Tri-dimensions and Pedagogical Effectiveness in Digital Chinese Teaching

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Abstract

Digital technology (DT) has brought a revolution to education in syllabi and curricula as well as in teaching equipment and methodology. However, the practicality and practicability of digital technology application vary by cases due to the characteristics of course content, the digital literacy of both teachers and students, and the mastery of digital pedagogy of educators. While the openness and convenience of digital teaching are visible and attractive to users, its individuality and limitations could be realized only after deep experience. In addition to the barriers related to technology and content, this research focuses on the pedagogical reasons behind the obstacles in digital Chinese teaching (DCT). In order to succeed, practitioners of digital education, including program designers and teachers, need knowledge in areas of content, technology and pedagogy. The integration of content, technology, and pedagogy is the key to the success of any course taught digitally.

Keywords: DT, DCT, Tri-dimensions, Pedagogical Effectiveness

Introduction

E-learning extends the time and space of education through creating a learning environment available to anybody, anywhere and anytime. The Internet provides educators platforms for sharing teaching resources efficiently in both quantity and quality. However, the practicality and practicability of digital technology application vary by cases due to the content of different programs, the digital literacy of participants, and the application of digital pedagogy. Although digital technology (DT) is beyond space and across time, it is limited by distance and differences in space and time of teaching. The convenience of access does not necessarily lead to good teaching results; neither does the huge volume of online resources serve the purposes of various programs. Students cannot be mass-produced; teaching materials have to be targeted, and teaching methods need to be individualized. There was much enthusiasm for digital technology application and online resource utilization in L2 Chinese teaching. However, many teachers still apply the traditional methods in teaching foreign languages although they replace the black or white board and audiotapes with PowerPoint slides and digital sound equipment. What are the causes for the transition from enthusiasm towards apathy of digital Chinese teaching (DCT)?

The author of this research was enthusiastic about applying DT and utilizing online resources in L2 Chinese teaching for quite a few years, including: 1) participating in an e-learning program for a few months;

2) using the online reading resource created by an American university that runs a successful Chinese program; 3) using online reading and listening materials from Podcasts and Popups; 4) investigating a few online Chinese programs equipped with multimedia; 5) buying quite a few digital materials for teaching Chinese phonetics, poems, and culture; and 6) participating in international conferences on DCT. However, none of those online resources exactly fits the purpose of the program she has been involved in. Most presentations at conferences consist of practices of new DT and case studies in a particular setting that do not discuss much about "the very concepts of 'digital' and 'pedagogy'" (Wiersma, 2013) and the theoretical grounding. Her former research (Zhu〈Lincoln〉, 2006, 2007, 2008, & 2012) ascribed the obstacles in DCT to either technological problems or content issues. This research, however, reveals the pedagogical perspective on problems and issues in DCT under the TPACK (Technological Pedagogical Content Knowledge, Mishra & Koehler, 2006) conceptual framework.

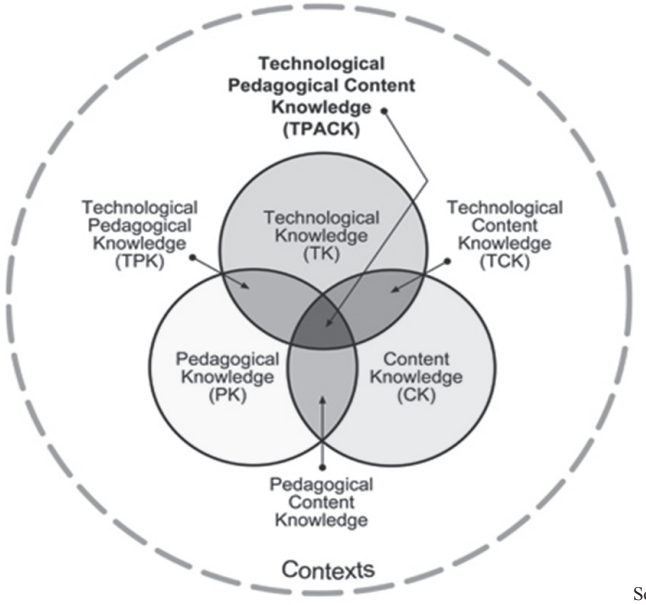
Literature Review

Most educators are applying DT in classrooms to varying degrees. Successful stories are accompanied by disappointment and anxieties. There is much reflection on DT in literature concerning areas of its value and results, its supports and barriers, and its success and failures accompanied by successful implementations or failed experiences without much theoretical analyses. Peachey (2012) stated that the "expensive equipment is of little value and barriers to successful integration remain," and the results of "real improvements in students and effective use of technology by teachers" are disappointing. CALL without an effective teacher may not work. But according to Mohanty, teachers "usually do not have adequate knowledge or training in effective integration of technology into language learning," and it is hard for teachers to keep up with the speed by which technology advances. Students are mostly technologically sophisticated, but "they get easily bored and lose interest in improving their English skills through a self-study mode of learning" (2009). Many teachers reverted to traditional paper-based resources and conventional group and individual tasks and activities (Peachey, 2012; Mohanty, 2009). In her digital adventures, the author has encountered the following difficulties and problems: 1) interactive barriers of technology in e-learning; 2) issues of interactivity and sustainability due to the differences in systems, teaching goals, and arrangements of teaching hours; 3) matching the level between students and online resources in use; 4) the low efficiency in online resource utilization due to the individual and group characteristics of users; 5) lack of products or resources that allow low level students to interact efficiently in Chinese; 6) online resources with cultural and social particularities; and 7) online Chinese teaching resources within an English language environment or teaching Chinese in English (Zhu〈Lincoln〉, 2006, 2007, 2008, and 2012). Ledgerwood (2013) provided five principles for teaching with technology: 1) think about where you or your students will use it; 2) never over use technology for teaching; 3) use technology as naturally as possible, not artificially; 4) ensure that the technologically- or media-based materials are pertinent to both you and the student; and 5) be creative, especially when repurposing materials. They can be considered pedagogical principles for digital education.

Pedagogy, as Wiersma (2013) stated, is the study of the elements of timeliness, mindfulness, and improvisation that instructors consciously use to facilitate meaningful exchanges in (and outside) the classroom. Perkins (2009) compared the role of technology in three stages of pedagogy: Old Pedagogy, New Pedagogy, and Digital Pedagogy. In Old Pedagogy, goals of using technology are not integrated or not present. New Pedagogy integrates classroom goals with the power of technology whereas the ubiquitous use of technology is integral to learning tasks in Digital Pedagogy. In both New Pedagogy and Digital Pedagogy, technology helps reach learning goals. The difference is that technology is used as a tool in New Pedagogy, but its ubiquitous use brings no mention of "tools" in Digital Pedagogy. In other words, technology

has been an integral part that plays only positive pedagogical role in need as chalks and pencils used in traditional teaching; and both teachers and students can use it with free application. Pelz (2004) discussed the principles of effective Online Pedagogy: 1) Let the students do the work; 2) Interactivity is the heart and soul of effective asynchronous learning; and 3) Strive for social presence, cognitive presence, and teaching presence through building up an online community, facilitating knowledgeable discussions and direct instruction. In Online Pedagogy, students are in charge of their own learning. The role of the professor is limited to providing the necessary structure and directions, supportive and corrective feedback, and evaluation of the final product. However, "technology can make it easier to teach in less, rather than more, engaging ways" (Fyfe, 2011). Educators need to consider how technologies "might be used to rethink the way teaching and learning take place, and how they might apply digital pedagogy" (Wiersma, 2013). The essential qualities of DCT Educators have to be linked to the principles of DCT Pedagogy. In other words, teachers of DCT have to be able to apply DCT pedagogy in their teaching.

Mishra and Koehler (2006) argue that the over-emphasis on the use of technology has led to an imbalance where teachers lack understanding of how to effectively use DT with learners. The authors believe that the combination of technological knowledge, pedagogical knowledge and content knowledge is the way that leads to efficient teaching while integrating technology. The following figure shows this theoretical framework of teacher's knowledge required for effective technology integration.



Source: http://www.tpack.org/

The three knowledge areas for digital educators are Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK). TK refers to the knowledge of technology, from pencil and paper to digital tools. CK is the knowledge of subject matter to be taught. PK refers to the methods and processes of teaching including classroom management, assessment, lesson plan development, and student learning. PCK (Pedagogical Content Knowledge) is the combination of content and pedagogy "to develop better teaching practices in the content areas." While TCK (Technological Content Knowledge) can change the way students learn specific content of the subject matter by using a specific technology, TPK (Technology Pedagogical Knowledge) changes the ways teachers teach by using various technologies. However, only

with TPACK (Technological Pedagogical Content Knowledge) teachers are able to integrate technology into their teaching in the subject area through an intuitive understanding of the complex interplay between the three basic components of knowledge. In other words, effective student learning only happens when educators teach content with appropriate pedagogical methods and technologies (Schmidt et al, 2009).

The Problems existed in DCT mentioned in literature fall into two categories: those that are related to content, such as curricular suitability, right level in quality and quantity, and relevancy of language and culture; and those that are related to technology, such as matching the system, interactivity, and sustainability. Mohanty claimed that the use of technology in learning is not necessarily sound pedagogy (2009). However, many problems themselves are of pedagogy that have hindered the integration of TPACK in, and the success of digital education. Digital pedagogy plays an important role in facilitating the practicality and practicability of the technologies in use, and the generality and standardization of the content to be taught. A successful DT program has to be tri-dimensional and teach standardized targeting content with appropriate pedagogical methods and technologies that are practical and practicable to both educators and students.

Three-dimensions in DCT

There are three perspectives on, or three ways of analyzing the difficulties and problems in digital Chinese education or DCT: 1) one-dimensional analysis on the isolation of content, technology, and pedagogy; 2) two-dimensional analysis on the intersections between content and technology, technology and pedagogy, or pedagogy and content; and 3) three-dimensional analysis on the integration of content, technology, and pedagogy. They also indicate different views and methods of running the digital programs. The discussion in this article reveals the differences among these three perspectives and theorizes the best way to run a DCT program.

Isolation of Content, Technology and Pedagogy

Content knowledge (CK) refers to the knowledge teachers must have for the content and nature of the subject they are teaching (Schmidt et al, 2009). CK in DCT has the generality of CK in any other Chinese language courses, but also includes the characteristics of phonetics, characters, and discourses of Chinese in a digital environment. The content is not presented silently in words, on paper or in books, but in the forms of multimedia on computers. The way that students deal with the learning content in DCT is through keyboard and other equipment used to reflect and communicate digitally.

Technology knowledge (TK) simply means understanding how to use technologies in various projects. Technology in DCT deals with the Chinese language in images, formats and displays including choosing appropriate characters through Pinyin and tone marks. The users will apply this technology in order to teach or learn Chinese language skills and use the software dealing with Chinese language. The IT staff can design digital language programs based on their basic TK. However, only those who have the basic knowledge of content and pedagogy of DCT, or those who understand the problems the users encountered or will encounter in DCT, have the practical TK in DCT.

Pedagogy knowledge (PK) normally refers to the methods and processes of teaching from lesson plan to learning assessment in any subject. PK in DCT focuses on student learning of the Chinese language. However, it is different from general Chinese pedagogy. PK in DCT contains a digital element. All the classroom activities are conducted in a digital environment that reflects the teaching methods and management applied. Assessment is also related to digital materials and done through utilizing the digital technology.

If the CK, TK, or PK in DCT acts in an individual dimension, and does not cohesively imply each other, they will face operational and interactive obstacles. Many problems in DCT are not isolated ones in the

area of CK, TK, or PK respectively, but are overlapping ones due to poor coordination between them.

Intersections between Content, Technology and Pedagogy

When CK, PK, and TK are connected with one another, they form three pairs of PCK, TCK, and TPK (Mishra, & Koehler, 2006). CK concerns the characteristics of the teaching subject whereas TK determines the equipment and environment of the teaching process. When the content connects the DT in its presence and delivery, CK and TK are combined as TCK. Teachers with TCK not only understand the content and are able to use the necessary technologies, but also understand "how using a specific technology can change the way learners understand and practice concepts in a specific content area" (Schmidt, 2009). TCK better serves the assurance of teaching quality than either CK or TK.

TK involves both system designers and users, or all three parties of IT staff, teachers, and students. Difficulties occur at the intersection of TK and PK when the two sides of IT staff and users lack common terms for explaining problems, and very few IT support staff have any pedagogical training (Peachey, 2012). Thus the connection between technology and pedagogy is the key to the practicality and the practicability of a digital system for both designers and users. When pedagogy connects the two sides or the three parties of TK, it becomes TPK. With TPK, IT staff design pedagogically appropriate DT, and teachers understand "how various technologies can be used in teaching" and "that using technology may change the way an individual teaches" (Schmidt, 2009).

PK cannot be discussed without content since it refers to general rules of instruction, such as teaching based on student level or assessing student learning in multiple ways. So in practice, PK is PCK, meaning teaching a subject in a pedagogically effective way that includes the variation according to the subject matter. PCK helps run the non-digital teaching programs successfully as long as the content is appropriate. However, PCK may run into technical problems in DCT in dealing with marks and characters of Chinese if the users, in using multimedia devices, apply the same input and output as those in other languages or subjects.

DCT implies not only the appropriateness of digital materials and resources in Chinese as the course content, but also the assurance of students' learning the content through a digitally effective way. This phenomenon does not happen when CK, TK, and PK are isolated, neither when only two of them are connected. It happens at the intersection where three of them are integrated.

Integration of Content, Technology, and Pedagogy

Teachers cannot run a DCT program with either CK or PK or TK in isolation, neither can they run a successful DCT project with any combination between two of the three such as PCK, TCK, or PCK. Only the integration of CK, PK, and TK or technological pedagogical content knowledge (TPACK) (Mishra, & Koehler, 2006) can provide teachers "an intuitive understanding of the complex interplay between the three basic components of knowledge by teaching content using appropriate pedagogical methods and technologies" (Schmidt, 2009).

DCT is tri-dimensional in its name itself: D refers to technology, C as content, and T as pedagogy. In DCT, all Chinese teaching related activities occur in a digital environment. If the technical designer doesn't have knowledge of the Chinese language and Chinese pedagogy, the system they have designed will encounter problems of applicability and practicality. If teachers or students do not understand how to use various technologies, it will affect the practicability of technology, and thus the mastery of the content.

The integration of technology in teaching does not come out as a result of adding up content and technology. First, both teachers and students have to be digitally literate, especially the teachers. In traditional ways of teaching, teachers are skillful in using teaching equipment and are familiar with the teaching environment. However, the digital teaching environment is often not designed and set up by the course teach-

ers themselves; a lot of the teaching equipment is new to them. So digital literacy should be the focus of teacher development to help teachers use technology in an effective way. Secondly, teachers need to learn the new subjects such as Digital Pedagogy and Psychology of Digital Education. Most teachers have been trained with the traditional pedagogy and educational psychology in mind. However, digital education brings its own pedagogical issues and problems in educational psychology. Many teachers have joined the digital revolution in teaching without any training in the subjects of digital pedagogy and psychology of digital education, as well as in digital skills. Yet only with TPACK can teachers teach in a pedagogically effective way and deal with psychological problems that appear in digital environments.

In conclusion, DCT should be established under the guidance of digital pedagogy, designed for targeting learners with clear, scientific, and step-by-step learning goals, and for users with a mastery and free application of technology. In other words, DCT should be conducted in a triad model that "emphasizes the complex interplay of these three bodies of knowledge. . .for developing good teaching" (Mishra, & Koehler, 2006). From "Isolation" to "Intersection" and then to "Integration" of content, pedagogy and technology is the evolution of this model in DTC. The pedagogical effectiveness as its core happens when DTC reaches its tri-dimensional integration.

Pedagogical Effectiveness in DCT

Conventional pedagogy discusses issues that cover the whole process of teaching for learning assurance. Pedagogy of Chinese discusses the ways of teaching Chinese in traditional teaching equipment and environment. Their goals are the same: to improve the teaching-learning interaction. The methodologies and approaches in digital pedagogy involve keyboard and multimedia equipment as well as the literacy of both teachers and students in digital technology. Digital pedagogy "compels practitioners to search out new ways to engage students in the creative analysis of subject matter" (Wiersma, 2013). But pedagogical effectiveness in DCT only happens in a tri-dimensional interplay among pedagogy, content, and technology that depends on: 1) teaching content that is standard and appropriate in both quality and quantity; 2) technologies in use that are practical for the program and practicable to both teachers and students; and 3) teaching methods that ubiquitously utilize the digital technology in the whole process and lead to students' mastery of the content.

Pedagogical Effectiveness and Content

There are online DCT projects and resources that are not applicable to other systems in terms of the level, format, the amount of teaching content and the differences between traditional and simplified characters in writing (Zhu, 2007 & 2008), although the designers intend to share their digital content with more people when they design. Whether the content of DCT can receive pedagogical effectiveness depends on its three "C"s: Curriculum, Commons, and Continuity.

Curriculum: In traditional teaching programs, standardization is ranged within a school, a district, or a country. In addition to the course within a curriculum, schools or districts often arrange collective preparation or coordination and open classes to standardize lesson plans and maintain the teaching quality of that subject. The volume of teaching content goes with the length of quarters or semesters and the academic year. Educators have to include the most important and relevant content towards the curricular goals depending on the characteristics of curricula such as available teaching hours, courses for electives, minors or majors, and age categories of learners. The curricular match is a premise for pedagogical effectiveness.

Commons: Practicality of teaching content depends on the commons (common ground) or generality of the learning material in quality and quantity. It excludes any irrelevant or extraneous materials that are not cohesive or distracting to the core content and curriculum. It is better to design or to use context-neutral or

pan-cultural content as a generic solution to enhance the pedagogical effectiveness, to increase the number of the users, and to enhance the suitability of digital content to students of different backgrounds. In using the online reading materials of an American university for Japanese students, Zhu (2006) had to spend time on explaining American society and culture that is not cohesive to the content of the course taught in Japan. The commons in quantity, or an appropriate amount of content, can avoid the two extremes of either students' attention distracting or cognitive overloading.

Continuity: Based on the common ground, the teaching content is presented contiguously within a curricular timeframe. "Continuity" implies the consideration of student knowledge background, learning history, and future plans. Students' native language affects the time for distributing the content in DCT. Students whose native languages use the Roman letters need more time on Chinese character writing while Japanese students need to pay attention to the differences between Chinese characters and Japanese Kanjis, and their pronunciation. DCT resources within an English environment are well-developed and in quantity, but not practical for Japanese students. It is difficult for users to make lesson plans out of these resources when concerning the knowledge background and the further learning of Japanese students including their character writing and understanding. In conclusion, three "C"s ensure practicality and pedagogical effectiveness of content.

Pedagogical Effectiveness and Technology

Online and digital teaching resources can cross the limitations of time and space, but their practicality is not guaranteed in different curricula, neither is the practicability of technology for teachers and students who are adopting the system or using the resources. As a tool, technology in DCT has to be practical, practicable, and ubiquitous.

Practicality: Digital materials have to be designed for effective teaching, and software to be created as the technical solution to meet the pedagogical goals. The more users practice on the same content with the same technologies, the more practical the technologies are, and the more effective their teaching application is. It is important to choose a practical digital system that can be used for a long-term pedagogical purpose and improvement. The practicality of technology in this article refers to those related software, hardware, and teaching materials based on solid knowledge of the Chinese language and DCT that fit more programs of the same standard. It also implies the duration of its usefulness. Long-lasting technologies are practical in terms of duration of the product and value of the investment. With their broadness in space and long lasting in time, technologies ensure worth and possibility for users to pursue pedagogical effectiveness.

Practicability: The mass-production of technology can bring pedagogical effectiveness when the technical proficiency of both teachers and students matches the technical level of the system. Otherwise, the individuality of technology will decrease the pedagogical effectiveness due to the variation of individual attention in the process of DCT. It is difficult for amateurs to apply technology proficiently, not to mention to keep up with its frequent renewal. It is not unusual to have a digital system that fits users with either high or low proficiency of technology but not the majority of users in between. In various digital learning programs, teachers and students use the technology at different levels of proficiency. But only when both teachers and students can use the technology at the highest proficiency could the technology serve the goal of content instruction and bring pedagogical effectiveness to digital education. Technologies unreachable for users are not practicable, and pedagogical effectiveness depends on the digital literacy of students as well as teachers.

Ubiquity: The ubiquity of technology implies the invisibility and omnipresence of technologies in digital education. One of the characteristics of DT is the fast pace of its development and refresh rate. Users should consider this phenomenon in DT as a challenge, and try to learn as much as they can to maintain

their TK. However, as a tool, technology application in DCT depends on needs. DCT does not have to include all the newest, the most advanced and complicated, nor the most expensive technologies, but only practical, practicable, and necessary ones. Technology should be an invisible tool not to consume the learners' attention and effort at the expense of missing the important content of subject matter. It is neither a lead nor a decoration to distract learners' attention, but either an assistant or an auxiliary to help reach the pedagogical goals of digital education. However, technology must be ever-present during the whole process to play its role in enhancing the pedagogical effectiveness in DCT.

Pedagogical Effectiveness and Teaching Goals and Methods

In general speaking, pedagogical effectiveness of digital education depends on generality and standardization of teaching content, and practicality and practicability of technologies including applying the appropriate teaching equipment and using it properly. However, the same digital content and technology can have different pedagogical effectiveness for the same group of students due to differences in teaching goals of a program and teaching methods of a teacher.

Pedagogical effectiveness relies on smooth interaction between content, technology and its users in the teaching process. Any interruption or distraction during the process and any flaws in the system will have a negative impact on its pedagogical effectiveness. Some digital materials are excellent in its content, but not suitable for the following reasons 1) not matching other teaching materials; 2) not for group teaching; 3) difference in teaching pace; 4) not for certain teaching styles; and 5) not for students of different age groups. The reason could be that the designer either had a different pedagogical goal or didn't have any specific pedagogical goal when the material was created. Some DCT resources in language, literature, or culture are made to fit certain teaching methods, or for amateur learning or just for cultural appreciation. They cannot be used in DCT programs at other schools or universities. For example, the animations used for young beginners of Chinese are not suitable for adult beginners, and the content for adult beginners should be more extensive in its volume and sophistication than that for children. Some digital content is suitable for both children and adults, but the variation in application should be considered when the technology is integrated.

Conclusion

While there are many DCT resources of the same type that can be used if the pedagogical effectiveness is not taken into consideration, very few of them perfectly fit the pedagogical purpose of other users. The following two types of programs for DCT are in high demand: 1) elementary Chinese for adults that is suitable for any system with a high efficiency of interaction and 2) DCT programs that can avoid the low efficiency caused by the differences among individuals in the same group.

DCT needs a common theoretical vision to discuss issues and problems that are due to the limitations of system designers and users, and separation between content, technology and pedagogy. In order to serve the original purpose of e-learning and online resourcing and ensure the practicality and practicability of DCT, we need a tri-dimensional quality control on content, technology, and pedagogy. First, generality and standardization of content contribute to the spread and development of the digital program. Online resources should be organized more strictly according to the related curricula, such as L2 Chinese curriculum provided by Hanban in Beijing or by the Overseas Chinese Affairs Commission in Taiwan. They should have clear goals aiming at Chinese electives, minors, or majors for different age groups with various cultural backgrounds. Second, stability and economic utility in technology are the keys to the operation and maintenance of digital systems and Internet teaching projects. Program designers have to focus on the practicability and feasibility of the skills and technologies in use with the consideration on the digital

literacy of both educators and students. Third, effectiveness and efficiency of digital pedagogy ensure the content to be delivered properly and technology to be used appropriately. Educators have to utilize the online resources and organize digital lessons pedagogically. Programs designed by educational institutions with rich human and financial resources under the guidance of IT companies are more likely to last. They do not focus on fancy appearance but aim at establishing systematic and stable digital learning environments that suit more users of the same categories. The DCT programs taught by experts of the subject who are digital natives are more likely to succeed. They do not focus just on using the technology, but also on learning results through DT and learning success with the practice of digital pedagogy. The standardized and stable DCT programs with triple qualities in content, technology, and pedagogy can reach their educational goals.

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