Integrating Information and Communication Technologies in Literacy Education in China

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Abstract

This chapter begins with a brief review of the historical context of information and communication technologies (ICT) in China, followed by the discussion of current state of technology integration in literacy learning and instruction. After reviewing and analyzing the existing Chinese database, the authors reported and discussed the findings of various types of ICT in use in Chinese literacy education, ranging from word processing, multimedia programs, to communication and social media tools. In addition, the authors also examined the roles and functions played by different types of ICT in supporting students’ learning and teachers’ instruction in Chinese literacy, as well as issues and trends in ICT integration in literacy education in China. In conclusion, issues were discussed regarding the ICT development in China, and suggestions are made to enhance the effectiveness of ICT use in Chinese literacy education.
Introduction

The emergence of recent technologies especially the information and communication technologies (ICTs) has profoundly transformed many facets of our lives. The multiplicity and wide availability of the ICTs have also brought significant changes to schooling and learning in the U.S. and around the world (New London Group, 1996). In particular, the impact of ICTs on literacy teaching and learning is immense because of the close connection between literacy and technologies (Bruce, 2003; Valmont, 2003). Traditional definition of literacy as one’s ability to read and write is no longer adequate, and literacy is re-conceptualized as multiple literacies that include traditional print literacy, technology literacy, information literacy, critical literacy, visual literacy, media literacy, among others (Burniske, 2008; International Reading Association, 2001; New London Group, 1996; Valmont, 2003)

No longer do we have to rely on print media to obtain the information we need. Electronic and digital texts permeate our daily reading and have become a way of life for many adults and students. An overwhelming amount of information is readily available for us to use just fingertips away. The immense amount of information demands that one has the ability to search, locate, analyze, and judge the usefulness of the information. Publishing software programs make it possible that everyone becomes a published author. New technologies have also blurred the line between authors and readers in cyberspace. Various modes of communication, both asynchronous and synchronous, are possible through networked computers and devices such as iPhones and iPads. Space and time are no longer hurdles for communication as they were before. These are just some examples of the changes brought by new ICTs that are connected to literacy-related competence.
The ICTs have also made it possible to transform the traditional learning environments into new learning environments. Traditional learning environments tend to be teacher-centered, print-focused where students are at the receiving end of knowledge delivery and are frequently engaged in isolated work, and they provide limited number of sense stimulations. In such environments, learning tends to be passive, factual and knowledge-based, and often happens in isolated artificial contexts (International Society for Technology in Education, hereafter ISTE, 2002; Jonassen & Land, 2000). Supported by ICTs, new learning environments call for student-centered learning. They provide multi-sensory stimulation and allow students to pursue knowledge in multi-path, nonlinear progression. In new learning environments, emphases are placed on collaborative work, information exchange, and learning that is active, exploratory, and inquiry-based. Highly valued are students’ ability to engage in critical thinking, informed decision making, and proactive/planned action in authentic and real world contexts (ISTE, 2002).

Under such a backdrop, many literacy educators in the west have called for effective integration of technologies into school curricula (Bruce, 2003; Leu, Leu, & Coiro, 2004; Reinking, McKenna, Labbo, & Kieffer, 1998). Effective integration of technologies helps students become capable information technology users, information seekers, analyzers, and evaluators, problem solvers and decision makers, creative and effective users of productivity tools, communicators, collaborators, publishers, and producers; informed, responsible, and contributing citizens (ISTE, 2002). In particular, critical literacy, the ability to question the texts, has become an ever increasingly important form of literacy that students have to master (McKenna, Labbo, Kieffer, Reinking; 2006; Smith, 2002).

The movement to integrate technologies into education is not only a western educational phenomenon. In China, in recent years, the issue of technology integration to support student
learning has also attracted attention from the central government, and several mandates have been issued to address this issue. Although the degree of integration varies from school to school and teacher to teacher, technologies have been used in many classrooms across the nation. This article traces the brief history of technology use in literacy education in China, to be followed by a review of literature on the applications of technologies that support literacy education. In conclusion, issues and trends in technology integration in Chinese literacy education will be discussed.

A Brief Historical Review of ICT Integration in Literacy Education in China

Compared with decades of technology use to support teaching and learning in schools in the U.S. and western European countries, China had a slow start in its effort to integrate technologies into education due to its slow economic development and lack of resources in most of the 20th century. Technology integration in education is a rather recent phenomenon (Liu & Zhang, 2006). Before the 1990’s, technologies were rarely used, and they could only be observed in highly selective university settings. Common technologies for language and literacy teaching and learning, if schools could afford them, included TV programs, cassette tapes, radios, overhead projectors. Computers were luxurious items beyond the reach of most schools. In a very limited number of well-resourced city schools where computers were available, they were reserved for technology classes in labs where students were taught basic computer literacy skills as an isolated subject. The concept of integrating technologies into various subject areas was nonexistent.

Since the late 1990’s, China has witnessed a rapid economic growth and the growth of ICTs. The Chinese government recognized the importance of information technologies to the future development of the country and started to form an active agenda to promote ICTs in
education. Information technology education became one of the major national educational priorities. In 2000, the Ministry of Education (2000) issued a policy document entitled “Information Technology Curriculum Guide in Primary and Secondary Schools”. This groundbreaking document stipulates that primary and secondary schools should offer information technology courses to students. Major goals of the information technology curriculum include: a) to cultivate students’ interest in and awareness of information technologies; b) to acquire basic ICT knowledge and skills; c) to develop an understanding of the impact of ICTs on human lives and conditions; d) to develop competence in locating, communicating, processing, and utilizing information; e) to use technologies in responsible and ethical manners; f) to use technologies to support life-long learning and collaborative learning. The guide also calls for the integration of ICTs into the teaching of other school subjects. Most recently, the Chinese government published a strategic document entitled “The Outline for National Mid- and Long-term Education Reform and Development Plan” (MOE, 2010). This critical document sets the direction for education for the upcoming decade (2010-2020), and ICT in education is one of the key elements of the document.

The Chinese government put into motion an extensive curriculum reform in 2001. New curriculum standards were set for various subject areas, and content related to ICTs was added to the curriculum guides for each subject area. In particular, the new curriculum standards for the Chinese reading and language arts have first time included items specifically addressing ICTs in Chinese teaching and learning (Ministry of Education, 2001a; 2001b). The curriculum guide for 1st - 9th grade (compulsory education) specifically highlight the importance of equipping future citizens with abilities to use modern technologies to collect and process information (MOE, 2001a). Detailed objectives include using the computer programs for word recognition and
typing Chinese characters (3rd – 4th), collecting information and using libraries and the Internet and other information channels for inquiry-based learning (5th – 6th, 7th – 9th). High school language arts curriculum guide also include objectives that require students to develop competence in locating and processing information through various media channels, using computers for word processing, editing, interface design, developing personal websites, and making presentations. Both curriculum guides also make recommendations on teachers utilizing rich curriculum resources available on the Internet and incorporating ICTs in Chinese teaching.

Much progress has also been made at the school and classroom level where Chinese reading and language arts teachers actively integrate ICT to support teaching and learning. The following sections in the chapter offer a comprehensive review of the current state of ICT integration in literacy education, including the types of ICT, various ICT applications and resources, as well as ICT supported pedagogy in literacy education in China.

**The Current State of ICT Integration in Literacy Education in China**

Following a brief review of the historical perspective of ICT application in China, we now focus on the sociocultural perspective of ICT integration in the context of literacy education in China. We searched, reviewed, analyzed, categorized and synthesized various periodical articles (journals and magazines) and website resources on the uses of ICTs over the past ten years. Our goals were to (a) acquire better understanding of the strategies, resources, tools currently used for literacy education in China, (b) inform Chinese educators of available ICT tools and resources that can be used to improve Chinese learning and instruction, and (c) suggest to Chinese educators the most effective strategies for the use of ICTs in teaching literacy. At the same time, we are interested in identifying gaps in the existing literature aiming at improving research and practice in the area of ICT integration in literacy education in China.
We relied on two data sources for this research: (a) journal articles and (b) web resources. Our primary data source came from the database *China Academic Journals* (2000-2009). Our secondary data source came from some popular websites frequently used by educators in China. We chose these two data sources because we believed that they had comprehensively and sufficiently captured and represented current trends in research and development of ICTs in literacy education in China. Seven major journals on the national level were selected for review: *China Educational Technology* (2000-2010), *E-education Research* (2000-2010), *Modern Educational Technology* (2004-2010), *Distance Education in China* (2001-2008), *China Information Technology Education* (2003-2010), *Modern Education Science* (Middle School) (2008-2009), *Modern Education Science* (Primary School) (2007-2010), and *Primary and Middle School Educational Technology* (2007-2010). In addition, we have also reviewed some regional level magazines, such as *Jilin Jiaoyu* (吉林教育), *Xiaozhang Yuekang* (校长阅刊), and *Journal of Subject Education* (学科教育) from a myriad of journal or magazine articles, we selected, examined and analyzed the articles related to ICT use in literacy education in K-12 ranging from reading, writing, literature, character recognition, to literature. As a result, over six hundred articles were examined. In addition, we also explored some online resources dedicated to teaching with ICTs. As a result, a number of websites were identified and annotated in this article for teachers aiming at assisting them to integrate ICT in their classroom instruction, including courseware, lesson plans, discussion forums and teaching resources for K-12.

Consequently, we have identified a number of themes that reflect the current state, trend, and impact of ICT integration in Chinese literacy education, consisting of (a) types, functions
and uses of ICT tools and resources, (b) the role of ICT in literacy education in China, and (c) the current trends in ICT integration in literacy education in China.

**Types, Functions, Uses of ICTs**

According to the articles we have reviewed, a variety of ICTs have been widely used in various instructional contexts in teaching reading, writing, and literature. Generally, these tools can be categorized into (a) standalone multimedia programs or courseware, (b) character encoding and input systems, (c) communication and collaboration tools, (d) mobile technology, and (e) corpora, and (f) instruction delivery devices (e.g., LCD projectors and whiteboards).

Below we will focus on the discussion of the first five types of technologies.

**Multimedia programs/courseware.** Standalone courseware refers to multimedia programs integrated with texts, graphics, audio, and animations, created with the popular presentation tool -- Microsoft PowerPoint, or interactive web development software, such as Adobe Flash. The multimedia-based courseware is often used to stimulate students’ interest in learning language, enhance reading comprehension, and support interpretation of literature. Some of the exemplary uses of multimedia programs include displaying the procedures of writing Chinese characters, illustrating literature concepts, creating a simulated environment by representing real-world situations or problems, evoking students’ emotional responses by developing the environment or culture depicted by stories, prose, or poems. (Li, 2009; Xu, 2010; Zhong, 2008)

**Chinese character encoding and inputting systems.** The character encoding and input systems are essential communication tools in this digital age because they are required for information retrieval, word processing, and composing emails. Therefore, it follows that computer literacy skills of inputting relevant information in a specific written language form
become basic literacy skills (Liu & Zhang, 2006). While Chinese computer inputting skill is taught in schools as a basic communications skill, the character encoding and inputting systems have also been used as an instructional method to teach students to learn pinyin, phonetic input method, recognize Chinese characters, or assist them in writing stories when they have not acquired a large vocabulary. The research showed that with the combined method of teaching pinyin, input method, and character recognition using a computer input system, students significantly shorten the time to command pinyin while mastering more characters compared with the conventional teaching method without a computer input system (Gui, 2009; Liu & Zhang, 2006; Xing, 2008). In addition, Renzi Ma, a graphic-phonetic input system was also developed to enhance literacy learning through young children to learn character formation or structure (Gui, 2009; Liu & Zhang, 2006). For example, the structure of the character “樹/shu/” is composed of three roots: “木/mu/”, “又 / you/,” “寸 / cun/,” all of which are characters themselves (i.e., simple characters in a grammatical sense). Based on the pinyin of these three roots, “樹 /shu/” is encoded as “myc”, the initials of the syllables of the three roots; therefore, by typing the three parts, m, y and c, the character “樹 /shu/” will be input into the computer (p. 199, Liu and Zhang, 2006). This method helps students to decode and encode Chinese characters and understand their meanings at a deeper level, which in turn helps students to retain the information in their long-term memory. Additionally, the voice recognition system is also used to improve the writing skills of students with writing disabilities (Hu, 2007). For those students with writing difficulties, the voice recognition software allows them to tell stories verbally and concentrate on the content.

**Communication/collaboration tools.** Communication tools involve emails, instant messages (e.g., MSN), chat rooms, and software application that allows users to make
simultaneous voice calls over the internet (e.g., skype). E-mails allow students to exchange
information and additionally can be used to support writing skill development, whereas the
synchronous communication tools such as instant message/chat rooms, such as MSN and skype,
can be used to support collaborative reading and writing tasks.

In addition, the emerging online collaborative applications, such as bulletin board and
wiki, have provided educators with additional tools to guide students in collaborative learning
activities. For instance, several articles discussed wiki as an effective collaborative software
application to support collaborative writing (e.g., Jiang & Xue, 2006; Lu, 2009; Ye & Zhou,
2007). The teacher can use the collaborative technologies mentioned above to guide writing on
an interesting topic, provide prompt feedback, and students can make revisions based on the
teacher’s feedback and ask further questions or for clarification in a timely manner (Xia & Sun,
2010). Furthermore, there are some learning management systems specifically designed to
provide a platform for interactive and collaborative learning, such as Blackboard and Moodle, to
create comprehensive courses for reading, writing and literature courses. For example, Yu and
Xu (2009) described how to utilize the collaborative platform and interactive features afforded
by Moodle to create an open-ended learning environment to support collaborative reading and
writing activities. This platform not only allows students to publish their works but also engages
students in social interaction and peer review processes, including providing comments and
feedback to each other, sharing information and resources.

Some popular and emerging social network tools have quickly found their ways into
Chinese literacy education, for instance, QQ and Qzone developed by Tacent Inc. QQ combines
all the common communication tools into a single system. It consists of a communication space,
instant message function, BBS for information sharing and group discussion, chat rooms for one-
to-one or group chatting, emailing function, album for sharing pictures, and a dropbox for uploading, downloading, storing files and sharing files. With its popularity and user-friendly features, QQ has quickly gained the attention of many educators. Some educators attempt to take advantages of the various features of QQ to support Chinese literacy education, for instance, to carry out discussion on a given topic, brainstorm ideas for a composition, or conduct a collaborative writing task.

Qzone is another product by Tacent Inc. Qzone allows individual users to customize their QQ space according to their personal interest, and on top of it, it has the blogging function, which allows individuals to write journals, listen to music, and upload pictures and images to express themselves freely. Some educators use Qzone to encourage students to write journals, and if they are willing they can share their journals with others. Qzone gives students the freedom to write what they want to write without worries or concerns of being criticized by teachers or laughed at by peers. Students can create their “zone” according to their interest and needs. In this sense, Qzone offers a mean of self-expression and self-creation. It helps to promote individuals’ self-image and confidence, especially for those students who were introvert or felt troubled in their inner world (Li, 2010).

Mobile technology. China has witnessed the rapid development and spread use of mobile technology, such as mobile phones, digital PDAs, and Pocket PC. Mobile technology is characterized by being small, light, easy to carry, and convenient to communicate through voice or text messages. With a wireless internet connection, users can search for resources and share information conveniently. The technological affordances have caught the attention of Chinese educators. Ji and Bai (2009) explored how this new technology could be integrated in teaching language and literature. Given its affordances, mobile technology allows learners to receive
instructions anytime and anywhere. They illustrated how to use the mobile technology in teaching a Chinese class of junior middle school level in several ways: providing materials for previewing a lesson, delivering pictures or graphics to help students establish mental representations of meanings of a text and evoke their emotional responses, providing instant feedback to students’ reading and writing tasks, providing online resources to help students complete a writing task or exercises for students to practice after class. Mobile technology also enables students to study an object closely. For example, when students study a kind of birds and its characteristics, they could search for information about that kind of birds, and listen to the twittering of the birds through an mp3 file, and watch a video clip of the bird living behaviors and habitats delivered by the mobile devices. Mobile technology can be used to help students develop observation abilities and descriptive writing skills.

**Learner corpora.** Corpora is a term originated from applied linguistics. It can be interpreted as a large-scale database that automatically collect and process a corpus of natural language and analyze rules and patterns syntaxes, semantics, and so on (Wei, Zhao, Yang, & Chen, 2008). The purpose of corpora is for a computer system to automatically analyze, index, and store natural language and for users to easily retrieve information from a large database by various searching techniques. Chinese educators have been using corpora to serve the instructional purpose. Different kinds of learner corpora have been built, such as reading corpus for elementary school students, ancient Chinese corpus, famous writers’ corpus, (e.g., Wei, 2008; Wei, Zhao, Yang, & Chen, 2008). These corpora have become rich resources for both students and teachers. Students can refer to exemplary writings and engage in a guided language task, such as examining a specific language pattern in a language context, and teachers can draw
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resources from the corpora to help them prepare their Chinese lesson plans (Wei, 2008; Wei, Zhao, Yang, & Chen, 2008)

**Online Resources for Teachers**

In addition to ICTs, there are numerous teaching websites and networks that provide a wealth of teaching resources, forums and tools for Chinese language teachers to share with each other lesson plans, instructional strategies, and teaching experiences aiming at improving teaching quality. We have identified several major web resources specifically related to Chinese literacy and literature, including: The Primary School Chinese Teaching Resources (小学语文教学资源网 [http://xiaoxue.ruiwen.com/]), The Middle School Chinese Teaching Resources (中学语文教学资源网 [http://www.ruiwen.com]), the Chinese Language and Literature Network (中学语文网中网 [http://www.ykyz.net/yuwen]), and Chinese Language Network (中华语文网 [http://www.zhyww.cn]).

The Primary School Chinese Language Teaching Resources (http://xiaoxue.ruiwen.com/) contains 12869 instructional courseware or multimedia programs, 636 video clips, articles on teaching Chinese, 7210 lesson plans, and 1618 tests. In addition, this site also offers a support center, various forums, such as the Chinese language and literature forum, the teachers’ forum, as well as many other links to additional resources. Similarly, The Middle School Chinese Language Teaching Resources (http://www.ruiwen.com) contains thousands of resources for middle school Chinese teachers, including 43901 courseware or multimedia programs, 15606 lesson plans, 14077 video clips, 3217 essay resources, and 40098 test items. Besides, this website also provides a platform to encourage communications and discussions among Chinese teachers, including Lesson Planning Forum, Chinese Forum, and Visitor’s Book.
The Chinese Language and Literature Network (中学语文网中网 http://www.ykyz.net/yuwen/) includes all kinds of information, such as lesson plans, teaching resources, courseware, test banks, literature works, still images, and videos. This site also contains a collection of articles on literature commentaries and appreciation. Users can leave comments, feedback and make suggestions on this site. There are also teaching channels catering to different subjects, topics and interests, ranging from basic knowledge, classroom activities, to materials helping students to prepare for high school and college entrance examination. On top of it, this site also offers sample textbooks published by some major publishers.

The Chinese Language Network (中华语文网 http://www.zhyww.cn) is a branch network of Language Newspaper. It contains teachers’ channels, student channels, resources, and blogs. The resources are categorized according to primary, middle and high school levels. The information aims at helping students to prepare for high school and college entrance examinations. Additionally, there are all kinds of banks, such as a composition (essay) bank, a writing topic bank, and a language encyclopedia bank, Questions & Answers, and a lesson plan center.

Docin Network (豆丁网 http://www.docin.com/) claims the largest collection of Chinese articles in various topics, including PowerPoint files, Courseware, and many other formats of files (e.g., doc, xls, ppt, txt, pdf, jpg, rtf, mpp, vsd, pps, pot, wps). Docin Network offers resources ranging from fictions, art, fashion, psychology, physical education, and education to science and technology, engineering, and computer science. A noticeable feature about this site is that teachers can freely share lesson plans by uploading and downloading materials. Since it has a wide coverage of topics, it is fairly easy to find materials related to education. For example, when we typed in a key word “Moodle”, we found numerous articles about how to set up
Moodle and use Moodle to create interactive and collaborative learning environments. We had the options of selecting doc, pdf, or PPT files. When typing “multimedia” (in Chinese), we found articles like “Smart Uses of Multimedia Programs in Elementary School Chinese Classes” (“多媒体技术在小学语文课堂的妙用”), and “The Principles and Methods of Using Information Communication Technology in Elementary School Chinese Education” (“小学语文教学使用信息技术的原则和方法”). These were resources shared by some educators. Docin fully illustrates the notion of communities of practice that build, share and use database and knowledge.

In the previous section, we discussed the use of corpora for Chinese literacy education. Some of the corpora that can be considered by teachers to teach reading, writing and literature include: HSK (http://202.112.195.8/hsk/login.asp), Beijing University CCL Corpora (http://ccl.pku.edu.cn:8080/ccl_corpus/), The Lancaster Corpus of Mandarin Chinese (http://ling.cass.cn/dangdai/LCMC/LCMC.htm), and Corpus of Essays for Elementary School Students (http://www.mclass.cn).

The Roles of ICT in Chinese Literacy Education

The literature reveals that ICT plays important roles in supporting literacy education in China in cultivating motivation, interest, and affect and developing cognition and metacognition in the contexts of reading, writing, literature, and character recognition.

Motivation. There are a large number of articles discussing how to use ICT to motivate students’ interest in learning language, reading, writing, and literature. For example, Zhong (Zhong, 2008) described how to use multimedia programs to enhance teaching Chinese characters. When teaching the concept “water” to young students, the teacher played a video clip
with the music in the background, showing a winding stream, the magnificent Yangtze River, the vast ocean, and the peaceful West Lake. This video clip grabbed the attention of the elementary school students right away. While they enjoyed the beautiful sceneries, the students were completely immersed in the simulated natural environment. It evoked the students’ feelings and understandings about water and the relationship between water and their day-to-day life. At this point, the teacher paused the program and began to explain the concept of water, the formation and characteristics of the character “water” (水). The multimedia created a visual effect on learners and presented a vivid image, which would help students to retain the information in their long-term memory. The students not only learned how to recognize and read the character “water”, but also understand the deep connotations associated with the concept “water”. Therefore, ICTs make Chinese class fun and interesting (Yang, 2007).

**Affective Development.** The multimedia affordances are used not only to motivate students’ interest in studying literacy, but also to support their affective and cognitive development. Affects and cognition are deemed to go hand in hand in reading comprehension and literature appreciation. A large number of articles examined how ICTs can be used to provoke senses, feelings, and imaginations, and present simulated environments to immerse students in the environment depicted by the text and help them experience and understand literature (e.g., a prose or a poem). Xu (2010) demonstrated how she used multimedia programs to stimulate learners’ imagination and evoke their feelings when she taught reading comprehension on a lesson titled “Chinese International Rescue Team is Terrific!” This text described how the Chinese rescue workers worked hard to rescue the people in a foreign country from the natural disaster. The vivid pictures touched the student to tears as the teacher read aloud the text. The use of pictures created an atmosphere in which silence speaks more than words.
**Skill development.** A great number of articles share ideas on how technology can be used to develop students’ abilities that are important to learning language and literature, including observation, critical thinking, imagination and creativity. Li (2009) found that many students were unable to make careful observations of people, things or sceneries in real life and form the connection between the things they observed to their own life experience, so she took advantages of multimedia technology in her teaching as an innovative teaching effort to develop students’ observation ability. In teaching younger children to write an essay on the topic of “A Small Lovely Animal”, the teacher first demonstrates how to describe a white rabbit by using a multimedia program. The multimedia program first demonstrated the rabbit in an instructionally logical order, first showing the entire picture of a lively white rabbit, then gradually panning to different parts of the rabbit, zooming in and zooming out and from different angles and perspectives (Li, 2009). Students could choose to pause at a specific point of the program or replay the program. With the help of the multimedia program, the teacher guided the students to engage in the writing task, that is, describing the small white rabbit specifically, clearly and vividly, and in a logical and sequential order.

**Teaching difficult points.** ICTs have been used to support teaching Chinese characters, abstract concepts, and difficult language points, such as imageries, metaphors, ironies and other rhetorical devices. At the elementary level, multimedia programs have been used to teach character recognition and writing. Animations have been designed and used to explain the formation of Chinese characters from the historical and etymological perspectives, for example, the image of water (水/shui/), represented by streams, rivers, lakes, and oceans, can be designed to gradually be transformed to the Chinese character through animations created with some authoring software like Adobe Flash (Zhong, 2008). This animation can be followed by
demonstrating the process of writing the character water (水/shui/), showing how to write the strokes and explaining the sequence of the strokes for a given character (Bian & Wang, 2005).

At a more advanced level, ICTs have been used as a method to teach abstract concepts, especially when students do not have the experience about a subject content being studied. Multimedia programs have often been used to address some difficult concepts and convey an environment depicted by poems and prose, especially ancient poems that are characterized by concise and vivid language and the use of images, similes, metaphors, and other rhetorical devices (Zheng, Ding, & Wu, 2008). The ancient famous poem on Mt. Lu vividly presents a picture of the majestic mountains through the sentences, “hen kan cheng ling ce cheng feng, yuanchu gaodi ge bu tong” (“横看成岭侧成峰，远近高低各不同”). It means when the mountains are seen from one side, they are mountain ranges, and when seen from the other side, they are peaks; and they show different heights when they are seen from different distances. By presenting Mt. Lu with pictures from different perspectives, students can examine closely the shapes of the mountains and meditate the poetic words used by the poet. As another example, when teaching the lesson “Waterfalls”, the multimedia presents a simulated environment depicting the scene of the roaring waterfalls like layer upon layer of waves surging unto the shore or the wind blowing over the pine forest. This simulated environment stimulates students’ imagination about and evoke their emotional responses to the roaring waterfalls that jump down the mountains from ten thousand miles high, as communicated by the poem. When teaching “The Rustling Drizzles” (xiao yu sha sha 小雨沙沙), Lou (2008) played the multimedia-based courseware first, which demonstrated drizzles falling on gardens, ponds, fields, and so on, with the lively and happy music playing at the background. It evoked students’ feelings about the mysterious spring rain and deepened their understanding of the subtle meanings of the drizzle in
the spring season as conveyed through a number of analogies, such as cow hair, flower needles, and tiny silk.

**Self-regulated learning.** The rich web resources allow teachers to create open-ended learning environments that encourage inquiry, problem solving, and self-regulated learning activities. Wang (2006) illustrated the design of an open learning environment using web-resources to promote self-regulated learning. During the instruction of the lesson *Taiwan Butterfly Valley*, students are first asked to read the text to acquire a preliminary understanding of the fascinating butterflies. Then the teacher would prompt the students with the question “In what ways do you find the Butterfly Valley fascinating?” The students are requested to search for, underline and read the sentences describing the magnificent views of the butterflies. Next, the students are further prompted to search for relevant information from the web resources, including articles, pictures, and animation to help learners further experience the views described by the texts. Wu (2002) discussed how web resources could be integrated to foster reading comprehension. In order to engage students in self-monitoring and self-regulated learning processes, Wu suggested providing students with question prompts to guide them in the inquiry process of searching, selecting, classifying and reorganizing relevant information in order to generate solutions to problems. For instance, when teaching the lesson “We Only Have One Earth”, which is related to environmental protection, the following question prompts were provided: “Why should we pay attention environmental protection? How do we deal with emissions and waste in chemical industry? In agriculture, which chemical fertilizers and pesticides will cause pollution to soil and water?” Students may use the question prompts as guide while browsing websites and resources to gain relevant information and formulate answers.
to the questions. After the web searching activities, students are asked to discuss with group members about the issues and to generate reports on environmental protection.

**Effectiveness and efficiency.** As mentioned earlier, ICTs helped to increase effectiveness and efficiency, as in the case of using Chinese input systems to help students learn character recognition and writing (Liu & Zhang, 2006). According to Gui (2009), it was much easier to recognize than writing Chinese characters. If students know a character but cannot write it, they can type the *pinyin* of the character and then select a suitable character from among a list of characters yielded by the typing output. Chinese input systems increase the number of characters that students can recognize and memorize within a limited period of time compared with the traditional teaching method (Zheng, 2006). At the same time, the use of Chinese input systems help young learners to begin writing at an earlier stage because students can type the *pinyin* if they cannot write a character that is needed in an essay (Zheng, Jing, & Wu, 2008). Liu and Zhang (2006) noted that normally most Chinese children could not write anything when they first started their formal schooling; however with the help of the computer and using the *Shuangpin* (double *pinyin*) input method, they could type what they wanted to say into the computer and learn to write compositions within a year. Some students who were already trained to recognize about 1,000 characters before their formal schooling could write stories on computers after a few weeks’ instruction (Zhou, as cited in Liu and Zhang, 2006).

**Trends of ICT Integration in Literacy Education in China**

In order to understand the trends of ICT integration in literacy education in China, we grouped the articles we had reviewed into two periods: 2000-2005 and 2006-2010, and we performed a general analysis on those articles. Comparing the period of 2000-2005 with that of
2006-2010, we observed that there was an increasing number of articles in ICTs in Chinese literacy in the last period (see Figure 1).

[Insert Figure 1 Here]

In general, we found that there were more articles discussing reading and writing than character recognition and literature (see Figure 2). Part of the reasons could be that the articles on teaching literature were sometimes classified as articles on reading and writing. Regarding teaching literature, more articles focused on teaching ancient poems. It could be due to the fact that ancient poems are difficult to decode and understand because of the use of the ancient Chinese, which was more succinct, comprehensive, and profound than modern Chinese.

[Insert Figure 2 Here]

In addition, there are more articles on the use of ICTs to motivate students, stimulate their interest, develop cognitive and metacognitive skills, and evoke their emotions, imagination and creativity than articles on how to teach difficult concepts and language points (see Figure 3). We hypothesized that the articles on the latter categories will increase in the next five or ten years as teachers explore more on pedagogical uses and deepen their understanding of the roles of ICTs in literacy education. Furthermore, we have also noticed that there have been increasing number of articles discussed the changed role of teachers over the past ten years.

[Insert Figure 3 Here]
Discussion and Implications

According to the Department of Education’s Educational Reform Guideline for Basic Educational Curriculum, educators should fully take advantage of the ICTs and promote technology integration in curriculum. Our literature review and analysis showed numerous opportunities and possibilities in addressing teaching issues, improving quality of education, and promoting curriculum reform. Just as Yuan and Hao (2010) summarized, ICT can motivate students’ interest in learning Chinese; it is means of aligning teachers’ goals with students’ goals; it helps to make breakthroughs in teaching difficult concepts and content; and it enhances or extends social interactions among students, between students and teachers, and between computers and students.

The application of ICTs in Chinese literacy education does not merely mean using technology to support learning and instruction, but more importantly it reflects new notions about learning and instruction. We argue that ICTs promote Chinese teachers to reconsider their role in education. Many articles indicate that teachers’ role should be changed from lecturing to supporting, from teacher-centered instruction to student-centered teaching, from the paradigm “The teacher asked me to learn” to the paradigm “I want to learn” (Lin & Ou, 2007; Zhang, 2003). Wen (2006) contended that students should take the ownership of their own learning and actively construct and build knowledge while teachers should be mentors, guides, and facilitators.

According to our observation and analysis, the role of ICTs has far exceeded the one defined by tools to support learning and instruction; rather it has caused the transformation in teachers’ belief about learning and instruction and motivated them to break away from the traditional teaching approach and seek innovative teaching approach to guide learners in self-
directed and self-regulated learning. Some of the new pedagogical concepts that have been increasingly discussed in the recent literature include (a) development of metacognition (e.g., Ding, Zeng, Yang, & Zhang, 2009); (b) self-regulated and self-monitored reading and writing activities (e.g., Wang, 2006); (c) knowledge acquisition and transfer of skills (e.g., Sun, 2008), (d) integration of Chinese literacy and other subjects, (e), interactive and collaborative learning (e.g., Hu & Bei, 2008). We are inclined to say that the development of ICT has become one of the determining factors promoting a paradigm shift in learning and instruction in China’s classrooms, and this paradigm shift meets the needs of the society and is consistent with the fundamental changes in instruction’s supersystems as China is rapidly moving away from an agricultural and industrial society into a digital/information society, which require employees to be able to think about and solve problems, work in teams, communicate, take initiative, and bring diverse perspectives to their work (Reigeluth, 1999).

While there is no lack of articles on a variety of topics on the application of ICTs in literacy education in China, our literature review also revealed some gaps in the research on the integration of ICTs in education, particularly in literacy education. The majority of articles are 1-6 pages of experience sharing or issue discussions, and very few articles are data-driven, empirical studies. Although it was exciting to see the rapid development of ICT integration in China’s education covered tons of articles, yet most of them were just piecemeal descriptions on the uses of a particular tool in literacy education, the designing a specific lesson or a learning environment using ICT, integrating ICTs with some specific instructional strategies, or discussing a particular learning management system. There was a lack of research on systemic change and diffusion and educational reforms at a large scale in China’s education. To bring about systemic changes in China, educational researchers, learning scientists, educational
psychologists, and teachers must work together to promote empirical research grounded on learning theories and instructional design theories. Besides, it is critical that educational researchers receive training in research methodologies so that they will be to design and conduct empirical research, including qualitative and quantitative research methods.

**Summary**

This chapter begins with an introduction about ICT application in China’s literacy education, followed by a brief review of the historical context of ICTs in China. Then, this chapter focuses on the discussion of the current state of ICT integration in literacy learning and instruction. Through reviewing, examining and analyzing over 600 articles from the database *China Academic Journals* as well as some websites, we reported findings on various types of ICTs and their uses in Chinese literacy education, including multimedia programs/software, Chinese character encoding and input systems, communication tools, collaborative platforms, mobile technology, and learner corpora. In addition, we also examined the roles and functions of ICTs in supporting learning and instruction in Chinese literacy. ICTs not only play important roles in supporting motivation, affect, cognition, metacognition, skill development (e.g., imagination self-expression, creativity), but also in promoting information sharing, exchange and collaborative learning.

This chapter also provides teachers with a wealth of web resources they can use for their lesson plans and instructional delivery, as well as platforms for discussion regarding how to teach literacy. In the end, we reported the trends and issues regarding ICT integration in Chinese literacy education by examining articles over the past 10 years. We found that the number of articles had increased from 2000-2005 to 2006-2010, and there were more articles on using ICTs to facilitate metacognition and to address some pedagogical issues. Our analysis showed that
ICTs have not only offered means for educators to try out innovative instructional approaches, but most importantly have brought about a paradigm shift in learning and instruction, particularly in changing teachers’ epistemological beliefs about learning and instruction. In conclusion, issues were discussed regarding ICT development in China, and suggestions are made to enhance ICTs integration and promote empirical research in Chinese literacy education.
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Figure 1. Comparison of number of articles in ICT in Chinese literacy education between 2000-2005 and 2006-2010

Figure 2. Comparison of Articles in the areas of reading, writing, character recognition, and literature.
Figure 3. The distribution of topics on various roles and functions of ICT: interest/motivation, metacognition, imagination and creativity, teaching difficult points, effectiveness and efficiency, and skill development.