but it gets you to really interact and it helps to remember.

Case Two (Teacher Two)

Teacher Two (T2) frequently incorporated authentic materials in classroom instruction. On June 05, 2008, the authentic material she used was from the Global Language Online Support System (GLOSS). Because the students did not have access to

the internet in the classroom, T2 asked students to download the materials to their tablet PCs prior to the class. T2 had the file open on the SMART Board and showed students how to choose the right passage. After the GLOSS passage was shown on SMART Board and students' tablet PCs, T2 discussed with the class the meaning of the title (两友人相遇：*A chance encounter of two friends)* as shown in Figure 3. T2 also asked students to quickly read the listed objectives of the GLOSS lesson.

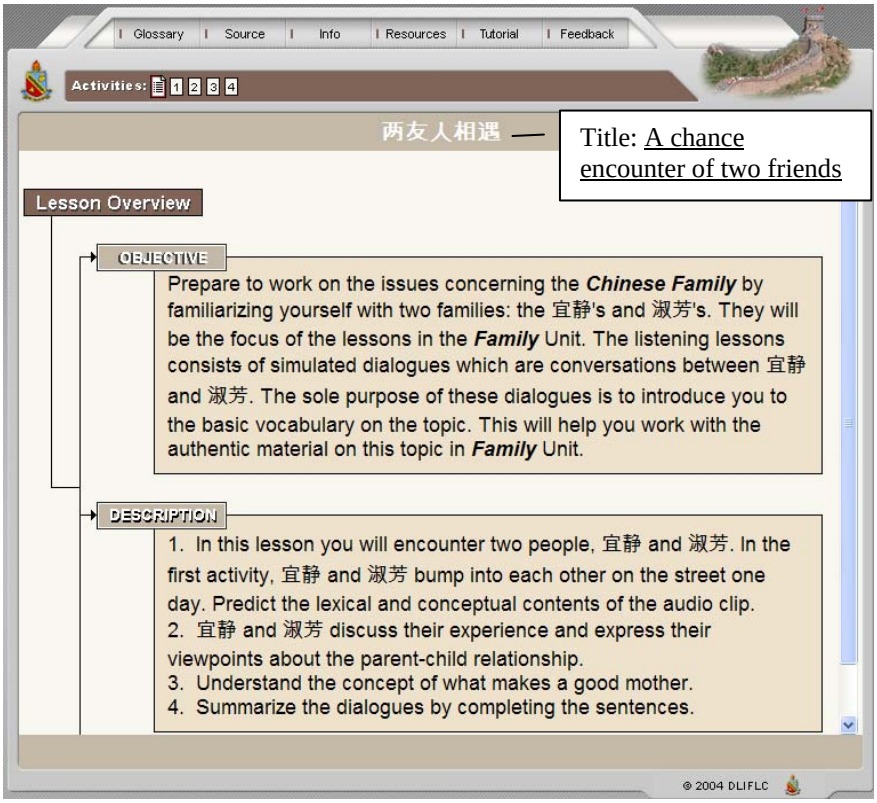


Figure 3. The title and objective of the GLOSS passage.

Teacher Two also explained how the website worked. She told the class that if they did not understand the Chinese instruction, they could click for an English translation. T2 told the class they would listen to the first part of the listening passage (*A chance encounter of two friends)* together for the first time from the classroom computer. T2 showed the class they could click on *Click text to switch language* to display English

questions (see Figure 4) if they could not fully understand the Chinese questions. She also demonstrated how to answer questions and compare their answers with the program's feedback.

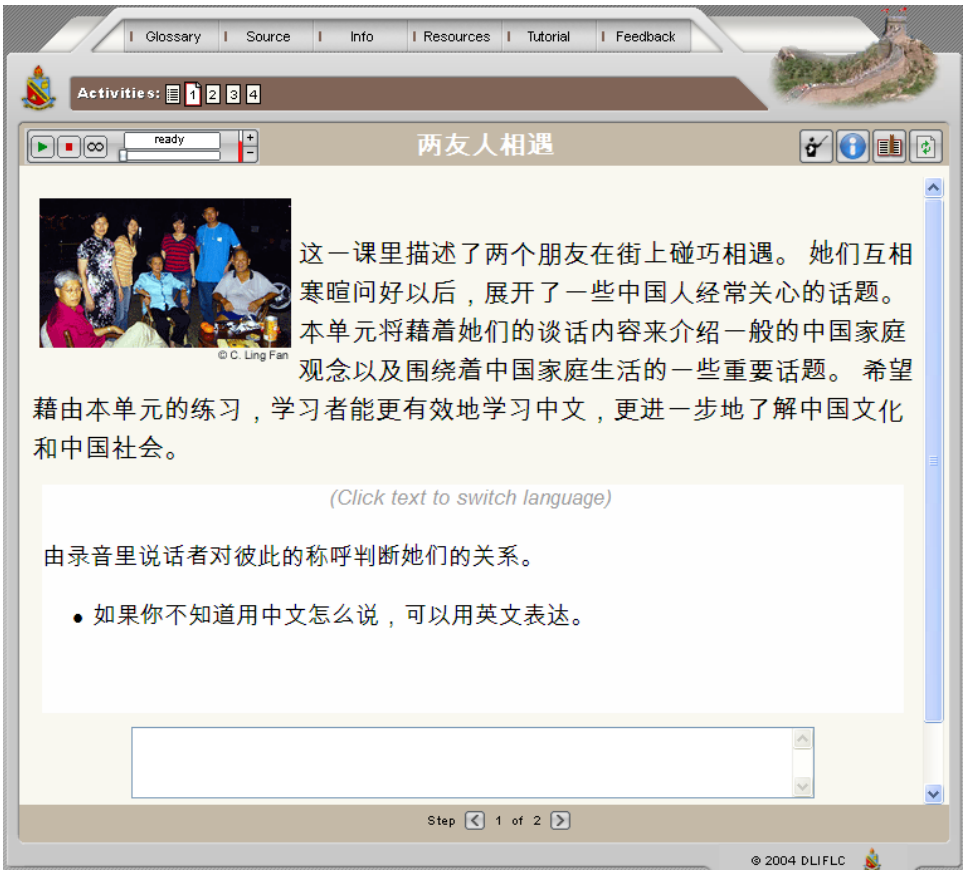


Figure 4. Language switch feature for comprehension questions in GLOSS listening passage.

Students followed T2's instruction. After showing questions on SMART Board, T2 asked the class to read the Chinese paragraph describing cultural and background knowledge of the listening passage as shown in Figure 4 and explained some phrases to the class. T2 also explained the Chinese questions (see Figure 4) to ensure students were not experiencing comprehension problems. Then T2 played the sound file of the passage from the computer in the classroom. T2 asked students what questions they could answer

after listening one initial time. Students replied to her. The class moved on to the next passage and repeated the routine.

Because authentic materials contained many new words and complicated sentence structures, T2 encouraged students to use Wenlin, an electronic Chinese/English dictionary, to look up unknown words while she was assisting other students. On June 19, 2008, T2 divided the class into two groups. One group was asked to read a given Chinese passage while the second group was asked to read a different passage. T2 told the class to look up unknown words in Wenlin or ask for her help. While students were reading their passages, T2 opened Wenlin in the classroom computer and SMART Board. She copied and pasted the passages into Wenlin to ensure students could see the display in a sufficiently large font as shown in Figure 5.

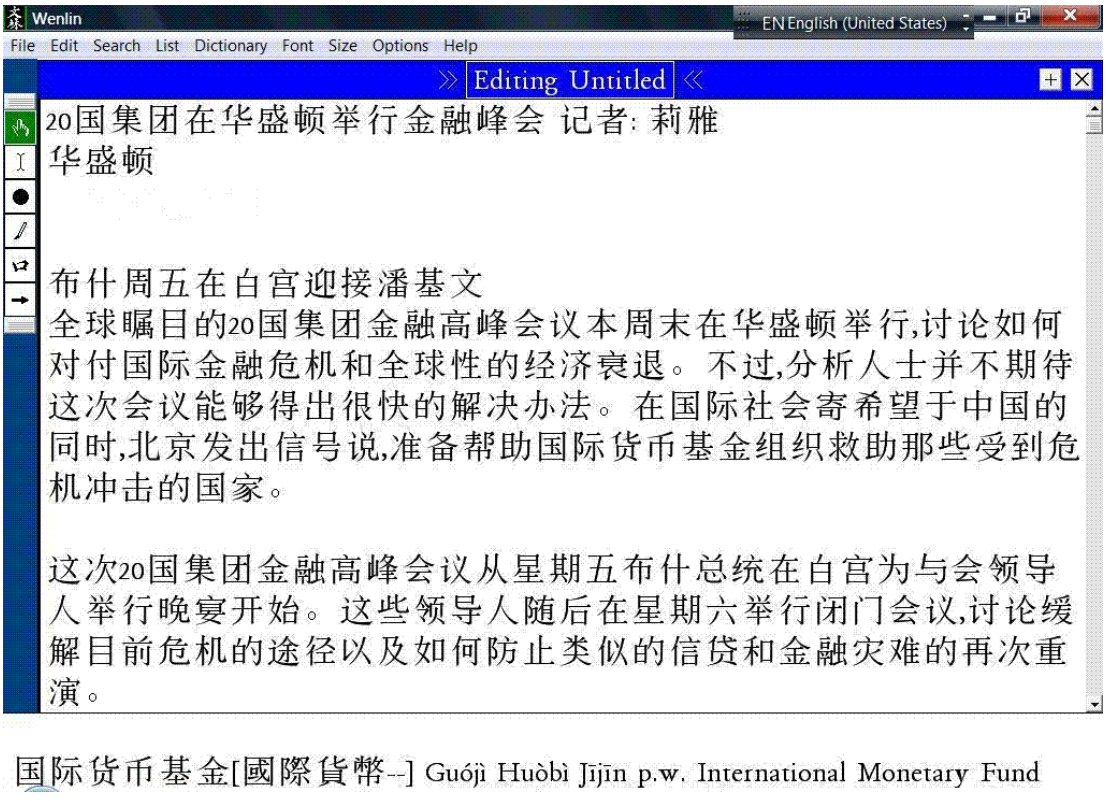


Figure 5. Wenlin copy-and-paste feature for displaying a Chinese passage.

After a couple minutes, T2 asked the class if they finished reading the articles and were able to retell/report the passages to the other students. S5 and S6 asked T2 about one sentence which they could not understand. T2 provided explanations and highlighted the sentence in Wenlin. Then T2 asked students to each work with a student in the other group and explain the content of the passage they had read to their partner. Thus, the class was soon separated into three pairs. T2 walked around the classroom and helped the pairs.

T2 thought technology was like a book and treated it as an inconspicuous element of daily life. As indicated in the following interview response, she did not think that the use of technology was anything special or unusual in her daily routine.

> INTERVIEWER: Could you give me an example of your successful Chinese language instruction in technology-enhanced classrooms? What made it successful?
>
> TEACHER 2: I can't think of any successful example because I think I do use technology in successful classes most of the time. The technology is not a special thing to me. It stays by my side everyday as like a book. It is a thing you grab and use; therefore, I could not think about anything.

Teacher Two believed that technology and pedagogy are tightly interrelated. She held a high regard for videos as a technology because they can be used to change the atmosphere of the classroom as shown in the following interview response.

> INTERVIEWER: Does your successful Chinese language instruction involve integrating content, pedagogy and technology? If yes, could you draw the interrelation among the three?
>
> TEACHER 2: I think so. Content, pedagogy and technology, I think they are related very closely. Basically, I didn't try to separate them intentionally, but I still think instructional content is still much more primary. But I think pedagogy and technology aren't separable. Special parts of technology are videos, movies, or this kind. Sometimes I will adequately add some videos because they are somewhat interesting. It is another way to provide input to students. Therefore, I would intentionally to add some to adjust the atmosphere of classroom.

Teacher Two incorporated videos to enhance the students' motivation to learn.

INTERVIEWER: Is it for enhancing students' motivation?

TEACHER 2: Yes. I will intentionally add some (videos) in class. For example, we had a video, "I love my family" serial.

Videos were used to engage students' interest and get ready for the rest of the week.

INTERVIEWER: What's students' reaction?

TEACHER 2: They just loved it. That is because I did not schedule much time to videos; therefore, I could only add them when time is available. At present, I sense students were clueless on Mondays. They are always this way on Mondays; therefore, I would intentionally add this kind of things.

Teacher two indicated that her most successful class for the week incorporated the use of an authentic video clip from a website as recorded in her reflective journal on August 8, 2008:

The most effective class was the lesson to introduce a hot topic sheet in China, "Human Fresh Exploration." We found a multimedia video from website. I could access it from DLI's network. In order to prevent a temporary network connection problem, I downloaded the video segment. When I prepared the class, I searched relevant news background facts, and then organized the information into handouts. Before watching the movie, every student read part of the content from the handout and then introduced that content to others. Before watching the video, students already had background knowledge. Last, I played the video because I could stop or choose other segments at anytime. We would pause and discuss after watching each segment, then replay the parts students could not comprehend by reading and listening. Sometimes, I would ask students some comprehension questions before playing the next segment. I gave students questions; therefore, they would watch videos with a purpose (formation of questions). That class not only practiced listening, but also introduced information about Chinese society. Students concentrated intently during the experience.

The following interview responses show students' reactions to the use of technology in Teacher Two's classroom:

INTERVIEWER: Could you describe the most successful class you have had in which the teacher used technology? How did the teacher make it successful?

STUDENT 2-1: The one I remember was really helpful is presentation where we use Smartboard and there was visual arrangement of different characters and we had to match certain grammar structures. We have to use certain grammar structure to create sentences. So you can visually move around the characters. That seems to be very helpful for visual learners which I think I am a visual learner. And this is just technology in the classroom? Okay. I think all of listening considering technology is iPods, listening files, and that is great. Yeah, I like it when they use the board to its full capacity. I think it is hard to do because it is such a big task. You know using it to manipulate sentences and utilize different functions so that helps me out the most.

INTERVIEWER: So because you can see?

STUDENT 2-1: Yeah, and it is easier to so I can maybe arrange the way I feel is right and I can be corrected very easily and then I can see what correct pattern should look like. That was helpful for me.

The SMART Board was utilized to create listening contests for the purpose of review by Teacher Two. The competition facilitated by the technology help press the students to accelerate the pace of learning.

STUDENT 2-2: We do the listening contest. We do like every so often. I think use of Smartboard and sound file gets from there have listening contest. We get to compete with who understand quicker. I think that helps.

INTERVIEWER: In what ways, how did it make it successful? How did it make it work? Because of competition?

STUDENT 2-2: Yeah. I think so because it is different stuff from what we've seen before. Most of time, some of it, they recorded on their own and put them in there so that it is different stuff. I think most of us just we have to it is a contest so we have quicker about being able to recognize what they were saying.

INTERVIEWER: And what did your teachers use that for? For previewing or reviewing?

STUDENT 2-2: It is usually right before a test so we get some practices right before a test. So much more like reviewing contest.

Case Three (Teacher Three)

The following is a narrative description of a class session conducted by Teacher Three (3) where she used GLOSS to conduct listening practice exercises:

On May 13, 2008, T3 started the class by asking some questions regarding words students had learned in the previous lesson. She then indicated that the class was going to listen to some GLOSS audio clips together. After playing an audio clip, she accessed the students' comprehension by asking them to respond to a multiple-choice question displayed on the Smart Board using PPT. Student 1 (S1) answered it, and T3 followed up by asking why he chose that answer. S1 explained that the first sentence answered the question. T3 pressed for more details. The class then progressed to subsequent questions.

Teacher Three also asked students to use tablet PCs to practice test-taking skills on their own. She gave guidance to them about how to perform the practice tasks. T3 monitored the students' progress as they worked individually using their tablet PCs.

During the class on April 03, 2008, after discussing a few specific sentences from a passage displayed on the SMART Board, T3 felt the students could perform some listening exercises on their own. She asked students to read English multiple choice questions first and then listen to an audio clip twice using their tablet PCs. T3 sat in front of the classroom computer and read the course material. When it was about time for the students to finish with their listening materials, she walked around to monitor the students' progress. At the end of the class, T3 checked students' answers to the multiple choice questions and provided feedback on the SMART Board.

T3 frequently used the SMART Board to break down complex sentence structures and point out keywords which could help students to associate meanings within each

sentence. For example, during the class session on June 04, 2008, she highlighted a long sentence in a third paragraph and asked students to find the subject of the sentence. After a student responded, she asked them to identify the verb in the sentence. Following students' responses, she pointed out the verb on the SMART Board and told students that if they focused on keywords of that kind, they could discover the meanings of unfamiliar, difficult sentences. The class discussed the passage in depth. T3 marked the sentence on the SMART Board and said it was a complex sentence. She used blue ink to underline key phrases and words.

Teacher Three described her successful use of technology in the following interview response:

> INTERVIEWER: Could you give me an example of your successful Chinese language instruction in technology-enhanced classrooms? What made it successful?
> TEACHER 3: I've taught so many classes. I need to think a moment. The most unforgettable, especially using technology-assisted instruction, I used technology more often when students were in the beginning level. Suddenly I am drawing a blank with my memory for specifics, but I do remember some activities using technology that went comparatively well. I will give you an example. When teaching vocabulary during the first semester, all vocabulary—well, not all but most of vocabulary--is concrete words. I think use of images is effective. Use of bright colors and use of images to teach brings stimulation to students. It also facilitates their effort to associate concrete shapes and colors with the new words they just learned. By so doing, students' memories can be enhanced. For example, when I taught the topic "buying things," I downloaded many pictures of clothes and pants. When I taught the lesson, I did not ask students to read the content and explain the meaning, but instead transformed the content presentation into a verbal practice. The main topics were "to sell pants," "how much is the pair of pants," "what kinds of color do you like," etc. Pictures were displayed on the Smart board. Students were in pairs. One student sold pants, and the other one was a buyer. Through repeated practices, students grasped the sentence structures. For instance, "I want to buy that pair of yellow pants," "what size do you want," "I want to buy large size," or "do you want to buy smaller size?" Because there were pictures displayed along with conversation, the whole class was very vivid and active. The content was no longer boring printed text. Students also enjoyed the lesson better. It was interactive.

Technology was also used to play materials for listening exercises. Even though technology can bring linguistic and contextual authenticity into the classroom, technology also sometimes hindered class progress. As set forth in her reflective journal on May 05, 2008, Teacher Three felt frustrated, and considered her class to be at the lowest level of success, when technology did not work. For example, on one occasion when the classroom computer failed to play a sound file, Teacher Three immediately tried to see if students' tablet PCs could play the audio clip. However, the resultant effect and quality was not ideal as she stated below.

> Today we listened to the GLOSS listening passage "Chinese engineers attacked by terrorists." We first had some discussion about the topic and the brainstorming part went well. Unfortunately, when we started to listen to the passage, we had some technical problems. We couldn't play the audio clips in the beginning. We tried to play the clips from one of students' Tablet PC, but the sound was too soft. It took us a while to get the audio clips work. To make things worse, the quality of the audio clips is not very good and some parts got cut off. Maybe we shouldn't have chosen the clips in the first place.

The teacher participants also used Wenlin to enlarge fonts for the digitalized content and display the meanings of certain keywords. With the SMART Board technology, teachers could easily underline keywords for discussion. The convenience and accessibility technology brings to the classroom greatly saves instructors' time when they ask students to locate specific elements within selected sentences and paragraphs. Teacher 3 described her most successful class this week in the following reflective journal entry on April 3, 2008:

> Today we went over the students' homework for last night. It was one Gloss reading materials about China's cooperation with some international wild animal protection organizations and a listening passage from Chinese Pod with two people discussing their views concerning the population aging issue. For the Gloss reading, I put the passage in Wenlin so that the characters look bigger and in case I want to show students the meaning of some new words, I can simply put the cursor over the characters. We mainly practiced skimming and scanning skills

and looking for key sentences for each paragraph. Students were also asked to guess what types of animals are protected according to the title of the organizations. For the Chinese Pod listening, I underlined key words and organized students to have discussion about the topic related to population aging. Students seemed to enjoy the class and the class generated a lot of discussing and students got a chance to use the new vocab. learned.

Technology enabled teachers to train students about test-testing techniques more efficiently. Teachers could precisely highlight answers to comprehension questions from articles. Students from Teacher Three's class described their most successful class in response to the following interview question:

INTERVIEWER: Could you describe the most successful class you have had in which the teacher used technology? How did the teacher make it successful? (For example, you might say that the teachers adopted the suitable technological hardware or software to explicitly deliver the course content in such a way as to strengthen your listening comprehension.)

STUDENT 3-1: The technology that we use now, with the smartboards and computers, and our tablets and iPods. For example, I think the best use of technology, we took a review test, multiple choice, and the teacher went on scripts and we listened to the PDF file and highlighted the answers. So, instead of wasting time going through the whole passage, they help us discern very quickly the specific area if you've heard it we will gonna answer the questions correctly. And if you didn't hear it, then you didn't. As far as time saving technique, that's probably the best example I can give.

INTERVIEWER: Do you think it is your teacher's strategy to help you listen, or is it because they highlighted?

STUDENT 3-1: It is both, strategy in the sense that it points out the one minute passage corresponding to the answers. In this sense, you might be teaching the test-taking technique in overall language absorption or comprehension. That really there is only say 2 or 3 parts of that whole a minute long passage that you need to listen to. So that sense it is strategy. ..

INTERVIEWER: Is that class you mentioned is for listening class or reading class?

STUDENT 3-1: That's for listening class.

INTERVIEWER: So any reading classes?

> STUDENT 3-1: Students can always read on their own with their tablets or look through the books. But also, I mean if there is one more detail you don't understand it, you can always copy and paste to Wenlin, the electronic dictionary, to find out what that is. It is kind of shortcut and it is a crutch we can't use her, but when we actually go to work, we have similar type of tools. I know that the teachers love the smartboard, and it is quite big for everyone to see. The best thing about the smartboard in reading is that teachers can point out where exactly in the passage you want students to look where before it is just the books. There is no way to get everyone to know. They have to go out to say here, here and here. So just for facilitation type, it is better.

Technology also enhances student access to authentic language materials by conveniently accessing websites containing the target language. Teachers can substantially reduce the time needed to describe specific topics (e.g., information about ethnic minorities in China), and help students absorb cultural content. Here is how another student describes Teacher Three's use of technology:

> STUDENT 3-2: Use technology, right? I guess for example, smartboard for learning news or anything authentic you can pull up from internet. For example, she can show certain video feeds or programs that are authentic. You know we watch smartboard something like that. And sometimes when we are doing our presentations, there are certain links on the presentation that goes to the internet and pulls pictures… and we have one time were learning ethnic groups in China. And when you click on the links, it went to the internet, it pulled different dialects in Chinese from China. And that was helpful for me and the real authentic materials from internet. If she didn't, my teacher does know all ethnic minorities how they look how they talk, you just cannot describe them all. When I saw that in the internet and when I got pictures of them, I got more understanding. It is meant to be more successful. Right, right, cultural content. Hearing their voices, hearing their pronunciation and hearing their dialects, I mean it is a big shot.

In summary, teachers used technology for the purpose of displaying electronic books (e-book) or online authentic content, playing sound files, animating the classroom atmosphere, training test-taking skills with expert (teacher) demonstrations of key sentence identification, and providing students more time and opportunity to work on tasks. Teachers used software programs such as SMART Board Notebook, Wenlin, and PowerPoint to provide instruction about new words, sentence structures, paragraphs, and

authentic articles. With the assistance of SMART Board, teachers could easily point out, mark, highlight, or underline any part of the electronic books or online authentic materials. The visual aids increased students' comprehension and motivation. Given the prevalence of technology in their modern classrooms, teachers thought that technology had become an inconspicuous, intuitive aspect of daily professional life. The versatile activities facilitated by technology made the classroom more enjoyable and also appeared to enhance students' understanding of course content.

Conceptual Relationship among TPCK Components during Teachers' Course Preparation Process

The three teachers were interviewed about their perceptions and beliefs of the relationship among technology, pedagogy and content as such applies to their course design and class preparation efforts. A member check was conducted to validate the accuracy of the researcher's interpretation. The three successful teachers unanimously responded that content was the primary factor during their course preparation. They all stated they need to read and study the content before considering pedagogical methods and technological tools. Pedagogy and technology played supportive roles to enable effective delivery of content. With respect to some aspects of preparation, the teachers stated that pedagogy and technology had an overlapping influence. The same was true for content vis-a-vis technology. Notwithstanding the overlapping effects, however, content was still the dominant factor when these teachers prepared their lessons.

The teachers further reported that they would peruse the instructional content and then make decisions about pedagogy. When they were in the process of considering what pedagogy to use, they found themselves spontaneously and intuitively considering what

technological tools to employ. One teacher mentioned that she did occasionally think about what technology she wanted to use before considering pedagogy, but this inversion did not happen often. The relationship between content as a primary driver, pedagogy as a secondary driver, and technology as a typically derivative outcome of other choices (but also an occasional secondary driver of pedagogy outcomes) is visually depicted below in Figure 6.

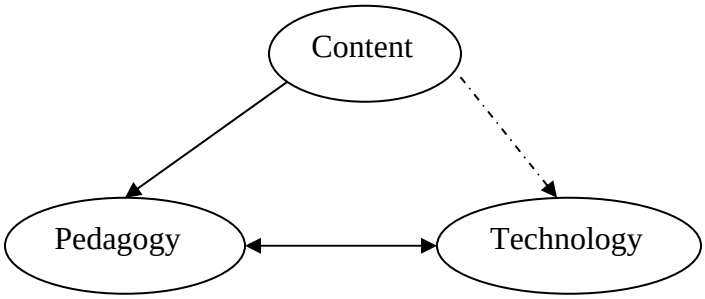


Figure 6. Content is a primary factor during course preparation.

The teachers and the academic specialist also stated that they thought of technology as a tool for facilitating a desired pedagogy. In their opinion, pedagogy and technology were reciprocally influenced to some extent and overlapped to some degree. One teacher stated, “We should not use technology for technology’s sake.” The academic specialist similarly stressed that “technology is a means, not the purpose.” These successful academic personnel stressed that they oriented instructional goals around students’ assimilation and comprehension of the content, not around the potential options for technology use.

Content not only enjoyed a primary position with respect to the conceptual flow between content, pedagogy, and technology, but also commanded a preeminent weight in priority and focus relative to the other two factors. The three highly successful teachers had virtually identical responses about on how content considerations dominated their

course preparation. They did not believe that pedagogy, content, and technology were balanced or equally important factors during their course preparation and classroom instruction.

Technology was regarded by the teachers as a kind of derivative pedagogical tool available to help motivate students and effectively achieve classroom instructional goal. In addition, the academic specialist said that proficient technological skills could not guarantee the progress of students' language proficiency. Content and pedagogical knowledge were accorded more vital weight than technology usage.

Modification of TPCK Conceptual Model through Analysis of Content, Pedagogy, and Technology in the Chinese Classroom Instruction

In this section, language content, pedagogy and technology used by successful Chinese teachers will be comprehensively described and analyzed. A modified TPCK conceptual model will also be presented. Content will be discussed first, followed sequentially by pedagogy, technology, and the modified TPCK conceptual model as applied to the Chinese classroom instruction.

Content

Several sources of instructional material were used in the Chinese Program in DLIFLC; among them are the DLIFLC designed Chinese basic program (course) textbook (containing 14 units), GLOSS and authentic materials, and supplemental materials created by instructors. More detailed descriptions of the nature and use of the materials are provided below.

The Chinese Basic Program Textbook and Its Supplements

DLIFLC had an in-house course development team that developed the Chinese basic course (CBC) textbook which served as the primary, core source of course content. The CBC textbook consisted of 14 units that were available in both electronic and printed form. Each of the textbook units was actually delivered to students as a separate physical volume. Each unit contained six lessons. Units one to five consisted of inauthentic materials covering very basic Chinese language for daily life situations and military-related concepts. Units six to nine contained inauthentic or modified authentic materials with more advanced topics. Units 10 to 14 were slightly modified versions of authentic materials from China and Taiwan. The content and sentence structures in these materials were quite complicated and intense. The literature covered various topical areas such as politics, history, culture, geography, and so forth.

The CBC textbook lessons contained vocabulary, grammar, presentations, questions and exercises designed to help students become familiar with simplified and traditional Chinese characters, connections within Chinese sentences, using Chinese in context, culture knowledge, articles about area studies, and so forth.

The CBC textbook was augmented with physically separate supplemental workbooks relating to units of coursework, including one homework workbook, one grammar notes and exercises workbook, one reading and writing workbook, and one listening exercise workbook. One homework workbook, one grammar notes and exercises workbook, one reading and writing workbook, and one listening exercise workbook related to the content of Units one to five. In contrast, there was a homework workbook and a listening workbook for each of units six, seven, eight and nine. Units 10

to 14 did not have any standard supplemental workbooks. The content of workbooks corresponded to the CBC units and lessons. Exercises and drills in the workbooks were designed to strengthen and enhance students' knowledge of the content in the CBC textbook. All workbooks were published and authorized by Defense Language Institute Foreign Language Center (DLIFLC).

Homework workbooks provided exercises for students to practice vocabulary and sentence patterns with several types of exercises that involved reading, listening, and writing training. Listening exercise workbooks presented listening materials which were similar to textbook sentences, dialogues, or paragraphs. These listening materials were accompanied by multiple choice exercises, translation, and short-answer type questions. The exercises were designed to provide students more exposure to the content of new lessons.

The grammar notes and exercise workbook provided explanations and sample sentences for key sentence patterns explained in the lessons. Most exercises of grammar notes and exercise workbooks were translation practices that required learners to construct sentences by utilizing assigned sentence structures. The reading and writing workbook contained the 500 most frequently used Chinese characters set forth in units one to five of the CBC textbook. The exercises in the reading and writing workbook included character analysis, character writing, sentence translation, and so on.

Students completed units one to five during the first semester, units six to nine during the second semester, and units 10 to 14 during the third semester. Each unit was accompanied by one or two student achievement tests. Each teaching team had flexibility and discretion to tailor the course content of the CBC textbook according to students'

specific needs. For example, if the teaching team thought the lessons of unit 9 would not be of optimal benefit to the students, the team leader could decide to skip the lessons and utilize other course materials. The workbooks were used as either in-class content materials or out of classroom homework assignments, depending upon each teaching team's class schedule, needs and preferences of the students, and the difficulty level of the relevant lesson.

GLOSS and Authentic Materials

GLOSS is the acronym for Global Language Online Support System, which was developed by the DLIFLC in-house team. GLOSS is a web-based interactive language-learning program. Its reading and listening materials are based on authentic materials from radio broadcasts, TV reports, and so forth in China and Taiwan. The program consists of questions and interactive feedback for self-learning. A variety of topics are covered including culture, environment, military, society, technology, and so on.

Online news materials were widely used during the third semester. The website New Tang Dynasty TV (www.ntdtv.com) and other news websites were introduced to provide the most up-to-date, important news to students. The New Tang Dynasty TV website has news clips with both simplified and traditional Chinese scripts. It is a convenient source for news materials. ChinesePod was also used as a recommended form of homework. ChinesePod is a Podcast website that contains Chinese language lessons at several different skill levels. The lessons incorporate Chinese cultural knowledge and include current topics frequently discussed by Chinese people.

Supplemental Materials Created by Instructors

Some supplemental reading and listening materials were developed by the teachers to parallel the structure and content of the textbook. Some supplemental materials were developed and voice-recorded by Chinese teachers to compensate for perceived informational gaps in the textbook, while other supplemental materials consisted of collected authentic materials from internet sources. The supplemental materials included presentations which were quite similar to the textbook content. There were also questions corresponding to the content. Teachers used the supplemental materials to extend and expand students' language knowledge.

Participant teachers stated that knowledge about culture, background, and language is connected, and is therefore intertwined in the treatment provided by the textbook passages or other (authentic) articles. Teachers did not teach cultural knowledge out of context, but treated culture as a component of extra knowledge derived from textbooks along with other dimensions of subject matter. For example, when some vocabulary, i.e., 文化大革命 (Cultural Revolution), related to cultural background was introduced; the teacher took advantage of the occasion to describe her personal recollections of that era during her childhood. The teachers stated that the introduction of cultural knowledge could increase students' comprehension and motivation. Therefore, teachers would prepare and include the content of cultural knowledge to expand students' understanding.

Pedagogy

The two types of instructional models: Learning Model Instruction (LMI) and Acquisition Model Instruction (AMI) proposed by Walker (1996) were found in

DLIFLC's Chinese curriculum design concept. As stated in Chapter 2, LMI focuses on the vocabulary, grammatical patterns, culture and linguistic forms of the Chinese language; whereas, AMI focuses on language application by advocating accomplishment of performance tasks in Chinese and the use of authentic materials (Walker, 1996). Participant teachers focused mainly on forms of language and sentence patterns needed to build a solid language foundation in the first semester Chinese course. The second semester afforded a transitional period of time from textbook and supplemental materials to authentic language materials. In the third semester, students relied upon modified authentic materials and entirely authentic materials provided by GLOSS and news from the internet. During the second and third semesters, teachers reinforced students' language proficiency levels by using authentic materials in a manner which resembled Walker's Chinese Acquisition Model Instruction (AMI). Although each semester had a different emphasis, the three teachers, native Chinese speakers, utilized predominantly Chinese dialog in class (i.e. Chinese dialog for more than 95% of all teacher classroom dialog, as measured by elapsed time) to explain the course content, answer students' questions, and give assignments. Teachers also encouraged students to speak only Chinese in the classroom. For example, Teacher One arranged a "Speaking Chinese Only" day. The majority of the students communicated with their teachers in Chinese.

The observed teachers used a signature pedagogy involving a habitual routine to keep students deeply engaged. This was clearly reflected by the class schedules, in-class instruction, and out-of-class homework. As Shulman (2005) once stated, routines can facilitate student efforts to concentrate more intensely on understanding course subject matter without wasting too much time on getting familiar with new class routines and

patterns. The teachers used routines associated with this signature pedagogy to provide guidance about instructional activities and requirements. Routines for class schedules, classroom instruction, homework assignments, reflections about the strengths and weaknesses of instruction and approaches to enhance students' progress are described below:

Routines of Class Schedules

The teachers distributed a course schedule every week. Students appreciated the fact that the schedule stated the date, time, lesson content, study locations, and homework. The schedule provided a basic structure for the course. As one student noted: "We know what we are going to do each day. We have homework. We have things we need to cover." The following seven routines were found in class schedules.

1. The first hour was set for homework feedback and introduction of some new content.
2. Reading, listening and speaking skill training efforts were distributed in a roughly even manner throughout the class periods.
3. Although listening and reading skill training efforts were experientially distinct, there was an emphasis on one unified topic throughout in order to provide repetition and thereby enhance retention.
4. Classes included a relaxing activity on a monthly or occasionally basis (e.g., watch Chinese movies, hold a class picnic, facilitate individual learning about interesting subjects, etc.).

5. The second and third hours were typically used for main instructional content, while the fourth and fifth hours were used for speaking or self-study. Patterns were varied in accordance with students' needs.)
6. The seventh hour was reserved on a school-wide basis for special assistance to students who were falling behind the average rate of student progress.
7. Vocabulary and textbook articles were set forth first; grammar and extra materials were presented afterwards.

Even though course schedules consisted of set routines, teachers still allowed flexibility based on the class' performance and apparent student needs. One student stated that "our weekly schedule changes are based upon the needs of the class." That flexibility is apparently a vital element amidst the various sets of routines, especially in the minds of the adult learners.

Routines of Classroom Instruction

Shulman (2005) indicated that signature pedagogy allowed students to habitually carry out intricate activities on a regular basis. Therefore, students can spend less time learning new rules of engagement and more time concentrating on increasingly intricate subject matter by following the same pedagogical routines each day. Signature pedagogies can constitute routines that do not depend on technology. The three teachers were observed employing similar patterns and routines during classroom instruction. The patterns of signature pedagogy incorporated by the three teachers included a) "warming up" the class and introducing new content, b) instructing and practicing the new content, and c) reviewing important content. As might be expected, instructing and practicing the new content consumed most of the instructional time. The teachers sometimes skipped

the review when time was insufficient. Each of these major routine patterns involved several steps or activities. These activities were flexibly employed in the classroom depending on course type, content, the particular skill training involved, and so forth.

Warming up class and introducing new content. Teachers were observed utilizing several kinds of warm-up activities to get students ready for ready class. Class content tended to determine the type of warm-up activity used for a particular class. The activities used for warm-up are described below.

1. Prediction and Brainstorming. The teachers presented an overview of the lesson topic, characters, comprehension questions, and so forth. Teachers would ask the students to predict what they would hear or read.
2. Provide Background Knowledge (Associate with Prior Knowledge) and Build Schemata: Teachers showed maps or pictures of instructional subjects and asked students how much they already knew about the subject. Teachers also provided guided questions to elicit more participation from students. This method was used mostly in conjunction with teaching about contemporary news, where the teachers were imparting certain knowledge regarding cultural and historical events.
3. Introducing Keywords or Conducting Preview Quizzes: Sometimes teachers conducted preview vocabulary quizzes before delving into course content instruction. Quizzes usually consumed five to ten minutes. If the content was more difficult, the teachers would use a bottom-up approach, introducing keywords before the students started listening or reading instructional content.

Instructing and practicing new content. Teacher routines for delivering new content fell into several general patterns. Below is a description of the instructional routines that were observed on a regular basis.

1. Give Assignments/Comprehension Questions: Before reading or listening to course materials, teachers gave comprehension questions or assignments to students. The comprehension questions were either short-answer or multiple choice questions which asked about the main idea and supporting details in regard to assigned content.
2. Synchronizing Listening and Individual Reading: After students received comprehension questions, the teachers would ask students to start reading or listening. Even though each individual student had an iPod and a tablet PC capable of customized listening drills, the three teachers still frequently used a synchronized listening approach to train listening skills. They thought synchronized listening would prevent students from counterproductively pausing at whenever they experienced a lack of total comprehension. They also thought the method would train students to guess the unknown meaning based on the portions of known content.
3. Intuitively, the teachers seemed to be implicitly teaching students that it is natural to experience moments of confusion during language acquisition, and that an effective listener is able to focus on inconveniently paced verbal streams in a way that persists through transitory moments of confusion or frustration. It appears that too much customization of the listening experience will undermine a student's ability to cope with a practical world where verbal

cues are typically delivered in a non-customized or roughly customized way. Class experiences and technology use should not be so artificial or idealized that students develop counterproductive expectations or limitations. At the same time, the teachers were observed customizing the synchronized learning exercises for the class as a whole based upon the students' cues and apparent degree of comprehension. For example, teachers would replay the audio segments in response to cues that students did not understand the content. If students still could not comprehend, the teachers would read the content slowly without giving an English translation.

4. Check Answers to the Questions and Translate: After students finished the questions, the teachers would call on students for answers. Students would either voluntarily answer questions or be called upon by the teachers. It was common to see the observed teachers ask students "why" they thought their answers were correct and then ask additional follow-up questions. During the process, teachers would also ask students to read Chinese sentences. When encountering complicated sentences, teachers would ask students for translations. If the students still could not figure out the meaning themselves, teachers would typically give examples to provide hints but still refrain from providing a direct English translation (unless the class appeared hopelessly stumped).
5. Train Students in Test Taking Strategies: Because DLPT listening and reading tests were the final qualifying tests for graduation, teachers would regularly train students about strategies designed to find main sentences, identify central

ideas and key points, and guess unknown words from a known context. Students were encouraged to employ these strategies during listening and reading practices. Two teachers asked students not to take notes during listening practices. These two teachers stressed to students the importance of training their short-term memories for better performance during listening exercises. In contrast, one teacher asked students to take notes on what they had heard. Thus, there was variation concerning the approaches used to train for test-taking, according to each specific teacher's own belief. This seemed to be another key aspect that the teachers had in common. They implicitly taught the students at every turn that adaptation, personal language learning skills, learning routines, and cognitive habits were even more important to successful language acquisition than any bits of specific subject matter under immediate consideration.

6. Explain Keywords and Sentence Structure: While checking answers with students, the teachers would explain keywords or sentence structures the students had failed to understand. They broke down the sentences by circling, underlining, or highlighting sentences and words for students to clarify structures and explain the keywords and grammar in context. This activity occurred most frequently during the second and third semester. For beginning learners, the teacher was observed explaining grammar structures without a content context. She would ask groups of students to create and use their own sentences.

7. Summarize, Discuss, or Report: After reading and/or listening to instructional passages, teachers would ask students to summarize the content in their own words. Teachers either asked students to report to each other in groups/pairs or had the whole class discuss passages together. Students would take turns providing pieces of information during the reporting sessions. Most of the discussion was initiated by the teachers. They would ask for students' viewpoints about the subject under consideration. For intermediate learners, teachers would have them retell the news content.
8. Pair and Group Work: Semester one and two teachers used pair work and group work frequently. The group work was interactive and engaged students through tasks or assignments. Prior to the group work, teachers would give instructions in Chinese, assign tasks, and provide demonstrations about the nature of the work product or outcome. The observed group activities included debating, two-way translation, information gap puzzles, and role play. During the pair and group work, the teachers were facilitators and monitored the quality of student performance. Teachers walked around the classroom and answered students' questions about specific content. Teachers were not the only source for explaining unknown content; the pairs and groups also provided answers and information to each other.

Reviewing important content. The teachers did not always review important course content when a class ran low on available time. The teachers spent most of each class hour instructing and practicing new content. When they had time to review content, teachers would quickly ask for keywords learned by students.

Routines for Homework (After Class) Assignments

Teachers assigned different homework based on students' various needs for improving their language ability. Common homework assignments are discussed below.

1. Review and Preview Course Content and Authentic Materials: In the class schedule handout, teachers would include reminders about required reviews or previews regarding course content. Most commonly, this entailed requiring students to preview selected course content intended for the next class session. It appears that successful teachers tend to emphasize the importance of advance student preparation for each class.
2. Prepare for Regular Tests with Preview/Review Vocabulary Quizzes, Lessons, and Unit Tests: The classes had regular tests, including quizzes and unit tests. Teachers included a reminder item – "prepare tests and quizzes" – to remind students about upcoming quizzes or tests in the weekly class schedule.
3. Speaking, reading & listening and writing homework: Speaking and writing homework assignments were selected and described by teachers. Teachers required students to record or write student personal experiences and thoughts in weekly journal assignment. Before beginning-level learners reached the state of tackling personalized homework, they were assigned to record recitations from the textbooks into their iPods. Teachers also assign students to work on listening, writing, and grammar workbooks which correlate with the content of textbooks and strengthen students' comprehension of specific subjects in the textbooks.
4. Suggested Homework (such as online authentic materials): Teachers would recommend additional reading and listening for students to complete after school.

For example, semester three teachers included the statement "Listen something from VOA, BBC, or New Dynasty TV!!!" in the course schedule. Both Voice of America (VOA) and BBC news describe current events in Chinese-language editions; therefore, these sources were used as part of the students' extracurricular reading and listening materials.

Reflection about the Strengths and Weaknesses of Instruction

The most frequent types of statements by the three teachers in their respective reflective journals were analyzed and synthesized into two categories: teachers completing all steps of model pedagogy, and student performance/production. Student performance was the key factor for evaluating the effectiveness of the instruction. Even though the teachers used similar technology and approaches in each classroom, student results were their most important criterion for deciding whether the instruction had been successful. The teachers were observed preparing well-structured comprehensive questions and instructional activities. However, if students could not perform effectively, the teachers considered the class to be unsuccessful notwithstanding all the efforts they had made. More details are explored below.

1. Did the teachers do what they intended to do under signature (model) pedagogy? From teachers' reflective journals, it appears that teachers would (in part) evaluate their own progress toward success in class based on the procedures of the signature pedagogy described above. The following illustrative passage is excerpted from one of the teachers' reflective journals about general thematic pedagogical progress:

> Today we studied two authentic listening passages: *the number of obese children continues to increase* and *a big accident*. Before we started to

> listen we had a lot of schemata building by discussing questions related to the passages to be listened. Through discussion, students have some background knowledge and some expectation about what they are about to hear. After the first listening, I asked them some general ideas about the passages. After the second and the third listening, I asked them more specific questions.

Before instructing their classes, the teachers would plan what they intended to do in the class. If a teacher ran out of time before accomplishing what she intended to do, the teacher would tend to judge that class session as being unsuccessful. For instance, here are some teacher statements in their reflective journals (RJ) about what they considered to be unsuccessful classroom instruction:

> RJ1: this lesson went well but I just wish I had more time left for students to do the monopoly game so they can further strengthen their grammar understanding.
>
> RJ2: The timing is not quite good. I should have spent less time asking questions.

2. Do/Did the students have a good grasp of the content with solid background knowledge? The teachers' general concept of a successful class session was that students appeared to have "a good grasp of the content" or "have a better grasp of vocabulary." The teachers constantly observed student performance during instruction and seemed to have good recognition of whether students had absorbed the new content. A teacher wrote, "After this exercise, I think students have a basic control of the basic structure of this lesson and they also get the opportunity to recognize and review the words that they learned from this lesson." These teachers possessed a strong intuitive sense about student performance and consistently evaluated students' comprehension and understanding.

3. Did students enjoy the lesson and become actively involved in the class activities: Teachers thought learners' active participation and enjoyment in class activities was very important. If students were tired, frustrated, or could not concentrate on class activities, the teachers considered the class session to be unsuccessful. Typical reflective journal (RJ) passages focusing on this point were as follows:

> RJ1: Even though this may take students some time to prepare but through doing it, they learn Chinese with a lot of fun. They also learned from each other and take advantage of each other's strength and complement each other's weakness.
>
> RJ2: Students actively involved in the class activities
>
> RJ3: Students seemed to enjoy the class and they could retell the content of the paragraphs with the help of the visual aids.

Students' enjoyment of classes brought the observed teachers a noticeable sense of fulfillment and also seemed to serve as an important indicator of classroom instruction success. Presumably there is a positive correlation between adult student classroom enjoyment and effective student comprehension of the material presented. In contrast to the enjoyment that comes from a sense of personal fulfillment from learning progress, it also seems very likely that a lack of comprehension will lead to frustration, and frustration will prevent or undermine student enjoyment. Thus, the experience of these successful teachers has apparently influenced them to carefully monitor manifest student enjoyment as a conspicuous surrogate indicator for more latent aspects of student comprehension.

4. Do students focus on tasks and apply new knowledge to perform tasks? Students' concentration on tasks as facilitated through the actual application of new knowledge was considered by the teachers to be an essential component of the

learning experience. Teachers reminded as follows to an interview question asking for thoughts about successful classroom instruction in the reflective journals (RJ):

> RJ1: Students get a chance to report back orally of the content of this presentation.
>
> RJ2: They were able to apply what they learned in the presentation with the ad I gave them. Also, students have a visual hint to help them to produce the language.
>
> RJ3: Presentation on proverb stories: This is the class that does not involve too much teacher teaching but a chance for students to express their creativity on speaking materials they practiced during the speaking class.

If students could apply the new knowledge in their role play or other activities, the teachers tended to express a belief that the class instruction session had gone well.

Teachers' Approaches to Enhance Students' Progress

Teachers were interviewed regarding how they set up class objectives to advance class progress. They were also observed in regard to what they did in the classroom to enhance students' progress. Based on class observation and interviews, the features and patterns below appeared on the most frequent basis.

1. Teachers would motivate students by complimenting their performance. During classroom instruction, teachers were observed constantly praising students' performances after students answered questions correctly. They made efforts to make students feel comfortable when the students had committed grammatical errors. The teachers were observed using indirect error correction techniques, such as rephrasing students' incorrect sentence structures without overtly pointing out to the class or student that a mistake had been made. While giving a

presentation to approximately 60 Chinese teachers about how she facilitated student success in DLPT and OPI tests, the semester three teacher stated that she constantly communicated with students in order to identify their problems, make students aware of their progress, and spark their interest in learning.

2. Course schedule and pedagogy would be flexibly modified according to students' feedback, needs, and preferences. Teachers constantly observed students' reactions to course arrangements. They would conduct face-to-face discussions with students or evaluate students' reactions toward the pedagogy and content. One teacher stated in her reflective journal that "from students' feedback, they do not feel they learned much by doing homework. They found exercises in the grammar book useful." Therefore, she immediately revised homework assignments to include more grammar and listening material. Her flexibility and adaptability were praised and highly appreciated by the students.
3. Different focuses and directions in different semesters. The first semester class focused on grammar foundation and tone practice by reading aloud. The second semester class focused on inauthentic to authentic materials and i+1 methodology (i.e. challenging students with content materials that were one level higher than the students' current proficiency level), and introduced the Oral Proficiency Interview (OPI) and DLPT 5 tests. The third semester class included mass listening and reading of authentic materials, test-skill training, vocabulary expansion, and DLPT 5 practices.
4. A focus on grammatical structures during the first semester. Teachers felt this was important. They stated that if students did not possess a solid grammatical

foundation, they would have problems with listening and speaking skills at the more advanced levels. They believed grammar knowledge affected all language skills and also determined how students performed at higher levels. The first semester teacher was also observed asking students to read the content out loud in order to improve tones and pronunciation. During the second semester, the teacher introduced the format of OPI and DLPT 5 to help students understand the parameters for their eventual crucial graduation exams. During this stage, the teacher introduced authentic reading and listening materials which were one level higher than students' current proficiency level. The teachers told students that semester two was the time to switch from inauthentic to authentic language materials. For semester three, students listened and read a lot of authentic materials to expand the range of their vocabulary. Practicing mock DLPT 5 and test-taking skills was considered to be indispensable. Students and teachers were cognizant of the importance of skill training with regard to identifying main ideas/sentences, reading author's tones, etc.

5. Tailor pedagogy to meet students' weaknesses. Pedagogy and homework were regularly modified to meet students' specific needs and characteristics. When teachers noticed a student with a trend of declining grades, they would tailor their pedagogy to attempt to address the challenge. For example, the teachers separated students into ability groups or split students into smaller sections based on their remedial needs. This approach was implemented with the goal of helping lagging students strengthen their targeted language capabilities.

6. Encourage students to utilize technology to assist language learning. Teachers were observed encouraging students to utilize technology in the classroom. The teachers would ask students to look up unknown words in Wenlin, browse the internet for topics of interest to the students, or use student tablet PC and GLOSS materials. Teachers even guided students about how to learn with technology and reminded learners to bring certain technological tools to class sessions.

Technology

Teachers and students expressed the view that technology could be a beneficial tool to save time, provide visual simulation, increase learning motivation, and facilitate learning at any time. However, they also thought that technology could also waste time when electronic equipment did not work properly. Cited examples included iPods that would skip a couple of seconds while making or playing a recording, tablet PC login and logout problems, sound files that could not play on the classroom computers, and so on. Participants' responses to open-ended questions regarding technology used in Chinese language instruction fell into two categories: hardware and software/programs.

The most commonly used and favored technology tools for the three semesters were revealed through data analysis based upon topic coding. The data analysis process was conducted by a matrix query function in NVivo. Since participant responses were classified into thirteen categories by semesters, no one category was overwhelmingly dominant. Table 2 shows the thirteen categories of technology use mentioned by the participants or observed by the researcher and provides a comparison of technology use between the three semesters.

By quantifying the data, the most commonly used tools can be highlighted. However, infrequently used tools may go unmentioned. The most commonly used and favored technologies (highlighted in bold in Table 2) are discussed in more detail in the following sections.

Table 2

Favored and Frequently Used Technology tools

Favored and Frequently Used Technology tools	Semester 1	Semester 2	Semester 3
Hardware			
SMART Board & TEC II computer	25.35%	28.95%	28.57%
Tablet PCs	11.27%	19.74%	22.22%
iPods	11.27%	9.21%	6.35%
Computer lab	1.41%	0%	0%
Software			
SMART Board Notebook	11.27%	13.16%	11.11%
Wenlin assisted teaching and learning	4.23%	7.89%	17.46%
PowerPoint	18.31%	3.95%	9.52%
Internet	2.82%	3.95%	4.76%
Rapid Rote	1.41%	0%	0%
Rosetta stone	1.41%	0%	0%
Ulead and Movie Maker	1.41%	0%	0%
Word showing questions, scripts, & vocabulary	2.82%	11.84%	0%
Shared folder for course materials	7.04%	1.32%	0%

Hardware

The most commonly used hardware tools were used to facilitate classroom instruction and student learning. The tools are discussed below in detail.

SMART Board (Interactive Whiteboard) & TEC II Desktop computer. Teachers used SMART Boards and TEC II desktop computers (a term for desktop computers used in all classrooms) in almost every class. SMART Boards were connected to classroom computers and projectors to display computer monitor images. SMART Boards were

interactive and included touch-sensitive whiteboards that allowed users to control the computer screen by touching SMART Boards, writing notes, and/or circling any objects shown on the screen. Traditional whiteboards take time to erase and are less flexible when changes are needed. Observations revealed that SMART Boards were used as a platform for displaying Word files, PDF files, PowerPoint files, webpages, videos, and other material. Students had positive opinions about the SMART Board and thought it helped bring a variety of course materials into the classroom. Two typical positive comments were as follows:

> A: It makes the lesson a bit more interactive or perhaps using it to display some other media for example news broadcast or video clips or songs that have some content they find to be relevant to the course we study at this moment.
>
> B: They also go off and they will select news clips from VOA or new Tang Dynasty or television, and then play those and we will review over what the content of the media article, recording-wise. So it is not just exclusively in the curriculum, it is also selected by the teachers.

Teachers used SMART Board to highlight answers, keywords, sentence structures of PDF textbook materials, and scripts. The Board was also used to play sound files. Students seemed to immediately know what teachers wanted them to read or do. According to one participant's comment, "the best thing about the SMART Board in reading is that teachers can point out where exactly in the passage you want students to look where before it is just time for the books." SMART Board proves to be a convenient display platform for showing and marking important content for learners.

Tablet PCs. Instructors do not have tablet PCs, only the students do. (This fact may cause instructors to shy away from tablet PCs more than would otherwise occur, and/or use the tablet PCs less optimally than would be the case if they had more "hands-on" familiarity or affinity with the tool). Therefore, the majority of responses from this

category were received from student interviews or class observation. During the time of the interviews, semester one students had not been issued tablet PCs. Therefore, their responses were slightly more sparse than semester two and three students. However, even students without an issued tablet PC had opinions on the subject, because they had heard feedback about tablet PCs from other classes and friends who did have tablet PCs to assist with learning.

Tablet PCs were equipped with a stylus. Students used the tablet PC to store, read and listen to all electronic course materials. They also used tablet PCs to write notes, organize new words, access GLOSS, and retrieve authentic internet materials. During the class instruction, teachers would ask students to use tablet PCs. For example, one teacher noted that "She asked students to read English multiple choice questions first and then listen the recording twice by tablet PCs." Specific examples of tablet PC (TPC) use in classrooms were noted in abridged fieldnotes:

S2 used OneNote to keep notes.

S1 listens and keeps notes in his TPC.

S5 had written some vocabulary in Sticky Notes program.

S8 wrote down the word in table TPC and asked the teacher how to write it.

Students answered the question in their tablet PCs.

She asked students to open their GLOSS file in Tablet PCs.

Students liked taking notes with Tablet PCs. "It makes things faster more accessible. It helps you save a lot of time especially when taking notes," a student said. Students also acknowledged the benefit from using tablet PCs to store textbook materials, which obviated the need to carry heavy textbooks around. Since students had electronic

course materials with them any time they wished, they could view the exact same source files and videos that their teacher had used on the SMART Board.

iPods. Participants praised iPods as useful devices that can be used anytime and anywhere. They not only can listen to sound files, but also use iPods as a hard drive for storing sound files and course materials. Students were assigned homework requiring them to record their own monologues on iPods. Even though it was quite convenient to record with iPods, students complained that iPods and Belkin recorders were frequently susceptible to "cutting out" during recording activities. Some students appreciated iPod's capacity to enable individual listening practices in the classroom. These students thought that the unsynchronized listening environment allowed them to stop and pause whenever they wanted without interrupting the pace of other students.

Students in semester two and three did not use iPods as often as students in semester one. There are two likely reasons for this pattern. First, for most of the research period the first semester students were the only cohort equipped with iPods. Second, students in second and third semesters needed electronic dictionaries to help them comprehend authentic materials. Most authentic materials (e.g., GLOSS) were in a digital format that could not be easily displayed or accessed with an iPod.

Software Programs

Software programs listed below were either used by teachers to create instructional materials and teaching aids, or by students to search for learning materials and assistance.

SMART Board Notebook. Overall, participants did not use the moniker "SMART Board Notebook" software, but instead tended to use the abbreviated term "Smartboard."

SMART Board Notebook was the software designed by SMART Technologies Inc. to save hand-written notes, as well as to import graphics, text, audio and video files for display on an interactive SMART Board whiteboard. Participants stated that teachers used SMART Board Notebook software to display visual aides when teaching new words, grammatical structures, training speaking/listening/reading skills.

The SMART Board Notebook software also fortified the interaction between students and teachers. As one student said, "Oh yes, I like it because we could interact. Because if we used the conventional white board, we couldn't move visual content. We would have to erase words and rewrite them and it would ruin the point of the game to rearrange things and interact with the words to help memorize them." Students enjoyed the interaction generated by the technology because users had the flexibility to move objects around, block key words, and arrange sentence sequences. One student said, "To incorporate Q&A sessions, for instance, when taking a passage and covering up certain words we will have to fill them in, and the teacher rotates the blocks to another area. We have to fill in words and write it." It should also be noted that teachers used the software as a traditional whiteboard to write sample or key sentences. The software could be used as either an interactive instructional aid or to maintain a tradition whiteboard function.

Wenlin. Wenlin Software for Learning Chinese was created by Wenlin Institute, Inc. The software allowed students to copy and paste Chinese passages and look up English meanings. Students used Wenlin to create vocabulary lists and look up unknown words. Semester three study participants mentioned Wenlin as a learning tool more often than study participants in semesters one or two. This is probably because participants in semester three were preparing for DLPT 5 and were studying more advanced, authentic

Chinese materials. One student shared, “But also, I mean if there is one more detail you don’t understand it, you can always copy and paste to Wenlin, the electronic dictionary, to find out what that is.” Each tablet PC had Wenlin software. It was not uncommon to see all students with tablet PCs on their desks and Wenlin open during the class observations.

The teacher for semester three also frequently used Wenlin as an instructional classroom aid. Observation fieldnotes reflected that “the teacher copied the text and pasted it in Wenlin. When the teacher moved the mouse over some key words, the meaning of words was shown in the bottom of the screen immediately.” The teacher not only used Wenlin for teaching, but also encouraged students to use it.

PowerPoint. The teachers used PowerPoint quite regularly to provide instruction about grammatical concepts and patterns. The visual aids were used to stimulate learning. The teacher for semester one used PowerPoint to create Jeopardy and Millionaire games; integrate reading, listening, grammar and speaking activities; and also review content. The teacher and students thought PowerPoint interactive games were enjoyable. One student noted that “the teacher can display a PowerPoint presentation there and you can hit the category you want to select and play the sound file of listening exercises, can display the answers and characters on the board, and it is fun and get you to interact and it works really well.”

PowerPoint was also used to list guided questions related to content passages, important grammatical structures, and key sentences. The semester three teacher used PowerPoint to list key words, depict complex sentences extracted from articles, and display photographs related to current events.

Word. Word was quite frequently used as well. Most scripts of listening passages were transcribed into Word documents. After implementing listening activities, teachers would display listening transcripts in Word and explain the difficult concepts to students. The teacher in semester one used Word to mark key and main sentences – in other words, answers to the questions. For example, one observation fieldnote records that "after students answered the question, the teacher showed the word document and pointed the right sentence of passage in Word document."

The semester two teacher used Word frequently to list vocabulary, as well as guided questions for reading and listening activities. As reflected in a fieldnote, "The teacher showed the script in Word and explained some key words. The teacher showed the guiding questions in the Word document on Smartboard." This teacher was comfortable using Word to list leading Chinese questions. Before students started practicing, the teacher would explain the questions in Chinese.

TPCK Conceptual Model

From the data analysis above, it became apparent that SMART Board software and hardware commanded heavy use and considerable favor in the classroom instruction involving students and teachers for the three semesters. Therefore, this specific technology-enhanced situation was further explored to facilitate investigation of the TPCK conceptual model in a Chinese instructional context.

Much of the content used in DLI Chinese courses was digitalized and could be displayed on SMART Boards. The SMART Board technology served as a platform for displaying the content (including textbook, internet, and multimedia authentic materials) in a format large enough for learners and teachers to see in a classroom setting. The

content and technology were integrated in a SMART Board technology assisted language learning environment. Even though teachers' statements indicated that they thought of content as the controlling factor for their presentations, the researcher suspects that the SMART Board technology exerted an influence along with content.

In order to efficiently utilize SMART Board technology to provide instructional content designed to optimize student comprehension, teachers had to formulate an effective pedagogy for transferring the content knowledge to learners. One teacher gave a simile about pedagogy during an interview, as set forth below.

> Pedagogy concerns how to effectively convey information to students. For example, content is on the near side of the river. A student is on the other side of the river. If I want to transport something to the student, I need to go over a bridge. That bridge is the pedagogy. Good or bad pedagogy functions as a bridge. I need to effectively deliver information to students via the bridge.

According to this teacher, pedagogy is like a bridge. Therefore, to transfer the content in a concrete and effectual way, this teacher (and from observation, the other two teachers) utilized the technology to present the content and engage students with the content. Teachers highlighted, circled and underlined keywords and sentences of the content to facilitate students' effort to find the main sentence/idea of the passage. When teachers used SMART Boards to highlight, circle and display keywords and sentences, or used SMART Board Notebook/PowerPoint software to create activities, the observable classroom instruction seamlessly integrated content, pedagogy and technology. Teachers subconsciously used the SMART Board as a whiteboard while simultaneously adapting their teaching activities in accordance with technological parameters. The technological design had the effect of imparting an "embedded," implicit pedagogy.

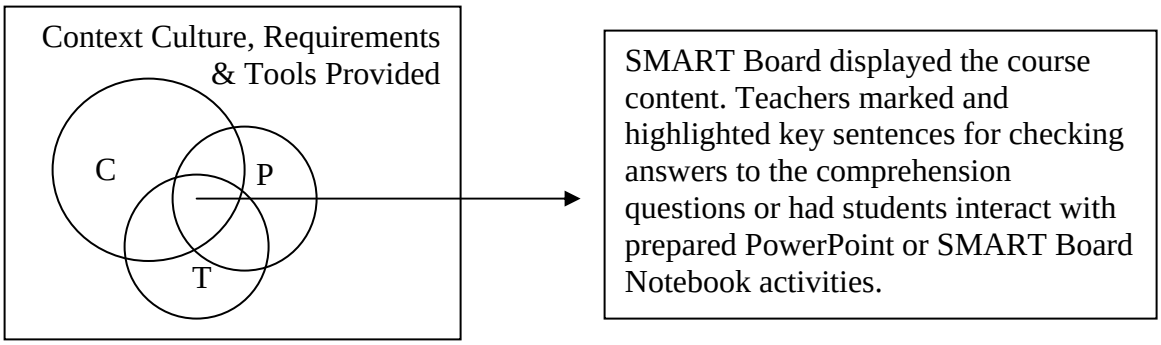
Every instructional context has culture and requirements for students' and teachers' performance. DLIFLC's basic course goal was to train students to achieve DLPT reading and listening level 2, and OPI level 1+ upon graduation. It is quite challenging for students and teachers to achieve that goal in 63 weeks. The teachers are necessarily expected to accommodate any pedagogy likely to accomplish DLI's goals.

For example, the second semester teacher stated that her pedagogic methods were influenced by DLI's requirements. She would use any teaching methods that would help her students succeed in the short timeframe. She also stated that the compressed DLI timeframe constrained the frequency of interactive or communicative activities that might be utilized in other settings, simply because such activities consumed too much class time. The teachers were observed employing test-taking skill training methods to prepare students for the pending DLI evaluations. One teacher remarked that DLI's assigned mission was to help students pass the final proficiency tests, and that this objective necessarily permeated everything the teachers did.

There is no doubt that the intense, compressed, absorbing, regimented nature of the DLI mission and environment has unique advantages and disadvantages from the standpoint of achieving effective language learning. Other institutions of higher learning that do not operate in the context of military imperatives and hyper-compressed scheduling will have teachers and students with a different profile of constraints, and thus a different profile of needs and priorities. This, in turn, will lead to a modified set of choices and adaptations when compared to the descriptions of DLI set forth in this study. However, the researcher believes that considerations and models set forth in this study

are transferable to many different setting, even if students or teachers might choose to address and solve the identified challenges in a variety of different ways.

Even though teachers displayed content on technological tools, content still commanded the largest portion of their time, focus, and energy. Based on teachers' responses and the researcher's observations, the conceptual TPCK model in the Chinese classroom instruction can be represented as shown in Figure 7.



Note. C= Content, P= Pedagogy, T=Technology.

Figure 7. The observed TPCK conceptual model in the Chinese classroom instruction.

Students' Preferences in Terms of Content, Pedagogy and Technology in Technology-Enhanced Learning Environment

Answers for students' preferences have been based on students' responses to interview questions such as "what could your teachers do or change to tailor Chinese Mandarin instruction to your needs and enhance your language proficiency" and "what is your ideal Chinese Mandarin class like? How is it related to Chinese course materials, instructional approaches and methods, and technological tools?" The questions were designed to be open-ended so that interviewees could liberally express what features of the technology-enhanced environment and intense language program they thought would be ideal. Because of open-ended questions, interviewees' answers very dispersed. No

dominating items could be identified. However, the most commonly mentioned preferences were distinguished and are set forth in Table 3.

Table 3

Students' Preferences in Technology-Enhanced Learning Environment

	Semester I	Semester II	Semester III
Pair work, group activities	15.38%	13.64%	5.88%
Teachers	30.77%	22.73%	35.29%
One on one speaking, instruction and learning	38.46%	18.18%	29.41%
Individualized & self-learning with teachers' facilitation	15.38%	45.45%	29.41%

Four categories most frequently mentioned by students were identified through topic coding. A matrix query function in NVivo was used to generate percentages of each category by semesters. Four categories of comments were mentioned by more than 15% of the respondents: group activities/interaction, teachers, one on one speaking (instruction & learning), and individualized and self-learning. More detailed information is provided below.

1. Pair work and group activities: Semester one and two students preferred group activities and interaction more than semester three students. It is possible that this is simply because semester three students were already in small groups (there were an average of four students in one class, and many of the struggling students were switched to less advanced classes before reaching semester three). Another possible explanation for the discrepancy is because students in the third semester were very concentrated on passing their final DLPT 5 test and needed more

individualized and self-paced activities during the final phase. Semester one and two students responded as follows:

> S1: I get a lot out of small group work. So if I am working with 2 or 3 other students on something, I may be able to get a lot out of that. Some of free format activities we do, and we do role plays. Yeah, that kind of stuff, that works very well for me.
>
> S2: Interaction with your classmates 'cause you are not always able to do that when you are at home.
>
> S3: It gets everybody involved.

Semester one and two students liked interaction among classmates when attempting to apply new knowledge. There were ten students in the semester one class and an average of four to six students in the semester two class. One student noted that the group activities got everybody involved, an atmosphere that tends to be absent while studying at home. It was also possible that because the teacher/student ratio is higher for semester one and two compared to semester 3, group work would be more valued in high-ratio classes due to the additional opportunities provided for students seeking to exercise their language skills. However, the percentage of comments related to pair and group work was comparatively lower than percentages for other noted preferences.

2. Teachers: most students were happy with teachers they had and did not think they could get noticeably better teachers than the ones they had been assigned. They stated that the teachers were willing to adjust their instruction and course schedule based on student feedback. In addition, they thought the teachers did their very best to help the students succeed. The following responses were typical.

S1: I'll say that both of our teachers are very good about listening to our suggestions and ask feedback from us. I think they do a great job. That can't be easy with that many people.

S2: Well, my ideal class is actually pretty close to this class.

S3: I think I'll say this, this teaching team probably the most patient teachers I've ever met. And I am very impressed with teacher one.
S4: I think what they are doing fits in very well.

3. One-on-one speaking, instruction and learning: Even though DLIFLC has a very low teacher student ratio (1:3 or 1:5), students still stated they preferred more one-on-one speaking practices, interaction and learning with the teachers. A student stated "if it is one-on-one you will be able to go at your pace instead of average pace of everyone" and individual questions can be answered specifically by the teacher. More student responses regarding one-on-one speaking or practice are set forth below.

S1: But I think my favorite is still 1-on-1 with the teachers with the students is good, too. Obviously, being with teachers will be more beneficial. That would be probably I would like to see more of. Probably would be that.

S2: I kind of like to have 1-on-1 with teachers interaction.

S3: But I think primary my learning style: 1-on-1 instruction.

S4: I really need someone just one human being to play recording for me have me writing what I've heard or say what I've heard and have that person just correct what I just said.

S5: Somebody sitting there 1-on-1 and making me talk back and forth dialogues that will be the most ideal situation.

S6: So my dream classroom would be to be a Chinese teacher, or somebody whom I am with 8 hours a day for a year and half.

Semester one and three students emphasized one-on-one practice with teachers more than semester two students. The teacher to student ratio for the observed

semester one class was higher than other classes, and consisted of people just venturing into the study of a challenging new language. There were ten students in one class, and it seemed clear that the students longed for more one-on-one teacher-student interaction. As for semester three students, they faced the demands and stresses of preparation for looming DLPT 5 and OPI tests, which could explain the urgency they felt for personalized attention. Semester two students are in a bit more of a comfort zone (although their instruction regimen is still very intense), and this might explain a slightly less urgent attitude towards obtaining personalized help.

4. Individualized and self-learning with teacher facilitation: Students were required to stay in the school for six to seven hours every day. Therefore, students seemed to prefer some self learning and some individualized learning. The individualized and self-learning mentioned here transpired in the classroom with teacher facilitation. During such times, teachers did not attempt to impart instruction about new content, but instead allowed students to study the material and topics the students preferred. Semester two students indicated a greater preference for this item than students in semester one and three, perhaps because the semester two teacher arranged for a self-learning hour every day. In addition, since the researcher solicited comments from semester two students about this unique self-learning hour not experienced by the other semester classes, the very act of questioning probably acted as a factor to influence the differential result. Generally speaking, students in semester one and three also communicated a similar predisposition towards individualized learning and self-learning. Students

enjoyed having time to study material or topics that interested them while the teacher was present to render assistance. Some participant student replies are described below.

> S1: I prefer the individualized.
>
> S2: More individualized.
>
> S3: It is really nice to have that self-study time during the day
>
> S4: I like the self study that way I can focus on what I want to do like read a Chinese novel or use the Chinesepod and use that.
>
> S5: I know I would be minority on this, but I do like the freedom of studying on my own.
>
> S6: I think it is more helpful than being in a class where they go over material that you already understand.
>
> S7: And it gives you more time to look up and just study topics are more unfamiliar to you. In my case, it gives more chance to preview ahead and read presentation and find out what words I am not familiar with and kind of work that into more familiar with.

The above four identified preference items were related to pedagogy. Even though some students couched their wish lists in terms of more authentic materials and internet (wireless) access, the study data suggests that they were not concerned with content and technology as much as they were about pedagogy – the desire for human interaction and personal attention during the learning process. It appears that students were generally satisfied with content delivered through the technological tools (tablet PCs and iPods) they used in the classroom and outside class (primarily tablet PCs). The students' learning environment was well-equipped with accessible technology. For the most part, the successful teachers participating in the study seamlessly integrated technology into the classroom in a way that seemed to leave students satisfied. Even when pressed,

students could not think of anything else that they would include in their ideal classrooms, except perhaps for wireless computers or computers with slightly better levels of performance. Here is a typical comment:

> I think what we got what we need so far. I think they use most of the technology pretty well. I know we are always using Smartboard, Powerpoint. I think they use a lot of supplementary like video materials as well. As far as what we are doing, we use iPods at home. I definitely listen to that. We have all of supplementary material there. As far as Wenlin goes, I mean that is a good program I have on my own personal laptop. And then again, I like tablet PCs whatever. It is different being able to actually write it down, quick looking it up and get to type it. It is completely different. I don't know what else will be available for them to use. I know what we have, they pretty much do use it pretty well. Are we going to get better computer? Wireless? That would be cool.

To summarize the findings in relation to question three, human interaction and individualize learning was greatly preferred. Instructional (learning) content and technology were effectively coordinated in the studied settings. Even though there were many means for delivering information and content, students had an exceedingly strong preference for human interaction and personalized attention. ”Humanware” still has a strong edge over hardware and software as far as students are concerned in a technology-enhanced learning environment, although they also seem to think that an effective mixture of all three is optimal.

CHAPTER 5: REFLECTIONS ON RESEARCH QUESTIONS

Chapter five is organized into four sections: a) discussion, b) implications, c) research design limitations, d) suggestions for future research, and e) conclusion. The discussion section expounds upon the research findings from the participants that correspond to existing literature. The implications section includes theoretical and practical implications of possible benefit to readers. The third section will discuss the limitations of the research study. The fourth section will provide suggestions for future research. In the fourth section, the study is summarized and concluded.

Discussion

The discussion section is broken into three parts in accordance with the three research questions. The three parts are a) conceptual relationship among technology, pedagogy and content during the teachers' course preparation process; b) technological pedagogical content knowledge conceptual model in the Chinese classroom instruction; and c) students' preferences in terms of content, pedagogy and technology in a technology-enhanced learning environment.

Research Question 1

Research question 1: what is the conceptual relationship among technology, pedagogy and content during teachers' course preparation process?

Koehler and Mishra (2008) asserted that "teachers constantly negotiate a balance between technology, pedagogy, and content in ways that are appropriate to the specific parameters of an ever changing educational context" (p. 21). The finding from the present study indicated that the three experienced teachers thought they did *not* negotiate a balance between technology, pedagogy, and content during their course preparation.

They insisted that content was the primary and first considered factor that determined pedagogical approach and technology use. The studied teachers characterized the conceptual relationship among technology, pedagogy and content in a quite sequential (linear) thinking process, meaning "a process of thought following known cycles or step-by-step progression where a response to a step must be elicited before another step is taken" (Linear thinking, n.d.). Their lesson planning procedures were quite similar to Hadley's (1993) guidelines for planning lessons:

1. Consider the content that is to be taught for a given class day.
2. Plan activities that will help students reach functional objectives.
3. Prepare an outline of what you intent to do during the class period.
4. Check for flow and integration of classroom activities.
5. Provide variety in classroom tasks.
6. Evaluate your plan after the class is over. (p. 488-490)

Koehler and Mishra (2008) believed that the conventional perspective is that "pedagogical goals and technologies are derived from the content area" (p. 18). Koehler and Mishra (2008) would likely say that the three participant teachers expressed the traditional view about technology, pedagogy, and content. A teacher's construction is typically derived from their past experiences and beliefs as such have emerged from their teaching and learning (Ulichny, 1996). Teacher belief determines how they organize curricula, design lessons and instruction (Smith, 1996). For example, the semester one teacher focused mostly on strengthening students' knowledge concerning grammar structure because she believed students would have better listening, reading, speaking and writing skills as a result of correct grammar usage.

The DLI Chinese program is content-driven because a majority of the content was decided by an institutional hierarchy. Even though teachers did have discretion to incorporate their own selected authentic material and supplemental materials, they still

understood that pre-formulated institutional content (with tests and rigid schedules that were derived from pre-formulated content) was an overriding constraint on their course preparation.

It is possible for content knowledge to vary somewhat in each DLI class, but the pedagogical methods and technological tools they frequently use must be accountable to very specific institutional goals and criteria. Content challenges teachers' professional knowledge and its scope is quite extensive. Content also drives teachers' evaluation of students' learning. As one teacher mentioned, she could deliver the content without any technological tools if absolutely necessary. Their pedagogical goal focuses on students' comprehension and assimilation from a content standpoint.

The teachers in this study viewed technology integration differently than what the author expected. The author had surmised that teachers treated technology as a component they intended to bring into the classroom for specific purposes such as motivating learners, creating interactivity, etc. In contrast to the author's initial assumption, Bush (1997) stated that technology has simultaneously become less visible, less obvious, and yet ubiquitous (cited in O'Leary, 1998). Consistent with Bush's assertion, it appears from the present study that since the teachers used digitalized curriculum or textbook content daily, the teachers did not regard their process as integration of content and technology. Moreover, it is important to remember that the teachers' view of technology and pedagogy probably influenced their answers to the interview questions.

Research Question 2

Research question 2: how can the technological pedagogical content knowledge (TPCK) conceptual model be modified by analyzing content, pedagogy and technology in the Chinese Classroom Instruction?

Prior to discussing the TPCK conceptual model in Chinese classroom instruction, we should revisit DLI's general context (extensive program) and mission. The mission of DLI is to cultivate qualified linguists who can pass the lower-range of DLPT 5. Rivers (1992) assumed that learners could acquire a solid language foundation at a spectacular rate when learning in a specialized intensive course with a low teacher-student ration (one to four learners). DLI's intensive program is not only designed to help learners develop a solid language foundation, but also to pass the lower-range of DLPT 5 with ILR level two or above. DLPT 5 questions are based on "authentic materials and real-life sources such as signs, newspapers, radio and television broadcasts, the internet." The Chinese Mandarin Defense Language Proficiency Test 5 (DLPT 5) familiarization guide, overview, and description are shown in Appendix A. DLPT 5 is a proficiency test that assesses a variety of content knowledge. Valette (1967) maintained that proficiency tests exist to examine if learners have "mastered specific skills and content deemed prerequisites for a particular job or course of study" (p. 5). The teachers undertook the responsibility to train qualified linguists and tried every possible way to help students succeed in the technology-enhanced environment.

In order to cover a wide range of content, the teachers used DLI-created textbooks, associated cultural knowledge, and used a great quantity of authentic and supplemental online materials created by peer teachers. Authentic materials were widely used in

semester 2 and 3 classrooms, especially GLOSS and other online articles. Authentic materials are "language samples, either oral or written, that reflect a naturalness of form and an appropriateness of cultural and situational context that would be found in the language as used by native speakers" (Rogers and Medley, 1988, p. 468). Teachers also incorporated DLI-created textbooks and online authentic materials for homework assignments.

As discussed earlier, teachers focused on what content they would present through the use of a content-driven pedagogy. That is to say, teachers claimed to be considering their pedagogy only after content was decided. Pedagogy is a dynamic process for transferring what teachers know to students. To ensure students absorb and retain the content knowledge, teachers naturally developed their signature pedagogy to educate students with the three routines: warming up and introducing new content, instructing and practicing new content, reviewing important content. At the beginning of the classes, teachers would ask students to predict what the passages would discuss or prepare students' background knowledge. This is consistent with the academic notion that "the comprehension advantage was derived from removing the ambiguity of the passage through appropriate background knowledge" (Bransford & Johnson, 1972; Harley, 1993, p. 139).

When imparting new content, the semester one teacher used more pictorial devices to guide students' conceptual thought development than the semester two and three teachers. One possible explanation for this is that lower-level learners study more simple, discrete content, and it is likely easier to collect or create suitable visual aids. The theoretic explanation for this outcome is that stimulation schemata employing visual aids

have been found to be especially effective for facilitating the efforts of lower-proficiency learners (Hudson, 1982; Hadley, 1993).

The three observed teachers often used top-down reading and listening approaches (grasping main ideas without going though vocabulary in advance) by employing comprehension questions. They would then explain grammatical structures and vocabulary within a context derived from the students' questions. These teachers often used a "comprehension check" approach to test the students' understanding of the Chinese content. This is in line with Hadely (1993), who explained that the comprehension check involves use of a variety of questions from the teacher to test student understanding of passages.

The teachers also gave frequent preview vocabulary quizzes to ensure students came prepared for class. Valette (1967) affirmed this approach be expressing the view that "frequent quizzes encourage students to devote time regularly to their language study" (p. 7). The observed teachers also administered unit tests once a month, a prudent tactic in light of reports that "students study for tests and are motivated by obtaining good grades" (Valette, 1992). Regular tests allowed the participant teachers to timely identify those learners who were behind and needed special assistance.

The most commonly used technological tools in the DLI Chinese Classrooms included hardware - SMART Boards & TEC II computers, tablet PCs, iPods, and software programs - SMART Board Notebook, Wenlin, PowerPoint and Microsoft Word. Those technological tools were provided by the school. In order to protect network security, teachers were not authorized to remove or add any instructional programs in the

computers. Despite that limitation, observation suggested that the technology was quite sufficient.

Koehler and Mishra (2008) asserted that "TPCK is a form of knowledge that expert teachers bring into play any time they teach" (p. 17). The present study suggests Koehler's and Mishra's statement might be exaggerated or over-simplified. The three participant teachers had more than ten years of collective teaching experience and are regarded as experts, excellent instructors because of the results produced. This study revealed that the teachers did encourage their students to use technological tools to facilitate learning. At the same time, the teachers did not intentionally or consciously think they have to incorporate a particular interaction of content, pedagogy and technology knowledge (TPCK) framework when conducting classroom instruction even though they were observed integrating TPCK during their instruction.

The three Chinese language teachers believed that content played a predominant role as they went through their conscious preparation processes for classroom instruction. They evaluated the effectiveness of instruction according to the students' manifest understanding of content knowledge and apparent engagement in course activities. Technology was not consciously used by teachers as a criterion for evaluating the success of classroom instruction. However, when technology did not work, class routines were interrupted, class time was effectively reduced because of inefficiency, and teachers could not complete all of the instruction originally intended. Teachers who did not complete instruction about all the content they planned thought that the class was unsuccessful - regardless of whether the reason for non-completion was technological or non-technological. This mentality was probably intensified because of DLI's compressed,

intense, regimented graduation schedule for military students, an operational constraint that makes each hour of class time all the more precious and all the more urgent. The successful teachers stated that they did not view technology as a special element of teaching per se, but as part of the classroom capital designed to facilitate teaching in technology-enhanced classrooms.

Koehler and Mishra (2008) also maintained that "technological pedagogical content knowledge is an understanding that emerges from an interaction of content, pedagogy, and technology knowledge. Underlying true meaning and deeply skilled teaching with technology, TPCK is different from knowledge of all three concepts individually" (Koehler & Mishra, 2008, p. 17). But the present study indicates that the three successful teachers did, at least in terms of conscious self-perception, treat technology, content and pedagogy as separate concepts and separate realms of knowledge during course preparation.

Furthermore, the teachers concentrated on their instructional goals, meaning of content and the best way to facilitate learners' grasp of the identified content. They thought of pedagogy as their delivery method for content. They thought, however, that the nature of the content was too abstract for learners to grasp without display tools, and thus they perceived technology and printed materials to be mediums of communication vis-a-vis learners. In other words, technology became an interactive platform for imparting a human sense of "concrete" and "visualized" interaction with unavoidably abstract content and necessarily pedagogical structure. Or, expressed in a simpler and more general way, technology enables teachers to render content and pedagogy in a presentable, perceivable, enjoyable format for learners.

It is possible that the three studied teachers are somehow not as expert or skilled as the teachers Koehler and Mishra had in mind when they made their pronouncements. Perhaps these researchers thought they had identified a special insight grasped only by the most elite, grandmaster teachers. But even if one assumes that proposition is true (this researcher does not), and further assumes that none of the very successful teachers in the present study qualify for that elite classification (this researcher does not), it would still be an academic distinction without a practical difference for the vast majority of language-training programs throughout the United States. The present study involved teachers with the highest levels of proven performance at a military institution of higher learning that is well-resourced and intensely focused on imparting language skills in a much disciplined environment. Any pool of language teachers that would be noticeably more adept than the participant teachers in this study would be quite small, and therefore would also be, as a practical matter, unavailable and irrelevant to the vast majority of language-learning programs throughout the country. This present study was designed to uncover and discuss theoretical principles with potential widespread practical applications.

Based upon the study, I believe that the TPCK framework has different interpretations when inspected from different angles. Instructional designers, teacher trainers, school administrators, and teachers all tend to carry way different viewpoints when perceiving or implementing the TPCK framework. This might help explain why it is that, in the practical vocational experience of the researcher, technology trainers and in-service teachers occasionally fail to see eye-to-eye. In technology-enhanced language classrooms, the observed teachers did not consciously think about the interaction among

technology, content and pedagogy. However, the way they taught did reflect a visible combination of content, technology and pedagogy, as viewed through the probable perspectives of non-teacher researchers, curriculum theorists, or technology designers.

There are analogs to this theoretical and practical dissonance in other academic disciplines besides education. For example, the Nobel Laureate economist Dr. Milton Friedman once provided an insight that is now part of standard reading for economics students. He noted that economists and non-economists both need to appreciate the fact that economics involves an analysis of familiar phenomena through an unfamiliar lens. As summarized and cited by Witte (2006), Friedman (1966) asserted that

> The value of any economic theory should be judged by its ability to accurately predict outcomes from any given set of observational input variables. In the world of economics, therefore, descriptive realism (e.g., the precise biological processes by which a particular species of tree orients its leaves to the sun) is secondary to accurate predictive final outcomes (e.g., the fact that tree behavior serves to orient leaves to obtain maximum surface exposure to sunlight).

Friedman was saying, in essence, that a failure to understand the unique theoretical viewpoint implicit in economic study was lulling economists and non-economists into misconstruing the proper significance and potential applications of economic analysis. It should not bother non-economists that most *economic* scholarship typically omits descriptive realism in order to hone an analytic focus on prediction of end quantitative outcomes (e.g. an economic model designed to use mathematical game theory to predict plant behavior in competition for sunlight exposure), because the academic world can *simultaneously* embrace *inconsistent but equally valid* theoretical models about the "same" research topic in order to address concerns more central to other disciplines and professions (e.g. a descriptive *botany* project designed to probe the *biological processes* associated with achieving leaf orientation toward the sun). In a

nutshell, economic theory *supplements* (not *supplants or invalidates*) the methodology and paradigms used in other disciplines, and the reverse is also true.

Disparate use or explanation through the TPCK framework is similar. People in different disciplines and different professional jobs can focus or interpret TPCK ideas to achieve very different goals and produce disparate (but equally valid) outcome results. TPCK can yield multi-layered insight if researchers and practitioners take care to become self-aware about the "lens" they have brought to their own endeavor by virtue of training and end objective. Teachers, curriculum developers, academics, and technologies should not fall into the trap of insisting that the TPCK framework should incorporate only *one* emphasis and *one* rigid set of characteristics for *all* purposes of theoretical analysis or practical application. Only multi-layered insights from a variety of disciplinary perspectives can adequately serve to optimize the experiential learning outcome for students.

The observed expert teachers in the present study did not consciously intend to bring TPCK into play when they taught, and yet in a sense the teachers were still observed "performing" TPCK in the classroom. Pursuant to a proper and flexible understanding of TPCK, both of these facts can be true (and consistent with TPCK) on a simultaneous basis. The teachers thought they were just using technological equipment provided in each classroom by DLI, but they did not consider the "implicit" characteristics already "embedded" in the technology by technology designers. Thus, when the teachers walked into their classrooms, turned on the TEC II desktop computers, and displayed digital content file on SMART boards, they did not pause to consciously evaluate the actual integration of content and technology that had occurred.

Viewed through the "lens" of the teachers, technology integration was eclipsed by student performance and learning as a primary consideration. But viewed through the "lens" of a research observer (and also perhaps through the "lens" of the curriculum designer or technology designer), it is proper to say that teacher training, curriculum design, technology design, institutional strictures, and perhaps even subconscious teacher behavior all operated to ensure that all aspects of TCPK received adequate focus *at some point in time* when measured from the perspective of the *real classroom experience of the students*. Teachers, researchers, curriculum designers, technologists, and academic theorists all stand to improve if they focus on the *end-result, actual integrated classroom experience from the students' standpoint* and become consciously aware of *all* the different "lenses" that have exerted an influence on that experience.

Consider one final, more specific example. The participant teachers used the SMART Board to show visual aids, guide questions, and gradually build student schemata with respect to the instructional content. When students asked content-related questions, teachers would circle keywords or underline sentences and provide explanations. In effect, the SMART Board served as a visible communicative platform to convey an invisible pedagogical process. Teachers did not realize or consider that their performance was an observable form of the TPCK framework, even after the TPCK concepts were put to them by the researcher to elicit specific conceptual feedback. Instead, the teachers insisted that they were solely concentrated on delivering content to learners. In so doing, they instructed many successful Chinese language learners, and the teachers thereby garnered a reputation for effectively helping students to pass final language performance tests.

Research Question 3

Research question 3: what were students' preferences in terms of content, pedagogy and technology in the technology-enhanced learning environment?

Students in DLI are provided with iPods preloaded with all instructional digital files, as well as tablet PCs, to enable one-to-one computing. DLI has also expedited an initiative to implement wireless computer connections. Every classroom is equipped with a desktop computer connecting to an interactive whiteboard (SMART Board). Participant students expressed appreciation for the technological tools at their disposal, and in general thought that the tools were sufficient to assist their language learning at any time and in any location.

But humanware still dominates hardware or software. Even in the seamless and optimized technology-enhanced learning environment of DLI, students still expressed a profound need for more individualized one-on-one learning opportunities with the teachers. This study finding is consistent with Oppenheimer's (2003) emphasis upon the importance of good teachers and tutoring. Even though the present study did not examine whether teacher quality or one-on-one tutoring were variables that would actually help students to perform better, that possibility should be carefully considered in light of the students' strong conviction that one-on-one tutoring did have the effect of enhancing their language proficiency and could be used to further tailor instruction to their needs in connection with technology-enhanced classes.

The teacher student ratio (1:3; 1:5) is quite ideal at DLIFLC compared to other colleges and universities. Students have more opportunities to interact with teachers than is afforded other settings. Even so, the group interaction with DLI teachers still did not

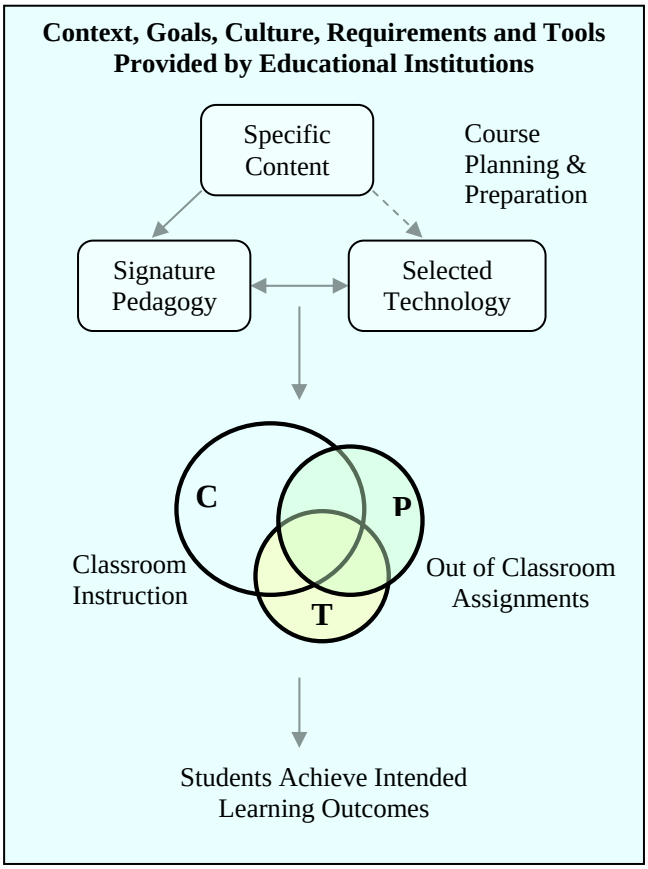
entirely satiate the students' craving for individual attention from instructors. Teachers afford authentic *interaction* with native language speakers, not just authentic *verbal sounds or phrases*, and this researcher speculates that *authentic interaction* probably impacts cognitive development and retention in an especially rich way. Given the intelligent limits of existing technology, some degree of human interaction and individual attention appears to be essential for language learners, and it also seems difficult for overkill to occur with respect to this kind of approach (speaking from a pedagogical and student performance standpoint, not a budget or economic efficiency standpoint).

Implications

The findings from the study afforded both theoretical and practical implications. I first discuss the theoretical implications regarding additional insight to TPCK framework, as set forth below.

Theoretical

Based on the results of this study, a modified TPCK framework is proposed as shown in Figure 8. The blue background rectangle in Figure 8 represents the influence of the sponsoring institution. The context, goals, culture, requirements and tools afforded by educational institutions not only influence the teachers' ways of teaching, thinking and planning, but also determine their use of pedagogy and technology. Content knowledge is very expansive and the institution influences the scope of selection in order to accomplish the school's mission, as represented by the "specific content" rectangle in Figure 8.



Note. T=technology; P=pedagogy, C=content. The blue background rectangle stands for influence of educational institutions.

Figure 8. The modified TPCK framework.

Likewise, pedagogical methods (signature pedagogy) and technological tools are necessarily constrained by the institute's logistical and strategic operations. For example, if fifty-minute class periods are a required regimen, it would make no sense for teachers to utilize pedagogical methods which would work effectively in a two-hour block but significantly diminish the quantity of content for a fifty-minute class period. Teachers also tend to be limited to whatever technological tools the school has provided to make instruction effective, enjoyable and efficient. Therefore, content, pedagogy and technology usage are all under the sponsoring organization's influence (in the case of this

study, DLI's influence). Within the overarching context of the sponsor, teachers can adapt and discover the most suitable and effectual instruction to help students succeed.

Figure 8 displays the modified TPCK framework with a complete instructional cycle. The three small rectangles (content, pedagogy and technology) with directional arrows are to depict the dynamic and sequential process that occurs during course planning and preparation. One-way arrows are used to reflect the fact that teachers tend to study specific instructional content first, thereafter deciding upon effective pedagogical methods and technology. During this process, a two-way arrow is used to depict the fact that pedagogical approach and technological aids are interactive and mutually-influenced. The dashed line indicates that there are processing sequences that could happen but do not commonly occur. For example, teachers seldom consider the technological tools provided by the institution right after studying the course content.

When teachers implement their teaching plans, the presentation of the lesson is the observable integration of the teacher's content, pedagogy and technology knowledge, as indicated by the Venn diagram composed of three overlapping circles in Figure 8. The circle used to represent content knowledge is larger than the others since the content is the most emphasized element during classroom instruction and out of classroom homework.

Using Venn diagram terminology, the union of the three circles (the total combined area of all three circles) represents then entire range of teacher knowledge brought to bear during the presentation of a lesson. The intersection of the three circles (the area where all three circles overlap) represents the teacher's use of all three types of knowledge to integrate content, pedagogy and technology. The non overlapping areas of

the circles in the Venn diagram convey the point that during a given class period, there may be occasions where only one or two types of knowledge are involved. For example, if students are working on their own to answer comprehension questions in a workbook, there is no effort to integrate technology. Hopefully, the composite of institutional resources, teacher preparation, classroom instruction and student's efforts, will result in the achievement of the intended learning outcomes as indicated by the arrow at the bottom of Figure 8.

Consider the following general description of the behaviors of the teachers observed during this study in relation to the modified TPCK model presented in Figure 8. During teachers' course planning, they first consider the content materials they teach. They study the content to make sure they understand the content in their own right. Second, they think about what pedagogical methods and procedures will be most suitable to teach the content. Teachers sometimes, but not often, consciously contemplate what technological tools they want to use before thinking about the pedagogical methods they want to adopt in the classroom. The original TPCK framework does not seem to provide a representation for this course preparation and planning phase.

Third, teachers start preparing instructional aids. In the technology-enhanced classroom, teachers predominantly prepare digital materials such as PowerPoint slides, Word documents and media files. Pedagogy and technology can permeate the process at this point, arising and adjusting in a kind of intuitive, subconscious, simultaneous, synergistic way. Content tends not to be altered by pedagogy and technology, because there are pre-set achievement and proficiency tests imposed as practical constraints upon the parameters of the content knowledge the teacher is expected to deliver to the students.

Finally, what is presented to the students is a classroom experience that integrates content, pedagogy, and technology.

This study supports the idea that the TPCK framework advocated by Koehler and Mishra (2008) represents observable behaviors and outcomes in classroom instruction, but rejects the notion that technology, content and pedagogy knowledge is equally distributed during teachers' course preparation process and is evenly important in shaping teachers' classroom instruction. Teachers display the content on the technological tools or platforms as their instructional aids, and thereby pinpoint the content knowledge students are acquiring in order to continually fine-tune the delivery of effective instructional activity. The teachers view technology as an effective tool to display their instructional content and pedagogical sequence. Nevertheless, content knowledge is their preeminent focus with subordinate consideration accorded to technology and pedagogy.

Teachers constantly observe students' performance regarding comprehension and mastery of content knowledge. Teachers do not evaluate student performance based on how much technology the students use. Trained teachers do frequently and consciously think about pedagogy, because pedagogy entails how teachers can facilitate student learning of the content. Technology is treated as a tool for implementing or executing "pedagogy" in a visible and practical manner.

To summarize, a teacher's ultimate goal is to expedite student achievement as derived from intended learning outcomes dictated by an imposed sponsor schedule and timeframe. Teachers tend to be open to the use of any pedagogy and tools provided to them in a reasonable accessible way that will help with the achievement of instructional goals.

Practical

The findings of this study—identified in light of the three participant teachers' perspectives— also offer four practical implications for educational practitioners and teacher trainers.

Integrate Content and Pedagogy Knowledge in Technology Training

Technology trainers should understand the content and pedagogy of concern to the relevant teachers and consider how to enhance the effectiveness of instructional activities in light of the in-service teachers' dispositions and beliefs. This approach will reduce teacher skepticism and make it more likely that teachers will enthusiastically try the innovations advocated by the technology trainers. Wherever possible, technology training should be rendered in the everyday instructional settings and classrooms familiar to the teachers. This helps the trainers to relate to the teachers' context, and communicates a sense of practical accessibility and realism to teachers that can enhance the persuasive effect of the teacher training effort.

In addition, technology trainers should demonstrate a practical understanding of the existing technology, pedagogy, and content that teachers think has been used by the most adept instructors to elicit the best student performances up to the date of the training. For example, in DLI's semester 1, teachers typically find it effective to focus on forms of language by having students read out loud and practice a lot of grammatical structures and vocabulary. In semesters two and three, teachers typically find it useful to concentrate on training students' skills in a way that points out main ideas and supporting details within reading and listening passages. Technology trainers should be aware of

these dynamics and consider how to incorporate the most effective or frequently used pedagogies.

As another example, teachers are often concerned with class control and management of the learning pace in any situation where technology is advocated to facilitate an unsynchronized listening method (e.g. learners listen to audio files individually). Technology trainers can work to identify suitable solutions in order to help teachers manage different learning paces in unsynchronized listening environments. The trainers could also provide suggestions and strategies for successfully delivering instruction in unsynchronized listening environments involving the use of electronic tools such as dictionaries. The teachers in this study utilized synchronized listening activities to train students' prediction abilities and help students deduce unknown meanings from the known contexts.

Technology trainers could compare advantages and disadvantages of synchronized and unsynchronized listening environments, and then provide recommendations on how, why, and when to apply the two methods. Technology trainers should also avoid making recommendations that would undermine teachers' efforts. The best method is to share demonstration videos of the two methods to elicit brainstorming from the in-service teachers. In another words, the technology trainer should no longer be just a mere trainer, but should also serve as a consultant to help the teachers identify how to best integrate content, pedagogy and technology in their unique setting.

Fix Learning Routines and Allow Flexibility

In the context of a signature pedagogy, it is important to maintain stable, consistent routines in and out of class, yet simultaneously afford adequate flexibility for

teachers to make adjustments needed to elicit optimal performance from each class and student. Teachers should constantly observe the students' performance and interactively communicate with students about the most suitable learning routines. This is especially true in intensive language programs, because teachers and students have more interaction than in other settings. Students recognize when teachers have made adaptation efforts for them, and this encourages students to stay focused on their learning. For example, students are usually tired after lunch hour, and teachers could schedule the after-lunch hour so that the interactive activities and productive skill training exercises (such as speaking) are incorporated at that time. Or, as another example, if students are exposed to higher-level content materials, teachers may find it useful to arrange a subsequent class period for slower-paced instruction designed to facilitate absorption of what they learned during the previous session.

Provide One-on-One or Individualized Learning in Technology-Enhanced Curriculum

Teachers may find it useful to provide one-on-one speaking blended with individualized learning for at least one class session per day in an intensive language program, by employing the assistance of one-to-one computer (each learner has a computer). Students could take turns or sign up for the opportunity. While the teacher has one-on-one speaking practices with a student, other students can be making use of online or electronic dictionaries to accomplish assignments, perhaps including reading and listening to authentic materials selected by the student on the basis of personal interests. One-to-one computing can allow users to work at a customized pace and access a majority of the learning materials. Before the end of class, teachers could then answer the rest of students' questions related to the content they have read, and/or have students

report what they have learned in class. For variety, the same arrangement could be implemented with student pairs or student teams in a collaborative or problem-solving mode.

Have Alternative Plans When Technology Does not Work

The technology-enhanced environment requires teachers to display digitalized materials on technological interfaces. Teachers should always be aware that technology is susceptible to occasional problems and have a backup plan in place. Teachers should also know how to detect problems quickly, and then efficiently report the problem to a technician for the soonest possible fix. Teachers should arrive at the classroom early and check all the technological tools she is planning to use, thereby preventing any serious waste of precious class time.

In addition, the one-to-one computing environment poses the possibility of additional technological problems for teachers. For example, a student may experience problems with an assigned iPod or computer, even as the devices for the other students work normally. The prepared instructional activities might need to be immediately changed or adapted on the spot. It may be advisable for teachers to have access to a couple of extra spare devices stored securely in or near a classroom, so that a malfunctioning device can be fixed or replaced at a more convenient time without hampering class progress. Crisis management can become a greater and more likely challenge for teachers in a one-to-one computing environment. Teachers should always be capable of pedagogical and logistical adaptation in order to manage classroom emergencies.

Research Design Limitations

The limitations of this study included the duration of the study, sample size, research context, possible internal bias, and the Hawthorn effect.

Duration of the Study

The data collection of the study took place over a four-month period. Even though four months was sufficient to collect a thick description of data, a longer period of time might be ideal when looking into more specifically-related fields in order to draw generalizations. Prolonging the study engagement might also have yielded different results because of the potential for evolving patterns of technology use in the studied classrooms.

Sample Size

This qualitative study involved only three expert teachers, one academic specialist, and forty students. The sample size is probably not large enough to ensure an accurate representation of the national Chinese language instruction academic community. Arguably, no sample size would be sufficiently large to do the latter. In any event, it is important to remember that the purpose of this study was to focus on a limited instructional arena within DLI.

The three teachers utilized as subjects were recommended and identified as excellent; therefore, a sample bias could also exist in comparison to the demographic distribution associated with all language classes at DLI. In addition, there were more observations of listening and reading classes, because participant teachers indicated to the researcher that they used more technology in reading and listening skill training. For speaking practices, teachers utilized small groups or one-on-one speaking practices with

students. The teachers focused on training students' proficiency, content expansion, and correcting students' speaking errors. Speaking classes were observed, but not as often as reading and listening classes.

At this juncture, without additional replication studies outside of the DLI context, it is not possible to have a calibrated sense about the degree to which the results of the current research can be generalized to other settings. The same can be said of comparisons or applications involving native-speaker teachers versus non-native speaker teachers.

Research Context

The research context was set with a unique, test-bound, intensive, regimented, military learning environment, which is quite distinct from "regular" institutions of higher learning. This fact may impose limits upon the degree to which the results of this study can be validly applied or generalized to the larger Chinese-language academic population. For example, in the military context writing is not an emphasized skill, as compared to the skills of listening, reading, and speaking. Students were trained to be qualified linguists. Students underwent six-seven straight hours of language training every day. The demographic and motivational profile for military students is probably quite different from learners in other educational contexts. Moreover, DLIFLC students spend their after-school hours focused almost entirely on language training or the performance of miscellaneous military duties, whereas students in other educational contexts typically need to take on a variety of different subjects and courses during the same semester.

The culture and goals associated with the DLI research context are also distinctive from other educational contexts. DLI's main goal is to use every possible means to train students for successful completion of the DLPT 5 test. Team leader teachers like those participating in this study not only need to teach at least fifteen hours each week, they are also responsible for completing a variety of administrative tasks, which might influence the way they teach and think in comparison to teachers who are not team leaders.

Hawthorn Effect

The students, teachers, and DLI administrators were aware of the study and their respective participatory roles in it. Teachers were notified prior to the occasions when the researcher would visit class sessions for observation. It is possible that the teachers or students performed differently when not observed. However, the teachers knew me well from other situations and had already interacted with me as a Technology Specialist, and the novelty of having an observer around seemed to wear off very quickly for both the teachers and students, so I don't believe there was a large discrepancy between observed and unobserved behavior. Another possible Hawthorn effect entails the students' performance or responses to interview questions. Even though they knew in advance that their identities would not be revealed, it is still possible they would answer differently if the interviewer was from outside DLI or that they hold opinions that they are not willing to share with any interviewer.

Internal Bias

As a principal investigator who works in the same context and educational institution as the participants, I assumed that DLI teachers who have high student evaluation scores are good teachers. I also presumed that teachers who receive excellent

teaching awards and who had several years of outstanding student performance could be considered as expert teachers. The participant teachers might not be expert teachers who use technology effectively, since it is possible they possess traditional perspectives that generate good results but are incompatible with sophisticated technology use. The definition of expert teachers was not comprehensively and exclusively defined in the study, due to the qualitative, exploratory, applied focus of the research effort.

In addition, the researcher only recorded what teachers did in the classroom and left out student's performances. The tactics and instructional aids employed by the teachers in the classroom might not have been effective or interesting to each and every student on each and every occasion. The researcher assumed as part of the study that whatever the three teachers did in the classrooms represented expert teaching, when it is possible that only some selective tactics were primarily responsible for the successful track record and obscured the effects of counterproductive practices also utilized by the teachers.

Execution of Instrument

Although the teachers agreed to participate in the study and kept weekly reflective journals, they did not turn in journals as originally scheduled, due to their busy instructional demands. Sometimes the teachers submitted their journals two weeks after their instruction or simply answered the questions. Logistics prevented perfectly ideal spacing of data collection, which may have introduced unanticipated effects of some kind. Even though the teachers mentioned they had experience with writing reflective journals, they might not have thoroughly reflected all of the important thoughts because of their busy schedule or undisclosed personal reservations.

Suggestions for Future Research

Even though the study yielded constructive implications, the limitations of the study suggest that other lines of inquiry could be profitably incorporated into future research. Suggestions for future theoretical and empirical research are set forth below. Theoretical research suggestions focus on examining and extending the TPCK conceptual framework. Empirical research suggestions emphasize effective teaching for technology-enhanced learning environments.

Theoretical

For theoretical research, scholars may want to conduct similar research in a different context and investigate whether the findings tend to be different in a non-DLIFLC's context or for a more extended period of time.

There are numerous opportunities for further examining whether the TPCK conceptual framework is a suitable metaphor for describing what expert teachers do for technology-integration, and whether curriculum or technology design professionals are inclined to adapt their current TPCK perspectives when exposed to feedback about teacher TPCK perspectives. Researchers may want to use different instruments in order to engage participants or conduct quantitative research involving a larger population. Scholars may want to take more variables into account with respect to incorporation of technology in the classroom and lesson preparation.

Empirical

Future researchers may want to examine students' observable outcomes in a non-DLI context which fully incorporates the TPCK framework. In addition, scholars should choose participant students in different demographic fields from this study.

As discussed earlier, students in technology-enhanced classrooms expressed a very strong desire for one-on-one teacher interaction and other forms of human interaction, and they also expressed a belief that this would enhance their performance. Were the students correct to assume that there was a correlation and/or causal effect of this kind? If so, what is the optimal amount of time for one-on-one human instruction, as viewed in terms of relative percentage, mix, or emphasis vis-à-vis other instruction techniques (especially techniques involving technology)? It would be ideal for a future researcher to examine the comparative effectiveness of one-on-one (tutoring) instruction without technology, online learning (interaction with technology), and blended learning with one-on-on instruction and face-to-face learning in a technology-enhanced environment.

In addition, the observed signature pedagogy transpired in an environment where teachers were focused on helping students pass standardized tests. Therefore, this might have had the effect of causing teachers not to blend in a lot of higher-order thinking, constructive activities, and student-centered activities into the signature pedagogy. A future researcher might want to look into the effects that different measurement and evaluation methods exert on the performance of Chinese language students.

Conclusion

When teachers design or prepare courses, the TPCK integrated framework does not apply to their conscious thought process. Teachers still perceive content, pedagogy and technology as individual elements. Content drives the choices regarding pedagogical methods and technological tools. The teacher's predominant focus is on how to help students achieve intended outcomes, not on how to constantly find the balance among

content, pedagogy and technology. Teachers are typically willing to try every means to facilitate better learner comprehension, if the means is made available, appears feasible given their personal capabilities of use, and appears capable of actually producing better student performance. A good teacher experiments with every idea that seems to have a plausible chance of helping their students appropriately raise performance. Good teachers are adaptable to their class environment and encourage students to utilize all tools available to help the students succeed. When they actually teach, expert teachers do not consciously latch onto the TPCK framework or onto the constituent concepts within the TCPK framework. The teachers adapt to the technology-enhanced environment with a singular focus on optimal delivery of content to learners.

The three teachers in this study were willing to adopt and use technology, but their philosophy and beliefs were that content was the most important element in language teaching. As Kim and Rissel (2008) stated, “Instructors' beliefs about interaction affected their use of computers significantly more than their technological expertise.” In-service teachers’ beliefs have been formed from teaching experience. Teacher trainers for technology, content, or pedagogy should be aware of teacher beliefs and better prepare themselves in order to encourage teachers to try new or modified approaches in the classroom.

Technology is a platform for delivering content, and implementing pedagogy in a more versatile, efficient, and convenient way. Content, pedagogy, and technological tools are (and should be) utilized to serve the purpose and interests of those who have chosen to affiliate with a particular language education program. However, in any technology-enhanced environment, human interaction and personal attention are still highly valued

and demanded. Students appreciate human interaction with teachers because they want access to an expert language performer with proficient content knowledge. Students' needs in each context might be different and should be considered carefully. Students greatly appreciate efforts made by a language teacher to specifically address student needs and learning requirements. These tactics can help other teachers inside and outside of DLI achieve better student performance and higher scores on exams.

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APPENDIX A: CHINESE DLPT 5 FAMILIARIZATION GUIDE

Chinese Mandarin Defense Language Proficiency Test 5 Familiarization Guide
The following is retrieved from the website of Defense Language Institute

Overview of the Chinese-Mandarin DLPT5
The Chinese-Mandarin DLPT 5 is designed to assess the general language proficiency in reading and listening of native speakers of English who have learned Chinese as a second language. The Chinese-Mandarin DLPT5 measures proficiency as defined by the Interagency Language Roundtable (ILR) Skill Level Descriptions, levels 0+ – 4. The Chinese-Mandarin DLPT 5 will be delivered on the computer. The Chinese-Mandarin DLPT5 includes both a Lower-Range test and an Upper-Range test. The Lower-Range test measures ILR proficiency levels 0+ - 3, while the Upper-Range measures ILR proficiency levels 3 - 4. Examinees will normally take the lower range DLPT5; those who receive a score of 3 on this test may be eligible to take the upper-range test, depending on the policy of their institution. The DLPT5 will be used to make operational readiness, incentive pay, and training decisions for civilian and military language analysts in the United States government.

Description of the Chinese-Mandarin DLPT5
Lower-Range Test
• *Test Design*
o The Lower-Range Reading Test contains approximately 60 questions with about 36 authentic passages. Each passage has up to 4 questions with four answer choices per question. The Reading Test includes passages in both the simplified and traditional writing systems starting at level 1+. The percentage of passages per level in the traditional writing system increases from 20% to 50% as the test progresses. Examinees who take the test will be required to read both writing systems.
o The Lower-Range Listening Test contains approximately 60 questions with about 40 authentic passages. Each passage has up to 2 questions and four answer choices per question. In the test, passages at the beginning will be played once. After a certain point in the test, examinees will hear the passages twice before having to answer the questions.
o For research purposes, some questions are not scored. These questions do not count toward the final score the examinee receives. Examinees will not be told which questions are not scored.
o Examinees have 3 hours to complete the Reading Test and 3 hours to complete the Listening test. Approximately halfway through each test, examinees will be given a 15-minute break. The break does not count toward the test time. For the Listening Test, although the playing of the passages is controlled by the computer, examinees may take as much or as little time as they wish to answer the questions. Managing the time effectively is the examinee's responsibility, just as it is on the reading test.
• *Test Content*
o The test is designed to measure proficiency in Mandarin Chinese regardless of how it has been acquired. For this reason, and because of the broad proficiency orientation of the test, its content is not tied to any particular language-training program.

o The passages included in the test are sampled from authentic materials and real-life sources such as signs, newspapers, radio and television broadcasts, the internet, etc.
o The passages cover a broad range of content areas, including social, cultural, political, economic, geographic, scientific, and military topics.
• *Test Format:* The test includes instructions on how to take the test, examples on how to answer the questions, and question sets containing the following parts:
o *Orientation*: This is a short statement in English that appears before each passage. Its purpose is to identify the context from which the passage is taken.
o *Passage*: This is the only element of the test that is in Chinese. The maximum length of a listening comprehension passage in the test is 5 approximately 2 minutes. The maximum length of a reading comprehension passage is approximately 600 characters.
o *Question statement*: Each individual question is based on the passage, is written in English, and is posed in the form of a complete question or an incomplete statement. The questions may ask about what is explicitly stated in the passage or, in some cases, what is implied in it. Occasionally, questions may ask about expressions that are used in the passage. The number of questions based on the passage is related to the length and complexity of the passage.
o *Answer choices*: Each question statement is followed by 4 answer choices, also written in English, only one of which is the best answer. Each answer choice is displayed on the screen with a button next to it that examinees will click to select that choice. Examinees can change their selection by clicking on a different button.

Scoring
Examinee scores are reported in terms of ILR levels, including "plus" ratings. Lower-Range tests are intended to cover ILR levels 0+ through 3. Possible scores are 0+, 1, 1+, 2, 2+, and 3. Upper-Range tests are intended to cover ILR levels 3 through 4. Possible scores are 3, 3+, and 4. Separate scores are reported for reading and listening. Scores on either type of test reflect current functional language proficiency in reading and listening as defined in the ILR Skill Level Descriptions. Scores do **not** reflect proficiency in speaking or writing, nor do they reflect examinees' job-related performance or ability to perform specific language-related tasks under special circumstance (e.g., reading or listening to a target language passage indefinitely many
times with the aid of supplemental reference materials and information sources). Scores on the test are based on the number of questions answered correctly. Since there is no penalty for incorrect answers, it is to the examinee's advantage to attempt to answer every question, even if it involves guessing.

APPENDIX B: ILR SKILL LEVEL DESCRIPTIONS

Sample: Interagency Language Roundtable Language Skill Level Descriptions-Listening
The following is retrieved from Interagency Language Roundtable (ILR) website.

Preface

The following proficiency level descriptions characterize comprehension of the spoken language. Each of the six "base levels" (coded 00, 10, 20, 30, 40, and 50) implies control of any previous "base levels" functions and accuracy. The "plus level" designation (coded 06, 16, 26, etc.) will be assigned when proficiency substantially exceeds one base skill level and does not fully meet the criteria for the next "base level." The "plus level" descriptions are therefore supplementary to the "base level" descriptions.

A skill level is assigned to a person through an authorized language examination. Examiners assign a level on a variety of performance criteria exemplified in the descriptive statements. Therefore, the examples given here illustrate, but do not exhaustively describe, either the skills a person may possess or situations in which he/she may function effectively.

Statements describing accuracy refer to typical stages in the development of competence in the most commonly taught languages in formal training programs. In other languages, emerging competence parallels these characterizations, but often with different details. Unless otherwise specified, the term "native listener" refers to native speakers and listeners of a standard dialect. "Well-educated," in the context of these proficiency descriptions, does not necessarily imply formal higher education. However, in cultures where formal higher education is common, the language-use abilities of persons who have had such education is considered the standard. That is, such a person meets contemporary expectations for the formal, careful style of the language, as well as a range of less formal varieties of the language.

Listening 0 (No Proficiency)

No practical understanding of the spoken language. Understanding is limited to occasional isolated words with essentially no ability to comprehend communication. (Has been coded L-0 in some nonautomated applications.

Listening 0+ (Memorized Proficiency)

Sufficient comprehension to understand a number of memorized utterances in areas of immediate needs. Slight increase in utterance length understood but requires frequent long pauses between understood phrases and repeated requests on the listener's part for repetition. Understands with reasonable accuracy only when this involves short memorized utterances or formulae. Utterances understood are relatively short in length. Misunderstandings arise due to ignoring or inaccurately hearing sounds or word endings (both inflectional and non-inflectional), distorting the original meaning. Can understand only with difficulty even such people as teachers who are used to speaking with non-native speakers. Can understand best those statements where context strongly supports the utterance's meaning. Gets some main ideas. (Has been coded L-0+ in some nonautomated applications.)

Listening 1 (Elementary Proficiency)
Sufficient comprehension to understand utterances about basic survival needs and minimum courtesy and travel requirements in areas of immediate need or on very familiar topics, can understand simple questions and answers, simple statements and very simple face-to-face conversations in a standard dialect. These must often be delivered more clearly than normal at a rate slower than normal with frequent repetitions or paraphrase (that is, by a native used to dealing with foreigners). Once learned, these sentences can be varied for similar level vocabulary and grammar and still be understood. In the majority of utterances, misunderstandings arise due to overlooked or misunderstood syntax and other grammatical clues. Comprehension vocabulary inadequate to understand anything but the most elementary needs. Strong interference from the candidate's native language occurs. Little precision in the information understood owing to the tentative state of passive grammar and lack of vocabulary. Comprehension areas include basic needs such as: meals, lodging, transportation, time and simple directions (including both route instructions and orders from customs officials, policemen, etc.). Understands main ideas. (Has been coded L-1 in some nonautomated applications.)

Listening 1+ (Elementary Proficiency, Plus)
Sufficient comprehension to understand short conversations about all survival needs and limited social demands. Developing flexibility evident in understanding a range of circumstances beyond immediate survival needs. Shows spontaneity in understanding by speed, although consistency of understanding is uneven. Limited vocabulary range necessitates repetition for understanding. Understands more common time forms and most question forms, some word order patterns, but miscommunication still occurs with more complex patterns. Cannot sustain understanding of coherent structures in longer utterances or in unfamiliar situations. Understanding of descriptions and the giving of precise information is limited. Aware of basic cohesive features (e.g., pronouns, verb inflections) but many are unreliably understood, especially if less immediate in reference. Understanding is largely limited to a series of short, discrete utterances. Still has to ask for utterances to be repeated. Some ability to understand facts. (Has been coded L-1+ in some nonautomated applications.)

Listening 2 (Limited Working Proficiency)
Sufficient comprehension to understand conversations on routine social demands and limited job requirements. Able to understand face-to-face speech in a standard dialect, delivered at a normal rate with some repetition and rewording, by a native speaker not used to dealing with foreigners, about everyday topics, common personal and family news, well-known current events and routine office matters through descriptions and narration about current, past and future events; can follow essential points of discussion or speech at an elementary level on topics in his/her special professional field. Only understands occasional words and phrases of statements made in unfavorable conditions, for example through loudspeakers outdoors. Understands factual content. Native language causes less interference in listening comprehension. Able to understand facts; i.e., the lines but not between or beyond the lines. (Has been coded L-2 in some nonautomated applications.)

Listening 2+ (Limited Working Proficiency, Plus)
Sufficient comprehension to understand most routine social demands and most conversations on work requirements as well as some discussions on concrete topics related to particular interests and special fields of competence. Often shows remarkable ability and ease of understanding, but under tension or pressure may break down. Candidate may display weakness or deficiency due to inadequate vocabulary base or less than secure knowledge of grammar and syntax. Normally understands general vocabulary with some hesitant understanding of everyday vocabulary still evident. Can sometimes detect emotional overtones. Some ability to understand implications. (Has been Coded L-2+ in some non-automated applications.)

Listening 3 (General Professional Proficiency)
Able to understand the essentials of all speech in a standard dialect including technical discussions within a special field. Has effective understanding of face-to-face speech, delivered with normal clarity and speed in a standard dialect on general topics and areas of special interest; understands hypothesizing and supported opinions. Has broad enough vocabulary that rarely has to ask for paraphrasing or explanation. Can follow accurately the essentials of conversations between educated native speakers, reasonably clear telephone calls, radio broadcasts, news stories similar to wire service reports, oral reports, some oral technical reports and public addresses on non-technical subjects; can understand without difficulty all forms of standard speech concerning a special professional field. Does not understand native speakers it they speak very quickly or use some slang or dialect. Can often detect emotional overtones. Can understand implications. (Has been coded L-3 in some nonautomated applications.)

Listening 3+ (General Professional Proficiency, Plus)
Comprehends most of the content and intent of a variety of forms and styles of speech pertinent to professional needs, as well as general topics and social conversation. Ability to comprehend many sociolinguistic and cultural references. However, may miss some subtleties and nuances. Increased ability to comprehend unusually complex structures in lengthy utterances and to comprehend many distinctions in language tailored for different audiences. Increased ability to understand native speakers talking quickly, using nonstandard dialect or slang; however, comprehension is not complete. Can discern some relationships among sophisticated listening materials in the context of broad experience. Can follow some unpredictable turns of thought readily, for example, in informal and formal speeches covering editorial, conjectural and literary material in subject matter areas directed to the general listener. (Has been coded L-3+ in some nonautomated applications.)

Listening 4 (Advanced Professional Proficiency)
Able to understand all forms and styles of speech pertinent to professional needs. Able to understand fully all speech with extensive and precise vocabulary, subtleties and nuances in all standard dialects on any subject relevant to professional needs within the range of his/her experience, including social conversations; all intelligible broadcasts and telephone calls; and many kinds of technical discussions and discourse. Understands

language specifically tailored (including persuasion, representation, counseling and negotiating) to different audiences. Able to understand the essentials of speech in some non-standard dialects. Has difficulty in understanding extreme dialect and slang, also in understanding speech in unfavorable conditions, for example through bad loudspeakers outdoors. Can discern relationships among sophisticated listening materials in the context of broad experience. Can follow unpredictable turns of thought readily, for example, in informal and formal speeches covering editorial, conjectural and literary material in any subject matter directed to the general listener. (Has been coded L-4 in some nonautomated applications.)

Listening 4+ (Advanced Professional Proficiency, Plus)
Increased ability to understand extremely difficult and abstract speech as well as ability to understand all forms and styles of speech pertinent to professional needs, including social conversations. Increased ability to comprehend native speakers using extreme nonstandard dialects and slang, as well as to understand speech in unfavorable conditions. Strong sensitivity to sociolinguistic and cultural references. Accuracy is close to that of the well-educated native listener but still not equivalent. (Has been coded L-4+ in some nonautomated applications.)

Listening 5 (Functionally Native Proficiency)
Comprehension equivalent to that of the well-educated native listener. Able to understand fully all forms and styles of speech intelligible to the well-educated native listener, including a number of regional and illiterate dialects, highly colloquial speech and conversations and discourse distorted by marked interference from other noise. Able to understand how natives think as they create discourse. Able to understand extremely difficult and abstract speech. (Has been coded L-5 in some nonautomated applications.)

APPENDIX C: INQUIRER'S BACKGROUND

Su-Ling Hsueh began her first position at DLIFLC as a Chinese instructor (team member) on May 23, 2005. Teachers are required to teach at least four regular teaching hours per day and to conduct one-on-one tutoring if requested by students. During her teaching, Su-Ling kept asking herself if she was utilizing effective methods to teach grammar, conversation, vocabulary, etc. She questioned whether she understood enough about content and pedagogy. Su-Ling felt she was using the same method repeatedly and wished to know what my colleagues were doing in their classrooms.

In October 2006 Su-Ling became a team leader. She was responsible for guiding team teachers to improve student proficiency, monitoring team progress, course scheduling, etc. She had 4 teachers and 24 students on her team. She kept questioning whether she was leading everyone in a prudent direction, and constantly wondered whether students would pass the final exam. Su-Ling was surprise when she was selected to be a Language Technology Specialist (LTS) in November 2006. She wondered about switching her job path to Language Technology before she had verified effective and signature ways to teach Chinese and lead a teaching team.

After starting the LTS position, Su-Ling used tactics implemented by previous LTSs. They had spent a lot of time fixing computer problems, answering faculty's phone calls and emails regarding technology problems, etc. Later, she steered the focus of her position more toward faculty technology training, attempting to directly influence how teachers used technology to enhance students' language skills. She started searching for ways she could a) provide more opportunities for the faculty to learn technology and b) motivate faculty to participate in more training sessions (at least one training session a week).

Su-Ling eventually designed a "technology completion certificate." After the faculty completed twelve important software training sessions, they could receive a completion certificate from the Dean. Each session was fifty minutes (3:40-4:30 pm) due to faculty schedule constraints. In such a short period of time, the trainers could only focus on imparting computer skills. Su-Ling noticed that teachers easily forgot what they were taught, apparently because of infrequent practice. The training content and quality became a concern to Su-Ling, and she started looking for better ways to train faculty

beginning in early 2007. After reading some articles, she realized the importance of integrating technology, content and pedagogy in connection with technology training.

DLIFLC has a division called Faculty Staff Development (FSD). Specialists in the department sponsor technology workshops. Those specialists have previous teaching experience but no longer teach in regular language classrooms. The specialists educate instructors to utilize more communicative approaches and technology in language classrooms. Even though those specialists try to integrate technology and pedagogy, Su-Ling wondered if they were optimally effective in their efforts to facilitate faculty progress with technology. Some participant teachers mentioned to Su-Ling that they thought the FSD workshops were inadequately tailored to individual teacher needs, and therefore lacked effectiveness. The teachers felt their input could help develop more effective methods for classroom instruction. Su-Ling immediately thought that something might be missing in the workshops conducted by the specialists.

Su-Ling observed that language practitioners expected specialists to provide solutions to technology -ntegration problems, but sometimes specialists' solutions were based on Aristotle-like speculations about what might work—unsupported byempirical or observational verification in real language classrooms. Perhaps, she thought, specialists should not be the sole source for optimal technology integration tactics or signature pedagogy. Language practitioners (teachers) who know content and pedagogy well and are willing to integrate technology in the classroom may possess more hands-on, real-world experience, and thus might be able to offer invaluable insights. Hence, if the specialists and teachers could work together more effectively to discover optimal approaches to technology integration, perhaps insights concerning signature teaching and effective technology integration could be more incisively explored.

APPENDIX D: TEACHER EFFECTIVENESS ANALYSIS OVERALL RATINGS

- Portion of the End-of-Course Student Questionnaire (ESQ)

At the end of their courses, students evaluate their teachers' effectiveness in teaching based on the following ESQ items. The teacher effectiveness analysis is standardized and adopted throughout DLI.

1. Came to class on time.
2. Was routinely well prepared for class.
3. Strove to work well with other team members.
4. Used English effectively when English was needed for teaching or counseling.
5. Used a variety of activities to make learning interesting.
6. Encouraged student participation in class.
7. Ensured that the foreign language was the dominant language in the classroom.
8. Explained language concepts clearly.
9. Could tell if I didn't understand something and adjusted accordingly.
10. Corrected my language errors effectively and in a positive way.
11. Provided supplemental materials that helped me learn.
12. Challenged me to do better.
13. Was available for counseling and assistance when I needed it.
14. Set high expectations for all students.
15. Gave me feedback that identified my strengths and weaknesses.
16. Discussed with me a plan to improve my weaknesses.
17. Treated students fairly regardless of their race, sex ethnic background, rank, or ability.
18. Maintained a relaxed, yet controlled, classroom atmosphere.
19. Avoided bringing gripes or other personal issued to the classroom.
20. Was a good teacher with whom I liked to study.

The Rating Scale:

0 = No Opinion (no opinion responses are not included in mean)
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

APPENDIX E: INTERVIEW QUESTIONS

Teachers' Interview Questions (30 minutes):

1. Could you tell me what responsibilities a team leader undertakes?
2. Do you consider yourself a successful team leader/instructor? If yes, what makes you successful; if not, what makes you unsuccessful and how can you improve?
3. Could you describe what is involved when you set up class objectives and oversee class progress?
4. Could you give me an example of your successful Chinese language instruction in technology-enhanced classrooms? What made it successful?
5. Does your successful Chinese language instruction involve integrating content, pedagogy and technology? If yes, could you draw the interrelation among the three? If no, what are the main factors?
6. Could you describe how you prepare to teach a class? What process is involved?
7. Have technology, pedagogy and content knowledge influenced your class preparation, lesson planning and course objectives? If yes, how are these three factors associated with each other?
8. Are there any successful and established routines in your class (e.g., homework assignment, classroom instruction and so forth)? What factors make those instructional routines successful or unsuccessful?
9. What role do technology, content and pedagogy play in your current class? How do you prepare yourself to excel with them?
10. Any additional remarks and thoughts?

Students' Interview Questions (15 minutes):

1. Could you describe the most successful class you have had in which the teacher used technology? How did the teacher make it successful? (For example, you might say that the teachers adopted the suitable technological hardware or software to explicitly deliver the course content in such a way as to strengthen your listening comprehension.)

2. Does your class have any fixed routines to save you some time in figuring out what to do in and out of class? If yes, are you in favor of them? Why? If not, do you expect to have some? What would be ideal?
3. What could your teachers do or change to tailor Chinese Mandarin instruction to your needs and enhance your language proficiency?
4. What is your ideal Chinese Mandarin class like? How is it related to Chinese course materials, instructional approaches and methods, and technological tools?
5. Any suggestions or recommendations regarding successful technology-enhanced instruction?

Academic Specialist's Interview Questions (20 minutes):

1. Could you describe the roles you play and the responsibilities you assume in the Chinese Mandarin Program?
2. Could you describe the Chinese Mandarin course materials used in the school? How are they classified and separated by semester?
3. How do specific pedagogy (approaches and methods) make Chinese instruction successful or unsuccessful based on your experience and observation?
4. What role do you think technology should play and how should it be integrated in Chinese Mandarin classrooms?
5. When you design and organize Chinese Mandarin course materials, what are the essential elements that you consider and what processes do you employ in designing and organizing those materials?
6. What should the Chinese language classroom instruction ideally be like to realize the objectives of the curriculum?
7. Any additional comments on improving Chinese language instruction?

APPENDIX F: AUDIT TRAIL

The audit trail commenced on March 10, 2008, immediately after IRB approval was received. The audit trail included all research activities performed during the study. Some cells include the researcher's thoughts.

Date	Summary of Events
03/10/08	Set up an appointment with the Semester 3 teacher (team leader).
03/12/08	Explained the research purpose, methods, and consent form to the Semester 3 participant teacher. She agreed to participate in the research. Her class (Semester 3 class) will start Semester 3 on March 17, 2008. However, we could not find an effective time to give a briefing to her students concerning the consent forms until March 24, 2008.
03/13/08	1. Had a short meeting with the chairperson of the Semester 1 and Semester 3 team leaders to verify the two teachers were successful teachers. He indicated that both teachers (team leaders) were excellent teachers who received Teacher Effectiveness Analysis scores above 3.8 on a scale of 4.0. This indicates the two teachers have been highly effective and successful in teaching Chinese. The chairperson approved my data collection in his department. 2. Explained the research purpose, methods and consent form to a Semester 1 teacher (team leader). She agreed to participate in the research. Her class (Semester 1) has already started for a month.
03/14/08	Provided a briefing to CM00408 class. There are a total of 10 students. All of the students agreed to participate in the study, and only one student declined to be videotaped.
03/15/08	Organized and inputted participants' consent information with ID (key) numbers in Excel spreadsheet; set up protected password.
03/19/08	Observed CM00408. The teacher designed a review activity with a PowerPoint Jeopardy game. I audio-recorded the class session with an iPod, video-recorded and also hand-wrote observation notes. After observation, I captured the video and saved the video file.
03/20/08	Sent a reminder about collecting reflective journals and class schedules from the two participant team leaders/teachers.
03/22/08	Read Spradley's *Participant Observation* and Appendix B of Williams' book (Williams, n.d.) before inputting all of the data in electronic format.
03/24/08	Provided a briefing to CM00407 students and collected teacher's reflective journals. However, only one team leader gave the researcher a reflective journal, and the other teacher was busy.
03/25/08	8:55am observed and video-taped T1 instruction; 12:00pm observed and video-taped T3 instruction. T3 students are not entirely comfortable with the videotaping. They were nervous and told me there were worried they would say something wrong after observation. I decided not to audio record the instruction because videotaping includes video and audio information.

03/26/08	Received the reflective journal of Semester 1 team leader.
03/27/08	1. Invited Semester 2 team leaders to participate in the research. She was interested in participating; however, we did not have time to go over details. 2. Had a short conversation with the chairperson of the Semester 2 team leader and asked if she recommended the Semester 2 team leader as a successful teacher. The chairperson immediately praised the excellent teaching job of the Semester 2 team leader and mentioned that the Semester 2 team leader has received average scores above 3.8 on the scale of 4.0 for Teacher Effectiveness Analysis overall ratings. The score is much higher than the minimum study selection criteria and indicates the team leader is highly effective and successful in teaching Chinese. The chairperson also approved my data collection in her department.
03/28/08	Obtained Semester 2 team leader's consent. Students' briefing will be given two weeks later, after students start Semester 2.
03/29/08	Organized and input the observation field notes into electronic format. Researcher decided to get to know each student, to specifically identify learners understand more about their thinking. Some students seemed nervous when the class was videotaped. At least one student in one class did not consent to be videotaped. Therefore, only the teachers were visually videotaped. Also the Defense Language Institute security manager indicated that the researcher should not visually videotape students because they wear uniforms showing their names, ranks, and services. This information is kept secure for national security reasons. Even though videotaping without visual depiction of the students shows only one visual dimension of instruction, it should give the researcher enough information about teacher's performance in class. During the observation, the researcher always quickly notes the students' behaviors, verbal reactions, and non-verbal expressions to compensate for the lack of a visual depiction of students' performances in the video tapes. Students cannot be asked to wear their civilian clothes, because that would violate/change the observed environments. Videotaping is very useful because it captures teachers' movements and conversation during classes. Audio-recording is discontinued, since videotaping proves sufficient to reflect the complete instructional sequence.
4/2/2008	Observation and videotaping of the CM00408 class instruction. It usually takes an hour to capture the video in Ulead 10.0 (the software to create videos) and another hour to render the video. During the capture and rendering, the researcher always works on something else. Students do not seem nervous during the videotaping, and they are familiar with the researcher. One student has an attention problem, and he seems not be able to catch up with the class. After the observation, I asked the teacher, and she said he was having some personal issues. The teacher had talked to the student regarding the issue this week.

4/3/2008	1. Observed CM00407 at 12:00pm today. It was a split session, and there were only 3 students. The three students look like good learners. Two of them will go to China for a month. They will leave in the middle of April. As usual, the class was videotaped, and the students were not visually recorded because of school security policy about students in uniform. To comply with the rule, the students' performances were recorded by handwritten notes. The teacher was teaching a long (level 3) paragraph, and the students were engaged. When asked how she could keep students engaged for such a long period of time, the teacher said that was due to the students' own persistence and motivation. 2. The two teachers have had problems turning in their reflective journals every Monday because they are very busy during week days. They also mentioned they did not know if they write down the correct information and indicated a need for researcher feedback. The teacher reflections were reviewed and found to provide rich information. However, one teacher did not follow the researcher-guided questions. Therefore, one of the reflective journal questions was modified and accompanied by an explanation in Chinese. In addition, the teachers were asked to audio-record the journal if it saves teacher preparation time.
4/7/2008	Interviewed the academic specialist for 30 minutes in his office. After listening to the recorded sound files, the researcher noticed the iPod recorded sound files with several moments of skipping. The sound file did not make it possible to tell what the academic specialist answered.
4/9/2008	7:55 am observation of T3 class, and the students seemed to be much comfortable when the researcher was around. 12:00 pm the researcher observed T1 class.
4/10/2008	Discussed with the two teachers when to turn in the reflective journals. One of the teachers could not make the deadline to turn in the journal. She did not have time to write her journal because she needs to teach four hours a day, correct students' homework, and grade quizzes and tests. She said she would record her reflective journal. The researcher talked to the two teachers, and they think turning the journals on Friday might be ideal.
4/11/2008	1. 1:20-3:00 pm interview of eight T3 students. 2. 1:00pm interviewed eight students from T3's class. 3. 4:45 pm interviewed T3 teacher (7 pages).
4/18/2008	2:00 pm observed T3 class.
4/23/2008	8:55 am observed T1 class.
4/24/2008	8:55 am observed T3 class. 10:30 am conducted the first focus group with T3 and T1 teachers
4/25/2008	2:00 pm observed T2 class.
4/28/2008	1:00 pm observed T3 class.
4/29/2008	7:55 am observed T1 class.
5/2/2008	8:55 am observed T2 class.

5/5/2008	1:00 pm observed T2 class. T2 taught the class a song related to the course content.
5/6/2008	9:00 am was supposed to observe T3 class; however, the teacher was ill. The observation was cancelled.
5/7/2008	9:00 am face-to-face interview with the peer debriefer, Timothy Berndt. 1:00 pm observed T1 class. She was teaching the pattern.
5/8/2008	2:00 pm interviewed T2 and recorded the session; however, the recording device has problems. Need to reschedule another interview session with T2.
5/9/2008	Teachers should submit their reflective journal; however, T2 and T3 teachers didn't send their reflective journals. Their schedules keep them busy. Researcher will discuss with them, especially T2, if they would be able to provide their reflective journals weekly next week.
5/13/2008	8:55 am observed T3 class. 2:00 am interviewed T2.
5/14/2008	7:55 am observed T1 class. 8:55 observed T2 class.
5/19/2008	12:00pm observed T2 class 1:00pm observed T3 class
5/20/2008	12:00pm observed T1 class
5/21/2008	8:55am observed T3 class 11:40pm interviewed one student from T3's class. 12:00pm interviewed eight students from T1's class.
5/28/2008	1:00pm observed T2 class 2:00pm observed T1 class
5/29/2008	12:00pm interviewed 12 students from T2's class.
5/30/2008	1:00pm observed T3 class.
6/3/2008	8:55am observe T1 class.
6/4/2008	7:55am observed T3 class.
6/5/2008	9:55am observed T2 class.
6/9/2008	2:00pm observed T2 class.
6/11/2008	1:00pm observed T1 class.
6/13/2008	1:00pm observed T3 class.
6/15/2008	Read more articles with qualitative and ethnographic subject matter. Wrote an integrative memo of T3's interview transcript. Coding data continues on an on-going basis. All of the documents were imported into Nvivo 7.0 and coded.
6/16/2008	8:55am observed T1 class.
6/19/2008	12:00pm observed T2 class.
6/24/2008	8:55am observed T2 class.
6/25/2008	8:55am observed T1 class.
6/30/2008	8:55am observed T2 class.
6/30/2008	2:00pm observed T1 class.
7/8/2008	8:55am observed T1 class.
7/14/2008	2:00pm observed T1 class.

7/15/2008	7:55am observed T2 class.
7/21/2008	12:00pm observed T2 class.
7/23/2008	8:55am observed T1 class.
7/28/2008	9:55am observed T2 class.
8/1/2008	2:00pm observed T2 class.
8/1-8/15/2008	After collecting enough data to display the pattern of classroom instruction, I finished class observation. All data was coded and categorized in tree nodes.
8/28/2008	4:00pm Performed a member check for the data analysis with 3 participant teachers. During the member check, teachers asked some questions about the findings. They questioned the low percentages in the table and gave suggestions. They agreed on the data interpretation.
8/29/2008	8:45am Debriefed the research findings and conclusions to Dr. Gordon L. Jackson, the senior researcher of DLI Research & Analysis Division. He provided suggestions concerning the structure of the findings. Changes have made to respond to his comments.
8/29/2008-9/10/2008	Continue to finalize writing up the findings and conclusions for submission to committee members.