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Doctor Thesis

New digital environment and Media Competence in Education

Case study of how digital textbook improve Chinese teaching in School

Universidad Autónoma de Barcelona

Faculty of Science Communication

Department of Journalism and Science Communication

Doctor of Communication and Journalism

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Dedication

I dedicate this Doctoral dissertation to my
Dad Zhang Jiansong, Mom Zhang Shufen,
and my husband Pablo Mora Mones,
Whose continued support and words of
Encouragement allowed me to complete this process.

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Chapter 1: Introduction

The research will study the impact of using digital textbooks in the media competencies of students and teachers in Chinese teaching in Spain. It will be done in a social context where implementing ICT in the school has become the most effective way to innovate the entire educational system, to improve the efficiency of teaching and learning and to adapt the educational process to the requirements of current society.

We assume that education is vital to all people, both individually and collectively. Enhancing the people through education is crucial for our societies (Dewey, 1897). But today the role of technology enhancing education is very important and a best way to innovate teaching and learning.

In this sense, European Commission sets out a European agenda for stimulating high-quality, innovative ways of learning and teaching through new technologies and digital content (Weets, 1997). While 70% of teachers in the EU recognize the importance of training in digital-supported ways of teaching and learning. Today's learners expect more personalization, collaboration and better links between formal and informal learning much of it being possible through digital-supported learning.

The existing education environment and paper textbooks have a limited ability to search, process, and collaborate with information that this society requests (Ju, 2010). To overcome this limitation, many different informational technologies have been developed. In this context, the implementation of digital textbook represents one of the most effective and disruptive in relation with traditional educational environment (Siemens, 2005).

An increasing number of schools in Europe are switching from print textbooks to digital textbooks. (Lee et al., 2013; Cargill, 2012; FCC & USDOE, 2012; Mardis et al., 2010; Nichols, 2009). Digital textbooks allow students to highlight passages, take notes, and change font sizes. Many contain built-in dictionaries and calendars and include bookmarking and search capabilities. Others allow including multimedia,

video and interactive that can be used and adapted by readers. At the same time, today's devices have evolved from platforms displaying simple digitized versions of print textbooks to tools that support highly interactive, multimedia experiences (Brown, 2012; Chiong et al., 2012; Ash, 2011; Doiron, 2011; Murray & Pérez, 2011).

Digital textbooks started out as electronic books that transferred paper-based content to digital form and have evolved into teaching and learning support systems equipped with numerous tools to help learners explore, build, apply, and share knowledge (Rao 2003).

Digital textbooks now tends to incorporate a plethora of features supporting student learning, such as note-taking tools, memo pads, writing and highlighting tools, messenger services, discussion boards, navigation tools (e.g., book- marking, page search/scroll, and course selection), screen-capture capabilities, textbook display options, and search tools.

A digital textbook platform is an underlying computer system on which application programs can run. It provides a framework for designing, developing, implementing, and managing digital textbooks and executing application tools within those textbooks.

Using digital textbooks, students gain access to the content and interact with other students through the platform interface.

Digital textbook shows more advantages than the traditional paper based textbook. Digital content is up-to-date. Students have immediate access to current events and the latest scientific advances without having to wait years for the next updated edition of a paper textbook (Lee et al., 2013; Cargill, 2012; FCC & USDOE, 2012; Mardis et al., 2010; Nichols, 2009).

But disordered displays, complicated procedures, and inadequate feedback within the user interface can lead to poor performance and learning dissatisfaction (Shneiderman and Plaisant 2009).

This project focus on the process of the implementation of digital textbooks in the educational system in Chinese teaching process and want to describe the process of the implementation, analyze its consequences on the entire communicational system of the schools, recognize the impact of the digital textbook in the process of learning and teaching and study how the entire process affect the learning results and the students, parents and teachers' satisfaction with digital textbook.

Background of the Study

New Media Consortium (NMC) conducted a Horizon Project to chart emerging technologies for teaching and learning in the year 2002. And since 2005, Johnson collaborated with Rachel S. Smith started to writing a report about the new learning trend. In the 2017 NMC Horizon Report, the author use N-vivo analysis to input all the report into the software to get a word frequency list. We can see from the list that the most frequently used words from the report are about digital technologies used in education.

Table1: Word frequency 2017 NMC Horizon Report

Word	Length	Count	Weighted Percentage
learning	8	694	2.53%
education	9	385	1.40%
higher	6	254	0.93%
students	8	243	0.89%
university	10	241	0.88%
http	4	202	0.74%
www	3	195	0.71%
org	3	190	0.69%
nmc	3	186	0.68%
technology	10	182	0.66%
2016	4	180	0.66%
student	7	155	0.56%
digital	7	147	0.54%

https	5	133	0.48%
institutions	12	129	0.47%
com	3	128	0.47%
online	6	125	0.46%
new	3	120	0.44%
faculty	7	106	0.39%
report	6	103	0.38%
technologies	12	100	0.36%

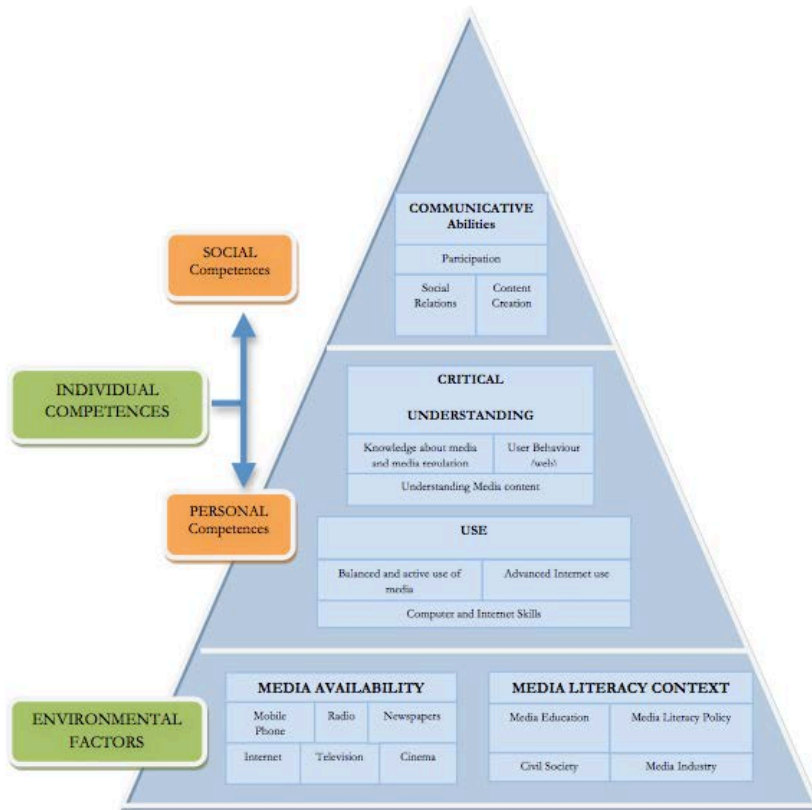
We can see more clearly from the graph below that teaching and learning with digital technology is a trend in the year 2017. And from the previous Horizon Report, we can also see that from the year 2010 the education trend already focus on the new technology.

So in this technology society, teachers face many challenges. One of the most important challenges is how to engage students in a technologically changing world. Although technology can be positively correlated to promoting academic growth and developing skills needed in the workforce, it has created a challenge for educators in both their role as a teacher and their delivery of information (Greenfield and Subrahmanyam, 2003).

Then we have the concept of Media literacy that teachers can apply to school. Media literacy is generally defined as the ability to access the media, to understand and to critically evaluate different aspects of the media and media content and to create communications in a variety of contexts (European Commission, 2007). Media literacy implies the use of technology, but technology is just a tool, which does not determine how we must act. It is our capacity to lead the use of technology and our potential to be aware of its impact that assure that technology improve our capacities and activities. This is the reason we have to acquire an understanding and adopt meaningful courses of action by employing different literacies (ALA, 2000; Martin and Madigan, 2006).

According to the structure of media literacy assessment criteria, Media literacy is evaluated by both individual competences and environmental factors. Individual competences include social competences and personal competence (José Manuel, 2009). The use of the new digital educational platform is in some extent effects student's individual competences both from social and personal perspectives.

Graph 2: Structure of Media Literacy Assessment Criteria

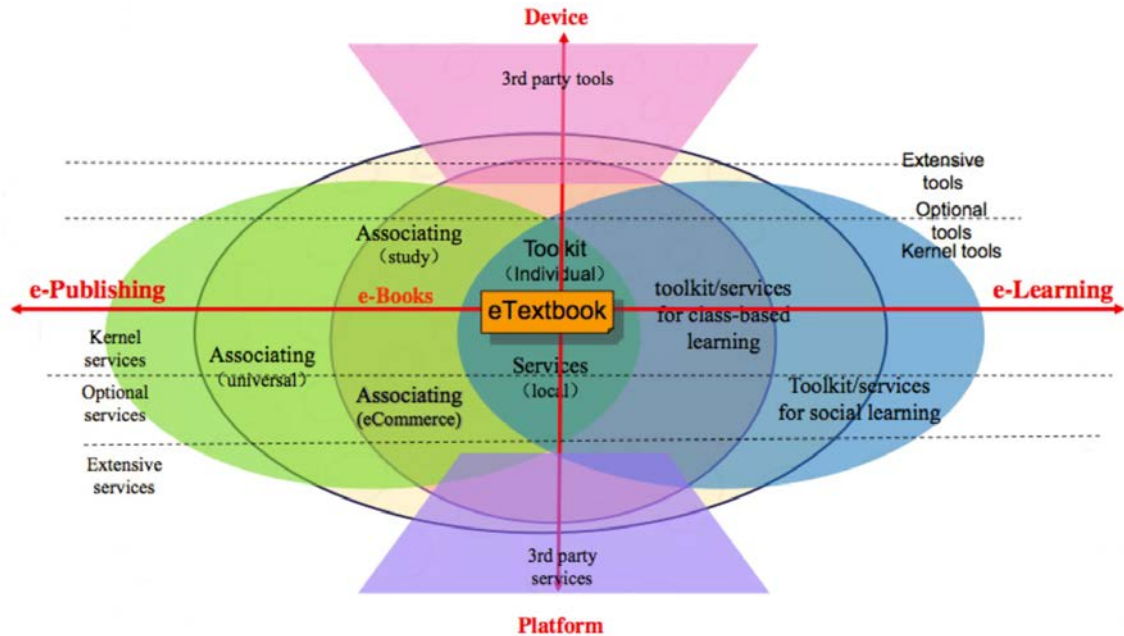


Steve Jobs once said: “Creativity is just connecting things. When you ask creative people how they did something, they feel a little guilty because they didn't really do it, they just saw something. It seemed obvious to them after a while. That's because they were able to connect experiences they've had and synthesize new things.” Digital textbook is not a new invention, it is just a combination of knowledge from traditional textbook with new technology, which provide the students a better channel to acquire information and knowledge.

Digital textbook function system can be well explained in the following chart according to the China’s E-Textbook and E-Schoolbag standardization workgroup framework, see Chart 2. Digital textbook is the new E-learning method and is more than e-books. It is a platform interacts with individual toolkit and services. It requires E-publishing that need content, associating with E-books. It needs a device to provide toolkit and needs a platform to provide services. Then with all the required content

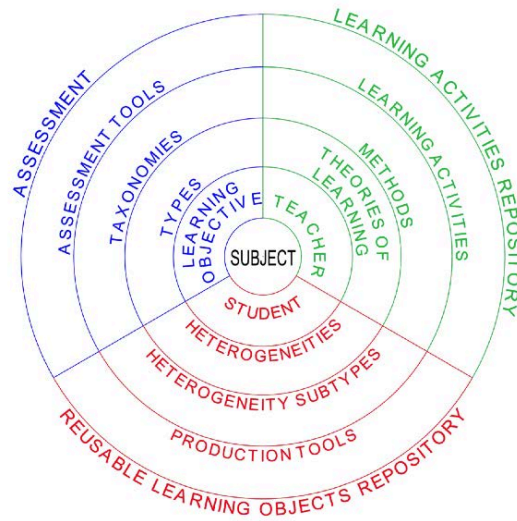
and device and platform it leads to E-learning. So the using of digital textbook is a E-learning method.

Graph 3: Digital Textbook Function System



To talk about E-learning, according to Dieudonne Leclercq, there are eight learning events, they are experiments, creates, debates, explores, meta-learns, receives, imitates and practices (Diedonne and Poumay, 2005). Digital textbook can good integrate all these eight learning events together and create effective learning. Line Kolås and Arvid Staupe, introduces the E-learning Circle, it is developed to ensure the quality of e-learning process, which integrate the teaching principles and techniques. This e-learning cycle includes the student part, teacher part and learning objective.

Graph 4: E-learning circle



From the year 2013, Centre for Learning and Performance Technologies (C4LPT) conduct a research on Top 100 Tools for Learning every year, and the top 20 products for Top 200 tools for learning 2016 are as follows:

Table 2: Top 20 products for Learning 2016

Tool	Top200	Description
YouTube	1	Video resources and video hosting
Google Search	2	Web search engine
Twitter	3	Public social network
PowerPoint	4	Presentation tool
Google Docs/Drive	5	Cloud-based office suite and document storage
Facebook	6	Public social network
Skype	7	Messaging app (text and video)
LinkedIn	8	Professional social network
WordPress	9	Blogging and website tool

Dropbox	10	Cloud-based document storage
Wikipedia	11	Collaborative encyclopedia
Yammer	12	Enterprise social network
WhatsApp	13	Messaging app
Prezi	14	Presentation tool
Kahoot	15	Classroom response tool
Word	16	Document creation tools
Evernote	17	Note-taking app
Slideshare	18	Slideset resources and presentation hosting
OneNote	19	Note-taking app
Slack	20	Messaging app for teams

Ranking number one is YouTube, which is a video resources and video hosting site, then google Search that provide online web searching service. Twitter is ranking number three, a public social network. Other tools, such as PowerPoint, Google Docs/Drive, Facebook, Skype, LinkedIn, WordPress, Dropbox also ranking the top 10 products for learning.

These products can all integrate in the teaching process, teachers can make use of these tools to connect with students and digital learning resource, all these tools can connected with the use of digital textbook, to maximum the roll of digital textbook as a platform for students to seek information and acquire knowledge. In order to build the 21st skills for the students, a list new tools for teaching and learning, which can be integrate into digital textbooks.

Nowadays we can see Chinese people all over the world, especially America and Europe. In the year 2009, according to Spain: Instituto Nacional de Estadística, the

official figures showed 145,425 Chinese citizens residing in Spain; however, this figure does not include people with origins in other Overseas Chinese communities, nor Spanish citizens of Chinese origin or descent. The number increase to 186,031 in the year 2015, most of them live in Madrid and Cataluña. In Madrid there are 49831 Chinese and in Cataluña there are 49773 Chinese. So we can see that more and more Chinese now are living in Spain and a lot of Chinese babies are born in Spain. Those Spanish-born-Chinese will go to local schools to learn Spanish, the environment for them are all Spanish, because their classmates are locals Spanish citizens and everyday life is in Spanish, so if there is no Chinese environment for them, they will forget Chinese. Most of the immigration in Spain are from south China, 80% are from a small city named Qingtian in Zhejiang province and Wenzhou also in Zhejiang province. They speak a dialect between them, so at home their children can speak the dialect, but they don't speak mandarin Chinese. So there is a great demand for them to learn good Mandarin Chinese, if the Spanish-born-Chinese will lose their mother tongue: Mandarin.

Teaching Spanish-born-Chinese is not equal to teaching Chinese people in China, neither nor teaching foreign people Chinese, so the teacher can not use the same way to teach, the teacher need to find the right way to teach Chinese and adapt to their characteristics.

The research will conduct a case study of digital education platforms used in Chinese class in Spain to know how students learn through digital technology and how digital education platforms help to improve students' learning results and satisfaction of using digital textbook. And giving suggestions on innovate education and creation on teaching with digital education platforms.

Purpose of the study

General objectives:

- The research tries to explore the role that the use of digital text books play in the process of teaching and learning Chinese, and in the process with which students acquire information and media competencies.
- The research will be done to recognize the different impact on teaching and learning Chinese depending of the use of print textbooks and digital textbooks.
- Try to find the indicator which affect the learning effectiveness to measure how digital technology help improve the learning results in learning Chinese. From the students' perspective, do participant observation and experiment to test students' learning results and abilities. From the teachers' perspective, measure the change with digital textbook.
- Giving suggestions on innovation and creation of the development of new ways of teaching and learning Chinese through the use of new digital environment.

Table 3: General objectives

General objectives	
1	Explore the role digital textbooks play in the process of teaching and learning Chinese and in the process with which students acquire information and media competencies.
2	Recognize the different impact on using print textbooks and digital textbooks to learn Chinese
3	Find the indicator which affect the learning effectiveness to measure how digital technology help improve the learning results in learning Chinese.
4	Giving suggestions on innovation and creation of the development of new ways of teaching and learning Chinese through the use of new digital environment.

Specific objectives:

Digital education platform is a new learning environment which can promotes the development of creativity, innovativeness and capability for self-directed lifelong

learning. Some researchers have focused their attention on exploring how textbooks impact learning (Durwin & Sherman, 2008; Davis, 2009; Meredith, 1980; Petrides et al., 2011; Reys, Reys, & Chavez, 2004; Spinks & Wells, 1993; Terwiliger, 1989). These studies have explored a wide range of outcomes including knowledge, comprehension, motivation, learning behaviors, collaboration, grades, and assessment performance.

The generative learning theory relates to the idea that learners actively participate in the learning process and work to construct meaningful understandings of the information in their environment (Wittrock, 1974). This position is based on the assumption that the design of instructional materials, including textbooks, can affect learning if such materials are designed to promote mental engagement and deep interaction with the ideas presented (Grabowski, 2004). Specifically, textbooks that (a) provide objects and adjunct questions (Wittrock, 1989), (b) include interpretation of the importance of the topics selected (Grabowski, 2004), (c) present problems, mysteries, inconsistencies, suspense, and enigmas (Grabowski, 2004), and (d) direct students' voluntary attention to engagement (Kourilsky & Wittrock, 1992) are predicted to have a greater effect on student learning than textbooks that do not include these design elements.

Digital educational platform is an integration of various technologies that can provide students new and more relevant learning experiences, the ways students learn and absorb new knowledge and the effectiveness of learning will be the focus of this paper.

The content of the educational platform is also a main point of the research. Results from the survey of marketing professors by Silver et al. (2012) discussed previously highlight the importance of content as a textbook selection criterion. Many other authors have also addressed the consideration of content in both K-12 and higher education selection decisions (Armstrong & Bray, 1986; Falduto, 2009; Griggs & Koenig, 2001; Meyer, 1988; Quereshi & Sackett, 1977; Rose & Lessen, 1980; Suh, 1970).

Meyer (1988) conducted an analysis of several science textbooks written for elementary school students, and focused primarily on comparing the content coverage of the books as a measure of their acceptability for use. Results from this study indicated that elementary science textbooks varied widely in the content they covered, as well as in how this information was presented. Meyer argued that because of these differences, content should be a key consideration in the textbook selection process.

So the research's objective is as follows:

1. Whether digital educational platform is good for the students to have a strong flavor of constructivist learning, rather than one of teacher-dominated declarative learning.
2. Is digital educational platform can help students be active agents in the construction of their own knowledge, rather than passive recipients of that knowledge from teachers.
3. What kind of contents that attract students and can have a better effectiveness for students in order to achieve better education
4. Whether students can participate learning by creating information.
5. Analysis what role social network plays in the process of learning?

With the experiment in Chinese schools in Spain, the research will try to provide concrete evidence and data for the effective use of digital educational platform in schools with the combination of policy recommendations. Try to create new teaching practices using technology to support schools and teachers in the teaching and learning processes.

Research questions

The effective use of information in society and the need for lifelong learning acquire more and more importance (Jolls and Thoman, 2008). Media consumption is

changing through user generated communication and the availability of digital products (European Commission, 2007). The use of new technologies is changing the educational system.

The access to the digital textbooks and its new platforms play an important change in the educational environment. Today the digital textbook goes beyond just an electronic version of digitized, text-based learning materials. Digital textbook is designed to be self-contained in nature, equipped with multimedia learning resources as well as tools for evaluation and authoring. It is connected to the national knowledge database and web-based resources for teaching and learning activities creativity (Seungyeon Han, 2013), equip students with abilities such as collaboration, communication, critical thinking, and self-directed learning abilities.

New ways of learning created by digital educational platform includes crowd authoring, it means the content is produced by students and for students; also including embedded tutoring, which means students offer to explain or discuss a difficult passage; what's more? It includes co-reading where students are automatically put in contact with others currently reading the same page (Mike Sharples, 2012).

The study will focus on case study of digital educational platforms used in Chinese class in Spain, to observe how digital educational platforms are used in the teaching and learning process. How it can support new learning and teaching methods, how it can be integrated with other classroom technologies already used in the classroom and also observes students' content retention and achievement by using the digital educational platforms to give suggestions on promoting media literacy. Our principal aim is to acquire a good understanding on how digital text books impact on the media competencies of the students.

According to a study from the Pew Internet & American Life Project, more than one-half of all teens that create media content and roughly one-third of teens that use the Internet share what they produce (Jenkins et al., 2009). Students are on the

computer almost constantly, and digital media motivates them to learn independently (Johnson, 2009). Resnick (2009), Professor of Learning Research at MIT Media Laboratory, raised a concern: As these new technologies have the potential to fundamentally transform how and what students learn throughout their lives and new digital technologies make possible a “learning revolution” in education, what is the learning process of this new revolution?

Some educators have recognized that technology introduces new-world thinking (Trilling & Fadel, 2009), and there is a way to make learning feel simultaneously more relevant to students and more connected to the world beyond schools (Corbett, 2010). This study needs to explore how digital educational platform enhances students’ participation in the classroom-learning environment. What’s more? Try to find the ways students use this digital educational platform and how it might be best used to help motivate them academically.

The research questions are as followings:

1. What happens in the classes and after class through the use a kind of digital educational platform in Chinese class?
2. How does the use of digital educational platform affect students’ educational experience?
3. What are the indicators that affect learning effectiveness?
4. Digital textbook compared with paper based textbook?
5. Is using digital educational platform effective and efficient from the academic perspective?
6. How digital textbook help improve student’s learning and pedagogical activities?

Importance of the study

Technology is rapidly becoming advanced to the point that hardly a day goes by when we are not engaged in some sort of interaction with technology. On a daily basis, most of the people include students, workers use computers or a smart device, such as a smart phone or iPad, to check Email, go online for course updates, or to actually engage in online courses. Now in more and more schools, computers are used all day in some manner. Technology is interacted in teaching and learning through students' everyday life, including online courses, online libraries, student Email and other information. Digital textbooks seem to mirror distant learning in similarity of cost and convenience. In some instances for a student, a printed textbook can cost as much as tuition. In terms of cost, digital textbooks are more affordable.

Based on various studies, digital textbook has a lot of advantages that is a good tools for the students. It will potentially replace existing paper-based textbooks in the school curriculum. Compared to traditional textbooks, the advantages of digital textbook are as follows:

1. Digital textbook incorporate the multimedia contents, such as video clips, animations and education-based games, are some of the elements have been shown to capture students' interest in study (Lee et al., 2013; Fletcher et al., 2012; Puente, 2012; Ash, 2011; Doiron, 2011; Korat, 2010; Strout, 2010). All these multimedia features can enhance the learning experience. The provision of multiple embedded tools, such as text-to-speech options, dictionaries, calculators, and note-taking capabilities, has also been found to support student learning (Cargill, 2012; Doiron, 2011; Mardis et al., 2010).
2. Digital textbooks allow teachers to “customize and produce content by re-purposing to suit what needs to be taught, using different modules that may suit a learner's learning style, region, language, or level of skill, while adhering to the local education standards” (Lee et al., 2013; Ash, 2011; Hill, 2010).
3. The content of the digital textbook is up-to-date, if there is internet, students can update latest information online. And digital textbook can be accessed anytime

and anywhere. This unlimited access translates into less wasted instructional time due to forgotten or lost textbooks and assignments (Fletcher et al., 2012; Murray & Pérez, 2011; Mardis et al., 2010; Nichols, 2009).

4. Students are no longer no longer need to carry backpacks loaded with heavy textbooks to schools. Digital textbook help decrease the physical burden placed on students that use paper-based textbooks. Paper-based textbooks, on the other hand, can weigh over five pounds each (Lee et al., 2013; FCC & USDOE, 2012; ProCon.org, 2012; Mardis et al., 2010; Nichols, 2009). Scholastic's (2013) survey of over 1,000 U.S. children age 6- 17 and their parents found that both children and parents identified that digital textbook is of great convenience, because there is no need to carry all of the paper-based textbook.
5. Digital textbook is better for the environment. Because digital textbook reduced printing and transporting books and fewer costs related to paper textbook disposal and recycling (Mardis et al. 2010).

But there are also experts think the opposite, they think digital textbooks have a lot of disadvantages.

1. Digital textbook will lead to shadow reading, which is different from paper-based deep reading. Some researchers believe that digital textbook is more suited to leisure reading instead of academic reading. Also some researchers believe that reading on mobile devices can be difficult because of their small screen size, lack of display clarity, limited image size and complexity, restrictive keyboard and mouse functions, and diminished space for interactive elements (Valerio, 2012; Doiron, 2011; Mardis et al. 2010; Aamodt, 2009).
2. Multimedia features may influence the reading comprehension. Although multimedia features such as pictures, videos and music can attract the students attention, but some researchers believe that all these multimedia features will influence the reading comprehension (Greenfield, 2013; Chiong et al., 2012; Doiron, 2011; Korat, 2010; Moody, 2010). Bosman and Richtel (2012) stated that

“a tablet offers a menu of distractions that can fragment the reading experience or stop it completely.”

3. Digital content have not established a common standard for the quality and accuracy. Some researchers believe that paper-based textbooks have the standard of the quality and accuracy and it has a long history of publishing books, but digital textbooks do not have a publishing standard (Lee et al., 2013; Doiron, 2011; Surdin, 2009).
4. Digital textbook is expensive and easily to break. And the cost of reparation is also expensive. In the contrast paper-based textbook is easily to be repaired. What’s more? The battery of digital textbook need to be charged because normally it has a big screen and need a lot of electricity, that increases the electricity demand (Greenfield, 2013; Wilder, 2013; ProCon.org, 2012; Riippa, 2011).
5. Using digital textbook can also lead to some health problems. Some researchers concern about the side effects of long-duration use of digital textbooks. If students spend too much time on digital textbook everyday, it could cause eyestrain, headaches and dry eyes. Frequent use of mobile devices has also been linked to a higher incidence of musculoskeletal disorders associated with repetitive strain on muscles, including carpal tunnel syndrome, neck pain, shoulder pain, and fibromyalgia (Greenfield, 2013; Lee et al., 2013; ProCon.org, 2012).

So digital textbook have a lot of advantages and disadvantages. What about paper-based textbook? Some researcher also support using a paper-based textbook, I list the reasons as follows.

1. The textbook is encompasses the main body of knowledge that students are expected to learn, it can give students a good idea of what’s on the test.
2. The textbook provides an organized framework for learning, unlike a collection of random articles accessed from the web.

3. Textbook save your time, the author of the textbook has gathered all the useful materials for you, so you don't have to search for a bunch of information to find the answer.
4. Textbook give you the straight story, online has more false, misleading, incomplete and biased information.
5. Textbook can improve grade, because it contain exercises, activities and quizzes, 78% of the students believe that they will get lower grades if they don't have their own copy of the required text.

So the importance is to know which is the best way for teachers and students through experiments. Chinese is very important for Spanish-born-Chinese, if the second-generation don not learn Chinese, than they will lose their mother tongue. So this study is very important to find out whether digital textbook is good for the students to learn Chinese or no.

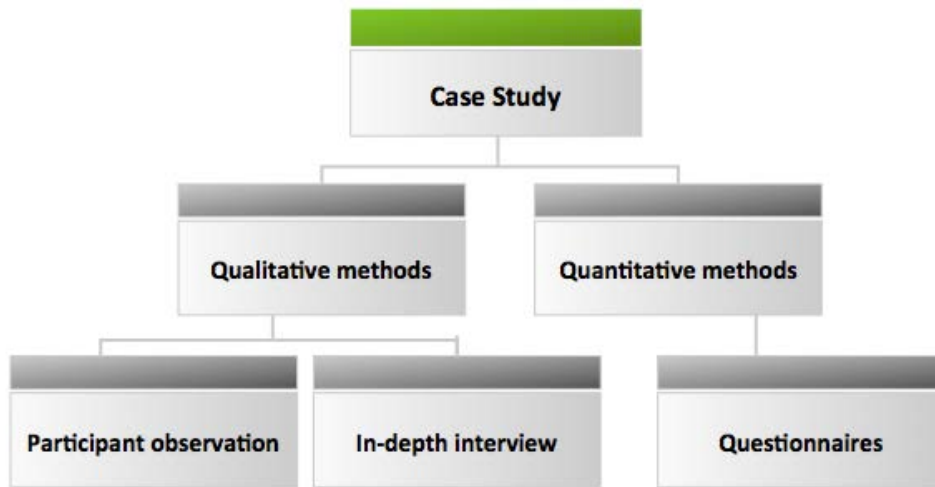
Research methodology

This research is a case study integrated with both quantitative and qualitative methods.

Qualitative methods: Participant observation and in-depth interview with students, teachers and parents using digital textbooks.

Quantitative methods: Send questionnaires to the students, teachers and parents. Collecting data and analysis the data.

Graph 5: Research type



Content analysis: Conduct a content analysis of Chinese teaching platforms used in Spain. Focus on one Chinese school teaching Chinese in Spain using digital textbooks.

Participant observation: Having class with the students, observe how students learn through digital textbooks in the classroom.

In-depth interview: With the questionnaire, also it is necessary to do an in-depth interview with students, teachers and parents to understand better why the data shows this result.

Questionnaires: The questions on the questionnaires focus on the attitude from the student's perspective whether they like the new way of learning; what do they think of the digital textbook used in their course; how many hours they use it in school and at home; can they find useful information through it?

The questionnaires also focus on the teachers' perspective to explore how they use digital textbook in the teaching process and whether it improves the teaching results.

Also the questionnaires focus on the parents' perspective to see the attitude of the parents towards digital textbook.

Data of students' academic results: Try to collect data of students' academic results with digital textbook and without digital textbook.

Theoretical framework

The pervious studies about digital educational platforms focus more on the advantage and disadvantage using it.

For the advantage, there are studies on digital textbook that can provide creative teaching. For instance, digital content is up-to-date which means students have immediate access to current information and the latest scientific advances without having to wait years for the next updated edition of a paper textbook (Lee et al., 2013). What's more? Similarly, digital content is easy to update and correct mistakes, which is easy for the publishers, it can electronically distribute new versions of the content instantaneously (Fletcher et al., 2012).

Also the multimedia features can enhance the learning experience. Electronic readers integrate with multimedia features, such as hyperlinks, audio and video extensions contain many interactive features like animated images, graphic simulations, virtual labs, interactive lessons, and education-based games which cannot be found in print textbooks, and these new feathers have been found to enhance the reading experience for students (Lee et al., 2013). Other new multiple embedded tools such as dictionaries, text-to-speech options, note-taking capabilities and calculators, have also been found to support student learning (Cargill, 2012).

In addition digital contents can effectively satisfy students' variety learning needs. For example, students who have poor vision or who are physically unable to hold a book or turn pages may find digital textbooks easier to read. Students who are easily distracted can use digital textbooks' interactive capabilities to stay engaged and focused (Fletcher et al., 2012). Also there is a study finds that digital content can provide link of the access of the resources that enable English language learners better derive the meaning of unfamiliar words and sentences (Verhallen, 2006).

As for the teachers, digital educational platform can customize learning, which allow teachers to personalize students' learning experiences by using different modules that suit students' particular language, learning style, or level of skill, it can also adhering to local education standards (Ash, 2011).

Digital textbooks better engage tech-savvy students. Digital textbooks address the discrepancy between the types of literacy experiences students encounter at school (paper, pencil, and print textbooks) and those they use in their daily lives outside of school (Web 2.0) (Hill, 2010). The Digital Textbook Playbook (FCC and USDOE, 2012) stated, "There remains a profound disconnect between the learning that happens in school and that which takes place out of school."

Digital textbooks can be accessed anytime, anywhere. Digital content is available anytime, anywhere, both online and offline, and accessible when and where the student, teacher, or parent needs it. This unlimited access translates into less wasted instructional time due to forgotten or lost textbooks and assignments (Fletcher et al., 2012). Also students do not need to carry heavy backpacks. Digital textbooks decrease the physical burden placed on students who use print textbooks.

However, there are also researches found that digital textbook had little effect for students' learning. In the United States of America, a large-scale study in 2007 found that, even with good hardware and educational software, little learning benefit for students was identified (Dynarski, Roberto, Heaviside, Novak, Carey, Campuzano, Means, Murphy, Penuel, Javitz, Emery & Sussex, 2007). Furthermore, Cuban (2001) described how the use of computers in classrooms did not result in improved learning opportunities for students. Such studies demonstrate that it is contested effectiveness that using technologies to support a pre-existing curriculum. Instead, they pointed out some challenges the teachers have to face that technologies and teaching are shifting to student-centered teaching and learning approaches. Other studies pointed out that they stress more on the complex set of challenges the technology have to face (Puttnam, 2009).

But we are now in the information age, the changing technology and innovation pedagogy is a trend. So studying whether integrates technology in teaching and learning processes in classroom or outside classroom is effective for students to promote a better learning.

According to the study of Seungyeon Han, academic achievement, attitude on subjects, self-directed learning ability and problem-solving skills are most important indicators. According to Naomi Miyake, content achievements, portability, Dependability and Sustainability are important indicators to measure digital teaching effectiveness (European commission, 2013).

Content achievements are assessed at several points in the learning process. Ask the students the same question at the beginning of the day and at the end of the day, collected the answers in written form, such as diagrams, models, or concept maps. Each individual's two answers can be compared with each other, with reference to the teacher's expected answer. The answers can also be compared between classes, to find out how one class compares against other classes.

Portability has been measured most often by asking students the same question again after a long time, like 3 to 6 months, or a year. This can be done through interviews, or at summative test sessions. Asking the students to solve a near transfer problem after such an interval, in different subject area contexts, can also assess portability.

Dependability is after the students learn the new knowledge, the student can learn by analogy, student should be able to solve far transfer problems which are related to the original questions. It can be observed on how well the students can solve the problems and understand the core materials when they proceed into a more advanced, new lesson unit.

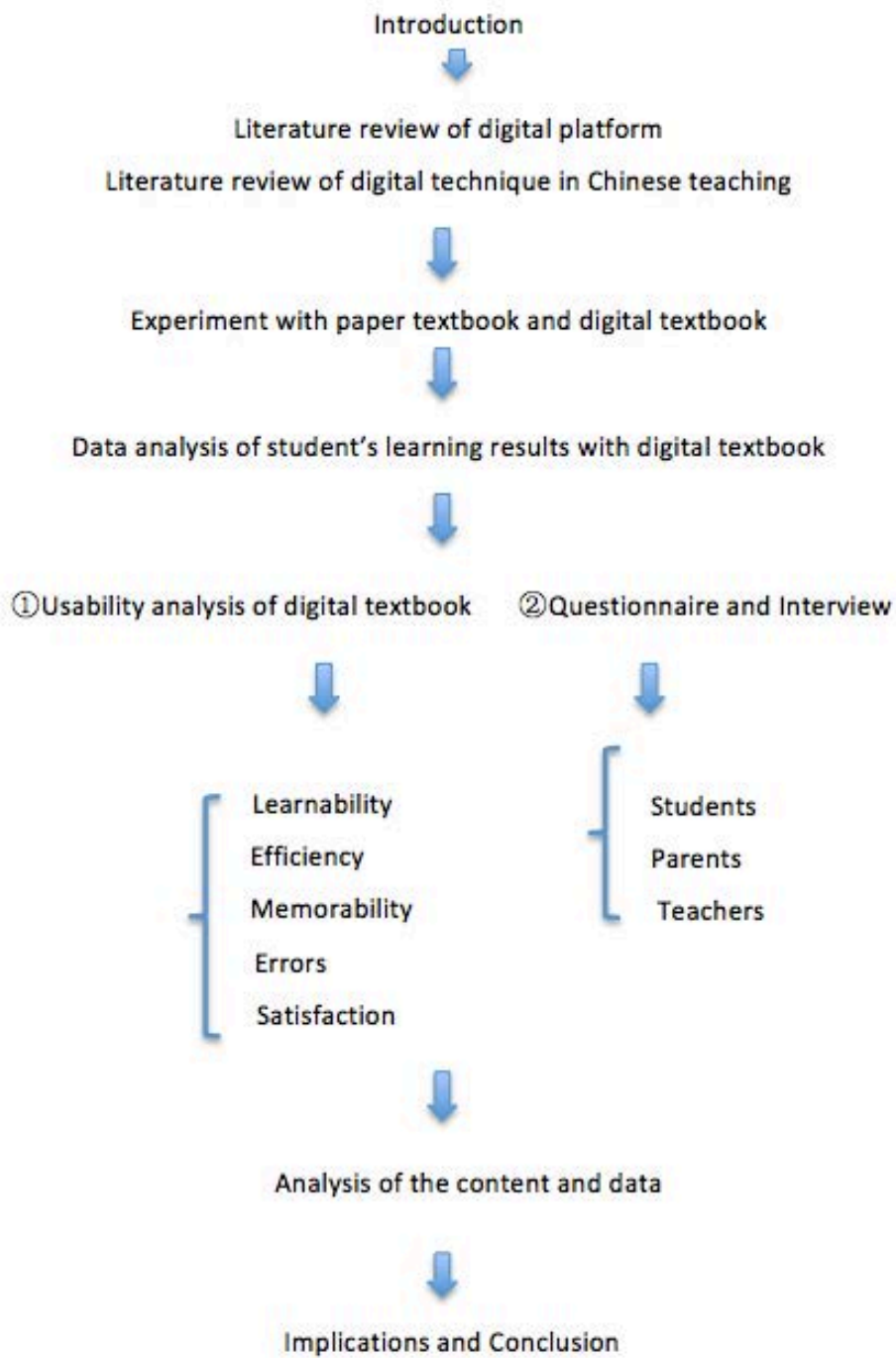
Sustainability should be measured by the amount of work the students do after the class in relation to what they have learned. This usually happen after school or at home. Sustainability can also be measured by the students' answers to questionnaire

questions about how much they prefer to study in the class using digital educational platform, on further, more challenging topics (Naomi Miyake, 2012).

Organization of the thesis

My project is a case study integrated with both quantitative and qualitative methods. The project is based on this structure below. First there is an introduction of the thesis, then the author will do a literature review of the digital platform and also a literature review of digital technique in Chinese teaching. Then the author conducts experiment with paper-based textbook and digital textbook, after the experiment there will be the data analysis of student's learning results with digital textbook. The analysis includes two parts, one part is the usability analysis of digital textbook: learnability, efficiency, memorability, errors and satisfaction. The other part is sending out questionnaires and interviews to the students, teachers and parents. After the experiment the most important part is analysis the content and data. In the end the author will do the conclusions and give some implications.

Graph 6: Structure of the thesis



The research will conduct a case study with qualitative methods and quantitative methods.

Chapter 2: Literature review

What is Chinese?

Modern Standard Chinese is the official language in several important economies in the Asia Pacific region, including Mainland China, HongKong, Macau and Taiwan. It is also one of the official languages in the Republic of Singapore. As one of the six official languages used by UN (United Nations), Chinese now has earned itself greater status in the World.

Chinese is also ranks the number one largest languages all around the world, and more and more people from all over the world start to learn Chinese and Chinese language learners are no longer exclusively of Chinese residence, consequently the Chinese language is gaining weight and popularity in a growing number of higher institutions, public and private schools in Europe.

The official language of China is the Mandarin, which has the name of 'Hanyu' or 'Putonghua'. It is the common language of all modern Han nationality people. In Taiwan Province and Hong Kong, it is called 'Guoyu' while in Singapore and Malaysia, it is often called 'Huayu'.

Refer to Chinese people may think of Cantonese, which is spoken by the people of Hong Kong, Macau and the wider Guangdong province, including Guangzhou. Most foreign Chinese communities, such as those in London and San Francisco, also speak Cantonese because historically Chinese immigrants hailed from Guangdong.

In the thesis Chinese refer to Mandarin because is the official language of China. Mandarin is shaped and based on the Beijing dialect and other dialects spoken in the northern areas of China. Mandarin is used as a mother tongue by most people around the world, accounting for about one fifth of the world's population.

Also Chinese once had very great influence on some peripheral countries with their languages and characters, such as Japanese, Korean and Vietnamese.

What is culture?

Talking about culture there are a lot of definitions, here we list some of the famous definitions.

‘Culture ... is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.’

Tyler (British anthropologist) 1870: 1; cited by Avruch 1998: 6

‘Culture consists of patterns, explicit and implicit, of and for behaviour acquired and transmitted by symbols, constituting the distinctive achievements of human groups, including their embodiment in artifacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values; culture systems may, on the one hand, be considered as products of action, on the other, as conditional elements of future action.’

Kroeber & Kluckhohn 1952: 181; cited by Adler 1997: 14

‘Culture consists of the derivatives of experience, more or less organized, learned or created by the individuals of a population, including those images or encodements and their interpretations (meanings) transmitted from past generations, from contemporaries, or formed by individuals themselves.’

T.Schwartz 1992; cited by Avruch 1998: 17

Above all, to understand more clearly what culture is, it is the characteristics and knowledge of a particular group of people, defined by everything from language, religion, cuisine, social habits, music and arts.

The word "culture" derives from a French term, which in turn derives from the Latin "colere," which means to tend to the earth and grow, or cultivation and nurture. "It shares its etymology with a number of other words related to actively fostering growth," Cristina De Rossi, an anthropologist at Barnet and Southgate College in London, told Live Science.

Confucian Heritage of Chinese Educational Culture

Confucian is defined as traditional attitudes and practices existing in East Asian societies, which ultimately are, derived from the teachings of the Chinese philosopher Confucius (551-479 BCE) and his later followers. Thomas Lee, in his work *Education in Traditional China, A History*, begins with a lengthy discussion of the Confucian roots of Chinese education (T. H. C. Lee, 2000). Li (2002) refers to the recognition of Mencius, one of the earliest and most influential interpreters and extenders of Confucian thought, as the archetypal teacher. Although some would note the post-colonial aspects of identity in the predominantly Chinese cultures, for example, Singapore and Hong Kong (Bray, 1997; Tan, 1997), but the dominant educational influence in those Chinese cultures is vernacular Confucianism (Jin & Cortazzi, 1998), rather than any attempt to define themselves in opposition to or distinction from colonial oppressors.

Confucian influence can be seen in three aspects, they are namely the centrality of learning or study, the place of memorization and the moral aim of education.

1. The centrality of learning or study

There are some famous quotes that Confucius think about education and learning. For example,

"Isn't it a pleasure to study and practice what you have learned? Isn't it also great when friends visit from distant places? If one remains not annoyed when he is not understood by people around him, isn't he a sage?"

"I hear and I forget. I see and I remember. I do and I understand."

"The essence of knowledge is, having it, to apply it; not having it, to confess your ignorance."

"When I walk along with two others, from at least one I will be able to learn."

Learning is the center of Confucian theory. "The Confucian tradition is characterized by discourse and debate on learning—why learning is significant, and how it is to be

carried out" (W. O. Lee, 1996, p. 27). Education in China is never treated as exclusive for elite in the theory of Confucian. Confucius treats all his students equally and advocate for opening education. He is always looking for those who are anxious to learn and eager to learn, regardless of their innate ability.

Li (2001, 2002) also found that central to the Chinese conception of learning even today is the idea of hard work. "All this suggests that differences in intelligence, according to Confucius, do not inhibit one's educability, but the incentive and attitude to learn does" (W. O. Lee, 1996, p. 29).

2. Deep learning and memorization

There is a stereotype when western educators see Chinese education. They thought the education in China is full of exercise and memorization without thinking (Dooley, 2003; Kember & Gow, 1991). Several writers (John B. Biggs, 1996; Kember & Gow, 1991; Marton, et al., 1996; Watkins, 2000) argue that in fact, Westerners have misperceived the use of memorization and have missed the deep orientation in Chinese learning. "While rote learning is regarded as being characterized by mechanical memorization in the West, such a notion was found not to describe learning practices associated with repetition in the Chinese culture adequately" (Marton, et al., 1996, p. 82).

In fact, Chinese students use memorization as the way to understanding, and repetition as the way to memorization (Marton, et al., 1996). When a child is learning to write Chinese characters, the teacher always give the homework to write each character 10 times to memorize how to write it. Repeating is the best way to learn a new knowledge, because sometimes each time repeat, you will have some new idea of understanding, in this way that you can understand better.

3. Moral aim of education

Confucius introduced the concept of a moral state and a disciplined society. The moral theory is the center of Confucius' philosophy, which is the most important part of the Confucianism.

Confucius thought highly on moral education in his teaching. Cultivating persons who were high qualified and virtuous was the main aim of his education. Confucius instructed his students that they should pursue ‘the truth’ and ‘moral integrity’ during all their life. And he viewed that moral education was beneficial for individual improvement, and could facilitate the development of society and the nation. Furthermore, Confucius indicated that virtues were not acquired innately, but developed through teaching and training.

The goal of Confucius’ moral education is to help each person improve moral characters and behaviors to become a completely virtuous person. And the main contents of moral education is “Junzi”, who is characterized by superiority of mind, virtues, ideals and moral.

A 2006 survey of local and municipal education office heads in China revealed that 100% believe moral education is important, with more than 76% believing that "moral education is the heart and soul of quality education" (Crawford, 2006).

History of foreign language teaching and learning

Language education refers to the process and practice of acquiring a second or foreign language. It primarily is a branch of applied linguistics, however can be considered an interdisciplinary field. There are four main learning categories for language education: communicative competencies, proficiencies, cross-cultural experiences, and multiple literacies (Phillips, 2007).

Increasing globalization has created a great need for people in the workforce who can communicate in multiple languages. Common languages are used in areas such as trade, tourism, international relations, technology, media, and science. Many countries such as Korea (Kim Yeong-seo, 2008), Japan (Kubota, 1998) and China (Kirkpatrick & Zhichang, 2002) frame education policies to teach at least one foreign language at the primary and secondary school levels. However, some countries such as India, Singapore, Malaysia, Pakistan, and the Philippines use a second official language in

their governments. According to GAO (2010), China has recently been putting enormous importance on foreign language learning, especially the English language.

In ancient times, there is great need to learn a foreign language. For many centuries, Latin was the dominant language in education, it was used for commerce, religion in Europe. As the country separated, French, Italian and English began to use in the 16th century. Then in the 18th century, the study of modern languages are becoming a part of the curriculum in European schools, students began to do exercises, study grammar and translating sentences. And in the 19th century began the innovation in foreign language teaching and lasted for 20th century. The earliest applied linguists included Jean Manesca, Heinrich Gottfried Ollendorff (1803–1865), Henry Sweet (1845–1912), Otto Jespersen (1860–1943), and Harold Palmer (1877–1949). They worked on setting language teaching principles and approaches based on linguistic and psychological theories, but they left many of the specific practical details for others to devise (Richards & Rodgers, 2014).

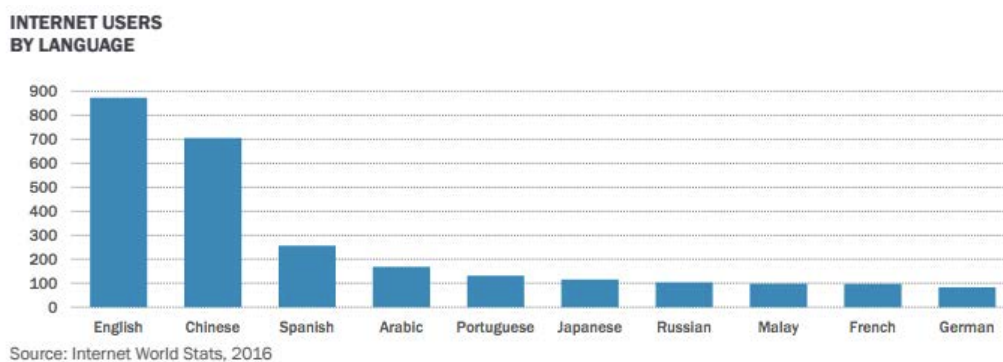
However this foreign language education in the 20th century is treated as a failure, because the students' level of the foreign language is minimum, and only a few researchers can read and assess information written in other languages besides their mother tongue. Then there are new methods of learning a foreign language, there have been two major branches in the field, the empirical and the theoretical. Researchers on the empiricist side are Jespersen, Palmer, and Leonard Bloomfield, who promote mimicry and memorization with pattern drills. These methods follow from the basic empiricist position that language acquisition results from habits formed by conditioning and drilling. In its most extreme form, language learning is seen as much the same as any other learning in any other species, human language being essentially the same as communication behaviors seen in other species. On the theoretical side are, for example, Francois Gouin, M.D. Berlitz, and Emile B. De Saüzé, whose rationalist theories of language acquisition dovetail with linguistic work done by Noam Chomsky and others. These have led to a wider variety of teaching methods, ranging from the grammar-translation method and Gouin's "series method" to the

direct methods of Berlitz and De Saucé. With these methods, students generate original and meaningful sentences to gain a functional knowledge of the rules of grammar.

Foreign language teaching has become an integral part of the 21st century's life-long learning process, with billions now learning a foreign language: 0.25% of them travelling abroad to learn in a local, native environment. Yet little is actually known about students' reasons for learning a particular language abroad or the overall demand for language courses and the effects of emerging market shifts. This stems primarily from a lack of documentation on certain languages (and their learning abroad), with the availability of data varying considerably by language.

According to Internet World Stats, the data en 2016 show that Chinese is the most wide-spread mother tongue in the world, English is the most common language of second choice. English also leads the ranking of most utilized languages on the Internet, although Chinese has been closing the gap over recent years. Spanish ranking the third.

Graph 7: Internet World Stats 2016



Foreign language learning we can see from the number of takers of foreign language tests, it is a supportive indicator that can assist in measuring the demand for foreign languages, especially in indicating trends in language learning.

Interest in various language tests indicates an appetite for learning a particular language, predominantly nationally, since the majority of test takers pass the exam in their home country.

We can see from the major language test that the learner is growing rapidly and has been a trend to learn a foreign language. The English test we have IELTS. It is International English Language Testing System (IELTS), it was introduced in 1989 and has been taken 15,000,000 times worldwide. The exam is produced by Cambridge English Language Assessment and jointly owned with the British Council and IDP: IELTS Australia. In 1994 there were 210 IELTS centers in 105 countries. The figure had climbed to 800 locations in 130 countries by 2010. More than 2.5 million people took the exam in 2014. And the Chinese language, we have HSK test. In 1992, the Ministry of Education began to promote the Chinese Proficiency Test (HSK), both at home and abroad. In total, there are 728 test sites in 91 countries. The most recent official figure of HSK test takers dates back to 2009, claiming that more than 600,000 Chinese language learners registered and attended the test.

So we can see that the foreign language learning is become more and more popular. It has become a part of the education curriculum. Nowadays language education can take place in classrooms but also online. There are many ways to learn a new language. There are audio recordings and books, the book contains all the knowledge of the language, and native speakers that contain in the audio CD read the conversation or the words or mp3 files online. People can learn from the book and the audios help the pronunciation and give a environment for a new language. There are also webpage and software for learning a foreign language. There is a software very famous for learning a new language, it is called Rosetta Stone. Rosetta Stone Language Learning is proprietary computer-assisted language learning (CALL) software published by Rosetta Stone Inc. The software uses images, text, and sound to teach words and grammar by spaced repetition, without translation. Rosetta Stone calls its approach Dynamic Immersion (a term which has been trademarked). This software is popular because it is different from other language learning software, it

teach in a way that a baby is learning his or her mother tongue. And nowadays there is also a software very popular among people around the world. A lot of people began to learn a foreign language from an application on the mobile, for example Duolingo, it is a free language-learning platform that includes a language-learning website and app, as well as a digital language proficiency assessment exam. Duolingo offers all its language courses free of charge. As of November 2016, the language-learning website and app offer 68 different language courses across 23 languages, with 22 additional courses in development. The app is available on iOS, Android and Windows 8 and 10 platforms, in the year 2016 there are about 150 million registered users across the world.

Background and literature review of Chinese education in Spain

A comprehensive study of Chinese language education in Spain would be of great significance for both China and Spain. First, Chinese education review of the past and present will help form a general picture of the perception and popularity of Chinese language in Spain. Second, it will help locate opportunities and challenges in overseas Chinese language teaching and contribute to the improvement of teaching outcomes and increase popularity of Chinese language education overseas.

Currently many countries trigger the popularity of learning Chinese, but Chinese teacher shortage, not enough teaching resources and lack of conditions of the system of learning Chinese are the main problems of Chinese teaching in a foreign country. Chinese education overseas has been difficult to break through and overseas Chinese schools and parents are worried. Practice show that Chinese education only rely on the Chinese school is not enough, but also need to provide student a good Chinese learning environment and using technologies to improve the learning efficiency.

Learning Chinese is becoming more and more popular all around the world, it is the same popular in Spain. If you search Chinese language school, only in Barcelona

there are 63 Chinese language schools, don't need to mention the whole Spain. Each city in Spain no matter how small the city is, there is one Chinese language school.

The author interviewed some teachers in Chinese language school in Barcelona, Madrid, Murcia and Granada. Most of the Chinese teachers are from a institute called Confucius Institute (Chinese: 孔子学院). It is a non-profit public educational organization affiliated with the Ministry of Education of the People's Republic of China, whose aim is to promote Chinese language and culture, support local Chinese teaching internationally, and facilitate cultural exchanges. The Confucius Institute program began in 2004 and is overseen by Hanban (officially the Office of Chinese Language Council International). The institutes operate in co-operation with local affiliate colleges and universities around the world, and financing is shared between Hanban and the host institutions. The related Confucius Classroom program partners with local secondary schools or school districts to provide teachers and instructional materials. Until October in 2015, there are 493 Confucius Institute around the world, and there are 998 Confucius class, the partnership is with 133 countries all over the world. In Spain, Confucius Institutes are in almost all the big cities and there are around 200 Chinese teachers teaching in the primary school, secondary school and institute. All the Chinese teachers are volunteered to work in Spain and they receive pension from Chinese government every month.

In Spain, some of the university also has the major and master about Chinese Culture and language. For example the Autonomous University of Barcelona, there is a bachelor degree in East Asian Studies. The aim of this degree is to equip students with knowledge on the social structures of countries of the Asian Pacific region and its customs, beliefs, ideologies and cultures, with a special emphasis on the languages of the region. It specifically provides students with advanced knowledge of the Japanese, Chinese and Korean culture. Students can choose between Japanese and Chinese as their first foreign language, then the other languages including Korean can be choose as second or third foreign languages. The Faculty of Translation and Interpreting at the UAB was the first to offer this degree in Spain. It was also the first

center in Spain, which focused on the study and teaching of East Asia in particular and in relations with countries of the region. And many of its teaching staff members are natives and a great number of students are from abroad. This faculty cooperates with many of the universities and institutions in Asia, so it offers a lot of opportunities for the students to exchange to Asia to study their languages and culture.

There are also some private Chinese language schools in Spain, and each language school offers different language course, including one to one private tutor or one to more Chinese language class. Usually the Chinese teachers are students who studied Chinese language teaching for foreigners. And each institute use different Chinese textbooks to teach. And some of the institute made their own book to teach, the teachers not only teach in the class, they also participate in editing the Chinese book. Wu Yan a Chinese teacher in Barcelona is a doctorate student in Chinese language teaching for foreigners, she participate in editing a material Chinese book used for teaching Spanish Chinese.

Also some of the language institutes use directly Chinese books that are world wide popular, such as Kongzi Institute. Kongzi Institute is the largest Chinese language school in Spain. It has more than 2000 students in the year 2016, it covers all the level of Chinese learning. They use the textbook Zhongwen and also the textbook has the digital version online. They have 4 institutes in Barcelona in 2016 and now opened 2 institutes more.

A new way of teaching and learning

Today's students have opportunities to learn in different ways from those of previous generations, with much of the change due to advancements in information technologies. Growing trends among students demonstrate increased passion for and reliance on technologies for entertainment and communication (Lenhart & Madden, 2007). At the same time, digital equity continues to be of prime concern to educators

as they strive to create learning experiences that serve all students (Leu, Kinzer, Coiro, & Cammack, 2004).

E-learning

According to Rosenberg, E-learning refers to “the use of the Internet technologies to create and deliver a rich learning environment that includes a broad array of instruction, information resources, and solutions, the goal of which is to enhance individual knowledge and performance” (Rosenberg, 2005). A noteworthy component in this definition is rich learning environments, perhaps eluding to Daft and Lengel’s (1984) media richness theory, or learning through enhanced communication and visual cues to resolve ambiguity to facilitate understanding. This may occur via multimedia, such as audio, video or media-enriched modalities. More broadly conceptualized, e-learning is a “structured, purposeful use of electronic systems or computers in support of the learning process” (Allen, 2003). E-learning typically spans distance, although not all distance education is considered e-learning (Rosenberg, 2001).

With the e-learning environment, there is a controversy conflict about students’ performance. Some experts believe that students’ performance outcomes are the same in an e-learning environment as in the traditional face-to-face learning environment (Russell, 2001, 2010). However, other experiment results suggest that student performance is better in online learning environments than in traditional campus-based learning environments according to a report commissioned by The United States Department of Education, Means, Toyama, Murphy, Bakia, and Jones (2009). They found that “students who took all or part of their class online performed better, on average, than those taking the same course through traditional face-to-face instruction”. Also in the year 2002, Schutte conducted an experiment at California State University- Northridge that compared the learning outcomes between traditional campus students and e-learning students and found that the e-learning students performed 20% better than students in the traditional campus course (Schutte, 2002). While on the other hand, there is also prove that is on the contrary, which showed that

online students do not perform as well as their campus-based counterparts. Based on this perspective, a study conducted by Michigan State University found that economic students performed nearly 10% lower while learning online than face-to-face, all things being equal (Carnevale, 2002). These opposing views add even more ambiguity to the debate as to whether, or not, e-learning is effective.

According to the 10 e-learning trends in 2015 (Table 4), we can see the trend for e-learning, digital textbook is a concept includes almost all the trends. It is an integration of various technologies that can provide students new and more relevant learning experiences, it includes the games, it is for personalized learning and the ways students learn and absorb new knowledge through digital textbook platform can maxims the learning process. Learners recall just 10% of what they read and 20% of what they hear. If there are visuals accompanying an oral presentation, the number rises to 30% and if they observe someone carrying out an action while explaining it, 50%. But learners remember 90% if they do the job themselves, even if it is only a simulation. Digital textbook is a platform and a tool for students to learn by doing and absorb information through personalized learning and improve students' competence.

Table 4: 10 e-learning trends

1	Big data	Big data analysis can improve e-learning by deeper understanding of the learning process. Statistics on completion time and rate can help track learner and group patterns.
2	Gamification	applying game mechanics and game design techniques to engage and motivate people to achieve their goals.
3	Personalized Learning	Tailoring of pedagogy, curriculum and learning environments to meet the needs and aspirations of individual learners.
4	Mobile Learning	Easy access – users can access the course anywhere and anytime they need it. Contextual learning – with QR codes, GPS and other technology mobile learning lets you put learning into context, depending on the location of the learner. It's also a great base for using augmented reality; Digestible content – smaller screens force educators to deliver content in smaller chunks, which

		makes it easier for learners to remember what they learnt;
5	Focus on Return-on-Investment	Return on Investment (ROI) compares the investment in training deliverable with the benefits over a specified period of time.
6	APIs	Application Programming Interface (API) is basically the way applications communicate with each other. The widely accepted SCORM and Tin Can are two examples of APIs in eLearning.
7	Automation	Content creation is a tedious and time-consuming process. If we could somehow automate the process of content creation then we could potentially create a revolution in the quantity and quality of online courses.
8	Augmented Learning	Augmented learning is an on-demand learning technique where the environment adapts to the learner.
9	Corporate MOOCS	Massive Open Online Courses are open courses for large numbers of users. MOOCs are often used by top universities. In the last few years MOOCs have also been getting more popular among companies and organizations.
10	Rise of cloud LMS	Despite speculations about the death of LMS, last years showed continued growth in the industry. Forecasts for 2015 predict it will continue to grow. Out of all learning systems, cloud-based platforms had the highest growth in the last two years.

E-book

There is a new way of reading books in the information society, which is called E-book. Normally an e-book consists of content presented digitally or electronically, that consist of text, pictures, images, charts and tables, which typically includes all parts of the original book. And it is viewed on a device, such as desktop or handheld device like ipad with a screen (Armstrong, Edwards, & Lonsdale, 2002; Hyatt, 2002; Lau, 2008).

Hart said:

An eBook has to be searchable, quotable, a source for new editions or republication of old editions, and be trivial to read, search, quote, and all those things via all common hardware/software combinations.

Wiley defined a learning object as “any entity, digital or non-digital, which can be used, re-used, or referenced during technology supported learning” (Wiley, 2000), an example of which is instructional content. Therefore, e-books may be categorized as learning objects, especially when each textbook chapter can be digitally accessed, separately, as a small chunk or unit of instructional content (Buzzetto-More et al., 2007).

Digitized texts have been available since the inception of Project Gutenberg in the year 1971. Michael Hart launches it in the year 1992 in the University of Illinois. What is the project purpose? The purpose is to increase the job proficiency. They want the students learn more about the computers, so they give an inordinate amount of free computer lab time. In the year 1992, Hart reproduced, distributed, and posted the Declaration of Independence in digital format. After that, he proclaimed “the greatest value created by computers would not be computing, but would be the storage, retrieval, and searching of what was stored in our libraries” (Hart, 1992). By producing a single document in digital format, Hart realized that a work could be distributed to many while being stored and retrieved indefinitely. So up to the year 2010, Project Gutenberg hosts over 30,000 free e-books, most of which are classics that have passed into the public domain, because the copyright protection or intellectual property rights have expired (Rawson, 2010). Those E-books can also downloaded to devices, such as ipad.

The first hand-held eBook readers appeared in 1998 with NuovoMedia’s Rocket eBook and Softbook. By 2000, the Microsoft Corporation entered the market with its Reader with ClearType technology for pocket PCs. By 2010, the eBooks and eReader market had taken off, increasing from about 5 percent to nearly 10 percent of the market over the previous year (Bosman, 2010).

In the year 1976, Burnard in the United Kingdom created the Oxford Text Archive (OTA) with the purpose of providing “electronic texts to the scholarly community . . . in more than 25 different languages” (Vassiliou & Rowley, 2008). Then the OTA “develops, collects, catalogues and preserves electronic literary and linguistic resources for use in Higher Education, in research, teaching, and learning” (Oxford University Computing Services, 2010).

In the year 2005, the Google Books Project has partnered with five of the world’s largest libraries to make scholarly materials more accessible to the public in e-book format. The Google Book Project has the potential of scanning nearly 60 million books into e-books from the library collections housed at Harvard University, Stanford University, the University of Michigan, University of Oxford, England, and New York Public Library (Carlson & Young, 2005). With an objective of scanning more than 150 million of the world’s books into e-books, the Google Books project is about 10% completed (Trachtenberg, Vascellaro, & Efrati, 2010). Furthermore, Google e-books (i.e., formerly branded as Google Editions) now offers more than 2 million e-books for free (i.e., works that have fallen into the public domain and partial book viewing) along with hundreds of thousands of e-books for purchase. In terms of e-book offerings, Google’s new online bookstore is now the largest e-book provider in the world, thereby positioning it to compete with Amazon.com, which holds about 65% of the e-book market share (Albanese, 2010; Trachtenberg et al., 2010).

Digital textbook

Textbooks, paper textbooks, play for a long time a key role in the educational systems. They still are a widely used reading and working support for students. Many researches have been devoted to them (Johnsen, 1993; Mikk, 2000; Moeglin, 2005; Bruillard, 2005).

A digital textbook is a digital book or e-book intended to serve as the text for a class. Digital textbooks may also be known as e-textbooks or e-texts. Digital textbooks are a major component of technology-based education reform. They may serve as the texts

for a traditional face-to-face class, an online course or degree, or massive open online courses (MOOCs).

Digital textbook is originally known as electronic books (e-books), but since 2007 it have been called “digital textbook” to emphasize its teaching and learning functions and roles in schools (Jung, 2008). That is to say, digital textbook is focus on formal and functional aspects of educational materials that students and teachers use in schools, so they are used in a comparatively limited way versus e-books generally (Kim, Yoo, Park, 2010).

Consequently, digital textbook can be defined as curriculum-based electronic textbooks for students that can be read on various types of devices, such as desktop computers, notebooks, tablet computers, or dedicated devices through wired or wireless networks, without time or space limitations. Digital textbook can support richer learning content with a combination of various learning materials, including not only textbooks, reference books, workbooks, dictionaries, and hyperlinks, but also multimedia content, such as audio, 3D graphics, animations, video, and virtual and augmented reality. Which means digital textbook can provide the features of traditional printed textbooks, with the added benefits of IT and various multimedia features (Yim, 2007).

Of course digital textbook has some advantages over paper-based textbook. The most important is digital textbook can support more diverse learning opportunities and a much wider range of learning activities with rich learning content by combining several educational materials with various types of multimedia features and information delivery methods in a ubiquitous educational environment. They can also quickly accommodate the latest information and new knowledge and changes (Yim, 2007).

Tablets

Tablet is also a word we hear a lot in the E-learning era. It is a mobile PC, typically with a mobile operating system and LCD touchscreen display processing circuitry,

and a rechargeable battery in a single thin, flat package. Tablets can capture picture/video, play video games, access the web, play media, navigate using GPS, and place and receive voice/video calls and text message.

In some extent, it is similar to an E-book and digital textbook, because some of the content just need a platform to perform to the user. Some of the schools start to use tablets for teaching. Churchill, Fox et al. (2012) argue that the extent to which Tablets will be used in education depends largely on teachers' perceptions of the affordances of this technology. They further argue that one of the limitations of research on the impact of Tablets is that it often looks at the affordances or qualities of Tablets separately from teachers' theories of how they can be used in teaching.

For example an iPad is a tablet, Dhir, Gahwaji et al. (2013) carried out a literature review on the subject of the iPad's role in education and found a number of frequently perceived benefits using iPad in class, such as students can use anytime and anywhere and it is good for classroom and small-group teaching activities, apps for teaching and learning, communication between teachers and students and support for interactive and collaborative learning.

In the year 2012, Acer and European Schoolnet carried out a new pilot study in 2012 on the use of tablet devices to enhance teaching and learning practices. During this study, Acer equipped 263 teachers in 63 schools from eight European countries (Estonia, France, Germany, Italy, Portugal, Spain, Turkey and the United Kingdom) with Acer Iconia W500 tablet computers. The project is to understand the use of tablets to enhance student's learning. Tablets were used across a variety of subjects, and tablets were mainly used for preparation of the lessons and classroom-based activities. Teachers showed confidence in the use of ICT. Students have the same access to information and tablets ensure richer content and a richer variety of content for students to work with.

Based on the rich media development of the Internet, now digital textbook forms a dynamic market, e-learning paradigms emergent, traditional publishers also have

pressure to change their business models. At present, digital textbook has attracted unprecedented attention of many governments. It has developed gradually from a hot study subject and a good technical innovation into a better tool, on the national level, to promote the development of popularization of education information and to improve the competitive capability of education.

European Commission sets out a European agenda for stimulating high-quality, innovative ways of learning and teaching through new technologies and digital content. While 70% of teachers in the EU recognize the importance of training in digital-supported ways of teaching and learning. Today's learners expect more personalization, collaboration and better links between formal and informal learning much of it being possible through digital-supported learning.

An increasing number of schools in Europe are switching from print textbooks to digital textbooks. Digital textbooks started out as electronic books that transferred paper-based content to digital form and have evolved into teaching and learning support systems equipped with numerous tools to help learners explore, build, apply, and share knowledge.

In schools there is an increase of, with regular presence in classrooms, a wide variety of technological devices such as smartphones and tablets, but in most cases, neither the teachers nor the administration know how to take advantage of these resources. When addressing education and learning we cannot neglect one of the main instruments that have always accompanied with every student: the textbook. In Spain, traditional textbooks are the main business for few companies and when it comes to digital educational resources, the scenario is even more defined, with the notoriously overwhelming leadership of only one company.

Digital textbooks around the world

Digital textbook already applied in the classroom in some countries and have good teaching effectiveness. In different countries, there are different digital textbook projects. And they use different digital educational platforms forms.

There are three mainly used digital educational platforms from three different countries. One is the digital textbook from South Korea, its Digital Textbook project started in 2007 and tested in pilot schools, the government want to equip the students for the future and provide more interactive, authentic and rich learning experiences, the outcome and achievement showed a great results in teaching. The other one is the Digital Textbook Play book from the USA, its playbook offers information for schools and classrooms to provide student a rich digital learning experience, and it is an interactive set of learning content and tools that used through laptop, tablet and other devices. The third one is the Netbook from the Future classroom lab, which is a project conducted by European Schoolnet and ran in parallel in six countries: France, Germany, Italy, Spain, Turkey and the UK from 2010, supporting teachers teaching in the schools using technology in the teaching processes and developing a sustainable network of schools engaged in the innovative approaches to implement ICT in the classroom. The author will give a detailed explanation of each country that using digital textbook.

Digital textbook play book in the USA

In the year 2011, State of the Union address, President Obama said, “I want all students to be able to learn from digital textbooks.” So digital textbook walked into the class in the US.

Federal Communications Commission and the U.S. Department of Education and builds upon the FCC’s National Broadband Plan and the Department of Education’s National Education Technology Plan. These four departments collaborative to bring the digital textbook into the class.

The Digital Textbook Playbook is a guide to help K-12 educators and administrators advance the conversation toward building a rich digital learning experience. This Playbook offers information about determining broadband infrastructure for schools and classrooms, leveraging home and community broadband to extend the digital learning environment, and understanding necessary device considerations. It also

provides lessons learned from school districts that engaged in successful transitions to digital learning.

For the educators, there are four major guideposts.

1. The first is to make the transition to create a digital learning environment. Nowadays students are “digital natives” – they are growing up in a decidedly digital world. Digital learning educates students using the same technology they use for communication and entertainment outside of school, such as smartphones, tablets, and laptops. It is not that students are only engaged by technology, but instead the passive, one-size-fits all education practices are not adequately adaptable to each student’s needs and aptitude. Digital textbook also give an opportunity for all the students to learn equity, they have the same access to tools, resources and content.

The researchers also point out that schools may take different roads to arrive at using digital textbook, but they all need collaborative leadership, thoughtful planning with all stakeholders, engagement of all teachers, creativity and flexibility plans from the teachers.

2. The key is to deliver sufficient connectivity in the school so that students in the classroom can access the Internet. The US Department of Education provides educators with a tool to estimate their bandwidth needs. This bandwidth calculator was updated in February of 2012, to coincide with the release of this Playbook. While in the US, not all the schools need the same bandwidth, so with different school is a different case.
3. The connectivity beyond school is also important, so that the students can access teaching and learning materials at home, which provide a digital learning environment. School also needs to provide additional resources and expertise to transform community institutions into digital learning centers. There are also home broadband adoption programs, for example Comcast, offers broadband and

an optional netbook, also digital literacy training for students. Also “Connect to Compete” program that offers laptop or desktop and free digital literacy training.

4. Device is also important, and the key users of digital textbook include students, teachers and parents. The device should be connected to a network and students can use it anytime and anywhere. Also students can share ideas with other students and can work with them together. Some of the schools are also implementing a BYOD model, which means bring your own device, that allows students to bring and use their devices for digital learning. This way is good because the family can choose the best device for their children, and students who have an ownership normally may take better care of the device and it reduces the cost of school.

So as this project is implemented, students no longer need to take the 50 pound backpacks with outdated paper-based textbooks, they only need to carry a light digital device that combines internet, which contains personalized content, learning materials, videos and games.

The results show that during the academic year 2010-11, 250,000 kids were enrolled on full-time virtual public schools (5% of public school students), 40 of the 51 states have passed significant online learning policies including educational funding (70 to 100% courses on public schools, depending on state). Some states like Florida are producing and offering their own digital courses free for their students and with tuition for outsiders. Since the project NetSchools (1996), the first to provide 1:1, numerous projects have been developed by companies with national or local cooperation. Florida is the first state to mandate, from 2015, the adoption of all instructional materials in electronic or digital format in all public k-12 schools. Then other states begin to introduce digital textbooks into the classroom. Alabama will be the 2nd one, with all high school kids with digital textbooks and tablets. Maine adopted a 1:1 laptop initiative for all middle school students in public schools (2002), expanding its reach to high school students by providing wireless network infrastructure to schools. Indiana, Utah, Washington, West Virginia, Texas and

California have implemented plans facilitating the use of digital platforms (devices, textbooks, etc.) to any school which requires.

Digital textbook in South Korea

In South Korea, the Korea Education and Information Service (KERIS) was established in April 1999 to support, plan, promote, and monitor the adoption and utilization of ICT in education. The Education Cyber Security Centre was set up to provide education institutes with a secure environment for Internet access, use of education information services, and protection against external hacking attempts (Hwang, Yang, Kim, 2010).

In the year 2010 the majority of the population in Korea is able to access the Internet anywhere and anytime: Internet utilization rate is 64.1% and 89.9% of the population use the Internet at home (Hwang, Yang, Kim, 2010).

A national project Digital Textbook project was launched by Korean Ministry of Education and Human Resources Development in 2007 with the help of pilot schools. In 2010, 132 schools and 6052 students in Korea participate in this project (2012, Seungyeon Han). In the year 2015, Qualcomm Wireless Reach and the Digital Textbook Association are conducting an innovative digital education service with 4G tablet PCs with first grade students at Saetbyeol Middle School in a metropolitan area near Seoul and Nongong Middle School in a remote area near Daegu, South Korea.

The project presents an exemplar model for digital education, instructional strategies, and future learning platforms in Korea. It is aligned with the Korean Government's "SMART" digital education initiative, which recognizes the correlation between educational progress and technology development and recommends the integration of these tools into the educational field. The project offers interactive learning environments that help students enhance self-directed learning ability.

The digital textbooks partly increased the academic achievements of students in elementary schools, especially in science and social studies (Byun, Ryu, Song, 2011). Also helped elementary students improve problem solving skills and self-directed

learning more than the printed textbooks (Byun, Kim, Song, Lee, 2010; Noh, Kim, & Lee 2010).

The impact of this digital textbook project has effective influence. The teachers, students and parents increase their confidence in using the devices. Teachers increased the amount of time spent on the devices for educational purposes from 75 minutes a day to 145 minutes a day. Teachers expressed confidence that tablet usage motivated students to study. Students became comfortable using the wireless devices for learning, increasing usage from 30 minutes each day to 125 minutes each day outside of school. They were also observed to be more engaged in class participation in school. Students' self-directed learning ability increased significantly and they were excited to be able to learn at their own pace, both in and out of class. Parents have become more open to using and supporting technology for learning and positive attitudes towards wireless devices for education have increased from 63% to 74%.

Japan Electronic textbook project

In Japan, the first digital textbook was developed in 2005 by a school-textbook company. It was for teachers to project and enlarge paper textbook in front of students.

Ministry of Internal Affairs and Communications of Japan, which is short for MIC, cooperate with the Ministry of Education, Culture, Sports, Science and Technology (MEXT), lunched a Future School Promotion Project. In Japan, computerization in classrooms trails behind many countries. In the top-level countries in the OECD Program for International Student Assessment (PISA), computerization of classrooms is pursued in wide-scale, Japanese level of ICT-utilization in the lowest level among them according to the 2009 PISA results of digital reading comprehension. For this reason, and also the result of the project of MEXT that the score was higher in the objective test given in the ICT-utilized class than those without, and pupils' knowledge, understanding and motivation to learn was higher. So Japan start this Future school promotion project. 10 primary school, 8 junior high schools and 2

special support schools participate in this project. They provide each school an environment of wireless LAN (Wi-Fi) and a tablet-type computer for each student (2010, Miwa Suzuki).

This project is a 4 years project, started in 2010 and ended in 2013.

The purpose of this project was to research on proper contents and appropriate usage of digital textbooks. The effect of digital textbooks has been tested from the point of Hardware– and Software-view (Taizan, Bhang, Kurokami, Kwon, 2012).

In japan, also there are several companies that develop digital textbooks mainly for teachers. These textbooks cover subjects such as Japanese, science, social studies and mathematics. A noticeable feature is that they have various functions, such as showing movies and pictures, marker-drawings and picture enlargement.

The effectiveness of using digital textbook can be seen in the report “The survey on the effect on learning from the use of electronic blackboard” by MEXT. Though this report is about electronic blackboard, but the content of this electronic blackboard is digital textbook. From the report we can see that many functions of digital textbook is used in the class. Showing textbook including moving page, viewing pages, scrolling display, enlarging figure and text, partial enlargement. Also the editing functions, showing teaching materials, training basics, sharing information, student support, authoring teaching materials. All these functions of digital textbook have been used in the class (Taizan, Bhang, Kurokami, Kwon, 2012).

Table 5: Categories about Functions of Digital Textbooks in Japan

Category	Function	Explanation	Using situation		
			When	Who	For What
Showing textbook	Moving page	Moves to the next page	In class	Teacher /students	Showing textbook
	Viewing both/single pages	Showing page in both/single page			
	Scrolling display	Showing page by scrolling			
	Enlarging figure and text	Focusing figure or text in textbook			
	Partial enlargement	Focusing one part in textbooks			
Editing functions	Marker, Pen	Make line in textbook contents	In class	Teacher /students	Add own idea in textbook
	Words balloon, Stamps	Insert Words balloon or stamps in textbook			
Showing teaching materials	Video Clips	Showing video clips	In class	Teacher /students	Understanding by other content
	Diagram animations	Showing diagram animation			
	Network	Showing information through internet			
Training basics	Kanji, Alphabets	Memorize kanji/alphabets	In class	Students	Memorize basic knowledge
	Flash Card	Memorize basic knowledge by Flash Card			
	Drill	Drills and exercises for memorize basic knowledge			
Sharing information	Board	Sharing students screen	In class	Teacher	Sharing student's information
Student support	Dictionary	Using dictionary	In class	Students	Understanding knowledge
	Speaking sound	Checking English pronunciations by play sound			
Authoring teaching materials	Saving Edited Files	Save file edited by marker or pen	Out of class	Teacher	Making teaching materials
	Teaching materials	Making Teaching Materials by using Figure and Picture in Textbook			

Source: Categories about Functions of Digital Textbooks in Japan

According to the education ministry in Japan, the number of students per computer remained at 6.5 in 2014, compared with its goal of 3.6 by fiscal 2017 set in the Second Basic Plan for the Promotion of Education. On average, only 37.4 percent of Japan's public schools were using digital materials in the classroom in 2014, which is a slight improvement on 32.5 percent from the year 2013.

Katsusika-ku Elementary school in Tokyo showed that the state of using tablet PC in class show good results. Students use tablet PC in the class of Japanese language, arithmetic and society courses. And each student can learn at his or her own pace and they all concentrate on this classwork. But also there is problem for teachers ICT level, because teaching skills of experienced teachers are reflected on test results obtained in

ICT-utilized teaching, implying that skill improvement of younger teachers is important.

Ashiro Elementary school showed that parents and schools already concerned the healthy way to use digital textbook. From health considerations, pupils create a small program of moving contents once each day to exercise in eye-movements.

The elementary schools questionnaire results show that children took very well to ICT-utilized learning, and teacher's skills in teaching with ICT are definitely improving.

Junior high school showed that the materials in storage were useful to teachers to follow individual pupils' growth. Teachers are increasing skills in ICT and leadership in classrooms. The system is highly evaluated among pupils. In addition, positive comments on the effect on classes from teachers, open class participators and guardians have been received.

China E-school bag project

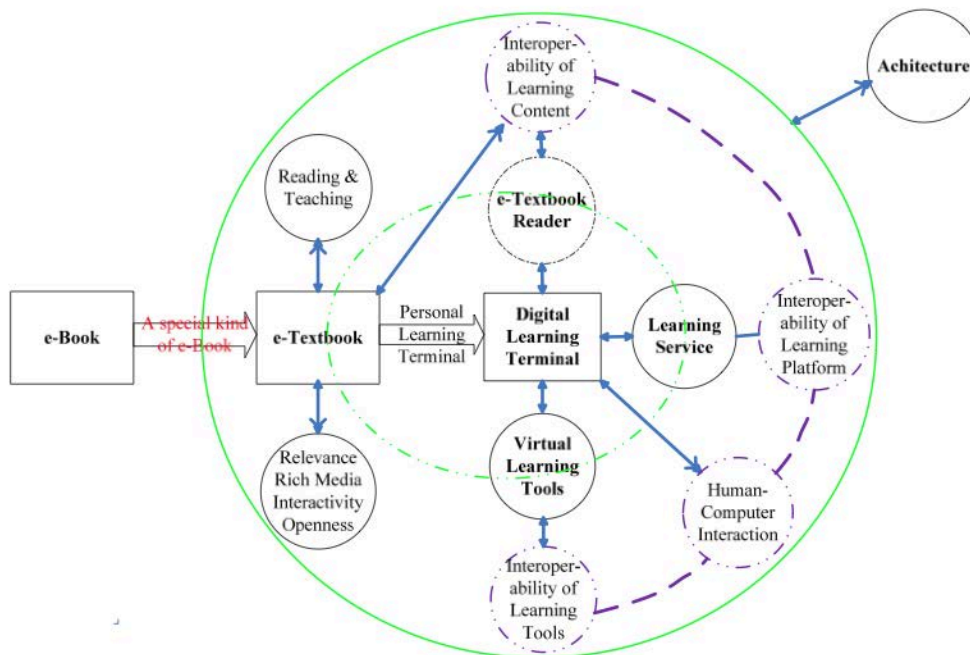
In China, under the high school entrance examination and the college entrance examination, students studied under great pressure. The students' school bag become more and more heavy. There is report that junior high school student's school bag's average weight is 7.5kg, and for high school students, the school bag's average weight is 10kg. So in the year 1999, the CPC Central Committee and the State Council issued the decision to deepening the educational reform to promote the quality education in China.

Ministry of industry and information Technology of China (MIITC) and General Administration of Press and Publication of China have conducted research on e-Textbook standards, as well as established relevant research institutions to work on the subject. An electronic reading industry consortium was founded in Taiwan and an e-Book industry consortium was founded in Shanghai. Shanghai Municipal

Commission of Economy and Information launched special research on e-Book industry. In Nov 2010, China e-Textbook and e-Schoolbag Standards Working Group (CETESBSWG) was jointly founded by the China National Information Technology Standardization Technical Committee of SAC (Standardization Administration of the People's Republic of China) and China e-Learning Technology Standardization Committee (CELTSC) of MOE (Ministry of Education) to work on e-Textbook & e-Schoolbag Standards (ETESBS).

E-school bag is different from e-book and e-textbook. E-book is e-content in the e-reader, it is a special kind of book. And e-textbook is a special book with readability and pedagogy that associate with rich media with interactivity and openness. When put e-textbook in a special device with e-service for learning, it is called an e-school bag. E-Schoolbag refers to the personalized learning environment with e-Textbook readers, virtual learning tools and ubiquitous learning services (Zhu & Yu, 2011; Wu, Zhu, & He, 2011).

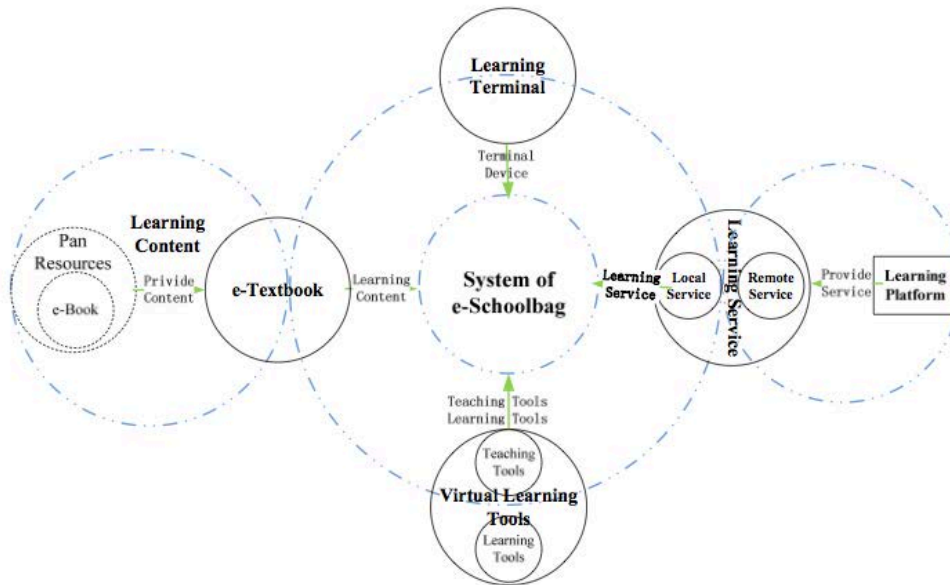
Graph 8: The figure of conceptual model for e-Textbook and e-schoolbag



source: The figure of conceptual model for e-Textbook and e-schoolbag

From the model of Yonghe Wu, we can show very clearly the conceptual framework of e-Textbook and e-Schoolbag from the perspectives of interoperability (Wu, Lin, Ma, Zhu, 2013).

Graph 9: The framework model of e-textbook and e-schoolbag system



source: The framework model of e-textbook and e-schoolbag system

These model shows the E-schoolbag system, it covers four parts: learning contents, learning terminals, learning tools and learning services. E-Textbooks are the core contents. Learning terminals, supplying hardware equipment to support learning activities, are the main media when using e-Schoolbag to study. They carry learning tools and online learning services. Learning tools are provided with virtual learning tools. Learning platforms supply all kinds of remote services to e-Schoolbag system, such as resources push, activity managements and so on (Wu, Lin, Ma, Zhu, 2013).

The widely used E-schoolbag has 7 functions.

1. Torturing function. It has variety learning resources, parents can view it and also talking online with teachers.
2. Notice function. Teachers can send notice to the students.

3. Attendance management function. Teachers can control and inspect student's studying time at home, parents can receive a message on the phone while their students are studying.

4. Account management function. Teachers, students and parents have a separate account and can log into the system in the same device.

5. Homework publishing function. Students can check their homework and see their grades.

6. Message function. Teachers can send message to the phone.

7. Class management function. Teacher can create a class and organize discussion between many classes.

Normally, different schools may use different models of E-schoolbags, some of the functions may be a little different, the provider of E-schoolbag will offer free training for the teachers and students.

Nowadays, there are many e-Textbook and e-Schoolbag initiatives and pilots under way covering nine provinces in China. All the pilot schools have electronic blackboard and Wi-Fi to connect E-schoolbags between teachers and students. And also all the content can be connected to the electronic blackboard.

The platform of E-schoolbag also has a lot of free teaching and learning materials, including lectures, E-textbook, videos, movies and E-book. Students and teachers can view all these materials for free.

The effectiveness of E-schoolbag is collected from many cities in China. A report from Shenzhen by Jiang Fengguang interviewed 28 teachers in 4 primary schools showed that in general the teachers are satisfied with E-schoolbag. They are happy about the functions of test and study after class, but they think some aspects need to be improved, such as the system of preparing of the class and preview function before the new class. Those teachers believe that E-schoolbag is easy to use and can satisfy different needs of teachers and students.

Another report from Guan Jueqi in the year 2015 did the experiment with 8 classes in 4 primary schools in Shanghai. 4 classes use E-schoolbag and 4 classes didn't use E-schoolbag. The students who use E-schoolbag have higher score in the exam than the students who don't use E-schoolbag. The motivation and studying feedback and participation are better using E-schoolbag. So we can see that E-schoolbag has influence of the learning results, and E-schoolbag brings a good experience of learning (Guan, Peter, Su, Zhu, 2015).

Another report from Zhongwei researched 191 students from Shanghai in 2016. From the learner's point of view, they found that learners are more attentive to E-schoolbag, it can promote communication between teachers and students. Also E-schoolbag stimulates the interest in learning, and erases the heavy learning burden. It also has a certain effect on the training of information technology and the ability of autonomous learning. Data analysis shows that communication, cooperative learning, learning interest, information technology ability and autonomous learning ability are significant Positive correlation. Therefore, whether it is researchers, school managers or front-line teachers, we must step by step to promote the application of e-schoolbag in the classroom, so as to cultivate learners self-learning and other aspects of capacity. In Europe, there are many education projects established related with new technologies to make innovation in education, the importance of digital technology in learning and teaching are obvious (Zhong, Wu, Feng, Wang, 2016).

So we can see that E-schoolbag project has a pretty good effect for students in China.

Digital textbook project in Europe

"The digital world is not just about machines and microchips: it's about giving people the tools to make their lives better, achieve their dreams and maximize their opportunities. Soon 90% of jobs could require digital skills: yet not enough Europeans are getting them. We need to change this trend from the classroom. If teachers are themselves more confident using ICT, they can better inspire the next generation," says Neelie Kroes, Vice-President of the European Commission.

Digital textbook project in the Europe has 4 main projects with the name iTEC project, CPDlab project, Living school lab and The Creative Classrooms Lab (CCL).

iTEC project

iTEC means Innovative Technologies for Engaging Classrooms. This project funded by the European Commission involving 26 partners: ministries of education (MoEs), technology providers and research organizations. It was started in 2010 and ended in August 2014, which lasted for 4 years.

It involves 14 Ministries of Education from across Europe, brings together teachers, policymakers, pedagogical experts - representatives from each stage of the educational processes - to introduce innovative teaching practices. Educational tools and resources were piloted with 50,000 students in 2624 classrooms across 20 European countries (Austria, Belgium (Flanders), Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Turkey, United Kingdom), with the goal of providing a sustainable model for fundamentally redesigning teaching and learning.

It provides concrete training and support material on iTEC-specific technologies, and inspiration through examples of innovative or just engaging pedagogical activities enhanced by the use of digital technology. The technologies include mobile devices, interactive whiteboard technologies, and a wide range of web-based tools and services (European schoolnet, 2010).

This project has findings from how iTEC approach impact on learners and learning, how iTEC approach impact on teachers and teaching and the potential iTEC approach for system-wide adoption in schools. They are as follows:

1. Teachers perceived that the iTEC approach developed students' 21st century skills, notably independent learning; critical thinking, real world problem solving and reflection; communication and collaboration; creativity; and digital literacy. Their students had similar views.

2. Student roles in the classroom changed; they became peer assessors and tutors, teacher trainers, co-designers of their learning and designers/producers.
3. Participation in classroom activities underpinned by the iTEC approach impacted positively on students' motivation.
4. The iTEC approach improved students' levels of attainment, as perceived by both teachers (on the basis of their assessment data) and students.
5. The Future Classroom Scenario development process was viewed as innovative by policy makers, teachers and stakeholders, but further work is needed.
6. Teachers and coordinators perceived that the Learning Activity development process has potential to develop innovative digital pedagogies in the classroom, but further work is needed.
7. Teachers perceived that the iTEC approach enhanced their pedagogy and digital competence.
8. Teachers became more enthusiastic about their pedagogical practices.
9. Teachers stated that they used technology more frequently; it was systematically integrated throughout the learning process rather than reserved for research or presentations.
10. Teachers were introduced to digital tools they had not used before; some were more favorably received than others.
11. Teachers collaborated more, both within and beyond their schools, a process facilitated through the online communities.
12. Awareness of the iTEC approach is growing in educational systems, and there are signs of widespread uptake.
13. The scenario-led design process can support mainstreaming of innovation, provided the process is refined.

14. Policy makers and teachers viewed the library of scenarios, Learning Stories and Learning Activities as a valuable output of ICT to support system-wide classroom innovation.

15. In countries in which iTEC aligns closely with national policies and strategies, the iTEC approach is likely to be adopted and to influence future practices.

This project showed that iTEC approach has considerable impact on learners and teachers and highlights the potential that exists for system-wide change. The results have meaningful suggestion for the future education.

CPDLab project

CPDLab project, started in October 2011, it is a two year project, aims to improve the quality of ICT-related Continuing Professional Development available to teachers, school leaders and other school staff and help schools become effective learning environments by offering a portfolio of training courses directly related to the needs of teachers in the future classroom, The CPDLab courses are aimed at secondary schools. (European schoolnet, 2010). This project is supported by the Commission's Lifelong Learning Programme as a Comenius Multilateral Project.

It delivered three training courses for teachers in the areas of interactive whiteboards, E-safety and Future classroom scenarios. This project offers support for other projects.

Living Schools Lab

Living Schools Lab is a two-year project funded by the European Commission and coordinated by European Schoolnet Starting in October 2012. It includes 12 Ministries of Education and it is about creating a NETWORK of primary and secondary schools to showcase and demonstrate innovative use of ICT (European commission, 2012).

Primary schools and secondary schools from 12 countries (France, Italy, Lithuania, Portugal, UK, Cyprus, Czech Republic, Austria, Belgium, Ireland, Norway, Finland) participated in this project. After the two-year experiments, they found out that:

1. Around 50% of students at grade 11 are in highly equipped schools (e.g. with high equipment levels and fast broadband), but percentages differ widely between countries.
2. Students are more confident in their digital competence when they have high access to ICT at home as well as at school compared to students having high access only at home.
3. Students use ICT most frequently during lessons when they are taught by digitally confident and supportive teachers, regardless of equipment levels. Even so, students use ICT for learning more outside than inside school.
4. Teachers and school heads are positive about ICT use – for retrieving information, doing exercises and practice, and learning in an autonomous and collaborative way – and about its impact on students’ achievement, motivation and transversal skills.
5. Around 70% of students are taught by teachers who have learnt about ICT in their own time.
6. Most teachers still use ICT first and foremost to prepare their teaching and fewer use technology with students in lessons.

The Creative Classrooms Lab (CCL) project

The Creative Classrooms Lab (CCL) project is developing innovative teaching and learning scenarios involving the use of tablets in and out of school. This project started from April 2013 to May 2015. It validate these in policy experimentations involving nine Ministries of Education in Europe and 45 classes that are already making use of tablets from different suppliers. This project has Pilots in six European

countries (France, Germany, Italy, Spain, Turkey and the United Kingdom) and the involvement of 245 secondary school classes. Each class has been provided with one netbook per learner and a notebook for each teacher, to share all class activities through technology. Devices are no longer tools to be studied, but instruments for learning.

Students use tablets to study in the class, and teachers observe how students learn with tablets, there are reports show that students can make use of tablets to work independently and have great outputs. It also changed the teacher centered class structure to student centered class, student form small groups producing content and developed transferable skills that can be used across subjects.

We can see many counties realized to integrate new technologies in school education is a trend and necessary learning tools for students, it can offer students new opportunities for a creating learning environment. New digital educational platform offer students more access to search for information and overcome the difficulties to study with the limitation of time and space.

So it is very necessary to study how students learn through this digital technology, whether it can promote studying effectiveness or decrease this process.

During the last ten years Spanish administrations have made a big effort in order to promote the inclusion of the new technologies with plans as “School 2.0” trying to put new infrastructures in the classrooms: computers, internet connections and even a massive donation of digital boards.

After the comparison between different countries and different projects, though the names of the digital textbooks are different according to different countries, the main functions are similar. In Asia countries, such as China, Taiwan, HongKong, Japan and Korea, the digital textbooks are more focus on the contents, which are rely on the electronic content provider, students learn through the contents that full of videos, sounds and information, but it lacks the role of students, which should be the active

role in learning and seeking information in the learning process. In the USA and Europe, the digital textbook plays a more active roll, students use it to create and seek information, which is a learning platform for students and it can improves more the ICT roll in education. My case study will focus on the secondary schools in Spain to see what roll the digital textbooks play in the learning process of Chinese.

There are mainly three kinds of digital textbooks exist in Spain. Firstly, it is the special device designed only for using for students, with a variety of teaching content related to this device, such as aula planeta. In China it is called E-school bag, interacted with images, sounds and videos in all teaching unit, a device is equal a school bag, students only need this device other than all the textbooks. Secondly, it is a normal device like an ipad or computer, there are a lot of e-content designed for these platforms, and some of them are free, school give each student an ipad or computer, they use it in the classroom with some e-content and the connection to the internet. The last kind is bring your own devices, student can bring their own ipad, computer or other devices to school, the teachers give them e-content which can be used in all platforms and their platform has a connection to the internet, it is easy for students to use their familiar device to personalize their study.

Today a growing interest of focus on digitalizing the educational system all over the world, digital educational platform becomes a significant change in primary schools and secondary school. An overview about the digital impact on students was offered by the OECD study survey (2011 report) that tested how 15-year olds use computers and the Internet to learn. It showed that of the 16 participating countries (not Israel or US), most students' results in digital reading were broadly in line with their performance in the PISA 2009 print reading tests. But in South Korea, Australia, New Zealand, Sweden, Iceland and Macao-China, students performed significantly better in digital reading than print.

The experiment start from 9th of January in 2016, last for 1 year and half more or less, because the teaching results can not be measured in a short time, it is a long observing process, with the new digital technology teaching and learning to see if digital

technique can improve the students' abilities and helpful with learning Chinese. All the kids are in their first grade of learning Chinese now, age 6 or 7. I choose a group of 27 students in my class, they almost finished their first grade of learning and going to move into the second grade. The first semester I teach them with traditional books, the next semester I teach them with online learning platform, to observe their learning performance, abilities and learning results.

Chinese learning and teaching in digital device

Chinese language and culture is vitally important as China becomes ever more influential in world affairs. The comment that Timothy Light made in 1999 is still true: "The coming century will be at least in part the 'Chinese Century' if for no other reason than the sheer size of the economy of China and the influence that the enormous economic energy will have on all of the rest of the world." The increasing number of students learning Chinese at all levels reflects a general recognition of the importance of acquiring Chinese language skills and cultural competence in order to enhance cross-cultural understanding and effective communication in the global community. In the past 25 years the teaching of Chinese has moved from being a marginal discipline with less-developed pedagogy to a strong profession. Students are given ongoing and varied opportunities to develop their communication competency and their understanding of Chinese culture.

Digital techniques play an important role in teaching and learning process. Teaching Chinese to the Spanish-born-Chinese is different than teaching Chinese in China and teaching Chinese to foreigners. Spanish-born-Chinese with the nationality Spanish and educated in Spanish schools their mother language is Spanish, they speak dialects with their parents at home, with only a little influence in Mandarin Chinese at home, the most important is to trigger their interest in learning Chinese and form the desire of learning by themselves. Digital techniques such as digital textbooks are used in many countries such as America, China and Korea. And it has a positive result in the students learning performance.

Zhao yuanlin did a research about digital resources used in Chinese language classrooms in the year 2012. The research covered China, Australia, Taiwan, Malaysia, Hongkong and some other Asian and Western countries. They found out that the most widely used ICT tool is PowerPoint, and also online resources and web 2.0 tools. Also commonly used ICT tools are interactive whiteboard, audio/video recording, mobile devices, web conferencing, online surveys and polls, Google earth & Google maps, video editing software, digital portfolio, podcasting, social networking websites, graphic organizer, content and mind mapping software and ebook reader.

Table 6: Most widely used ICT tools

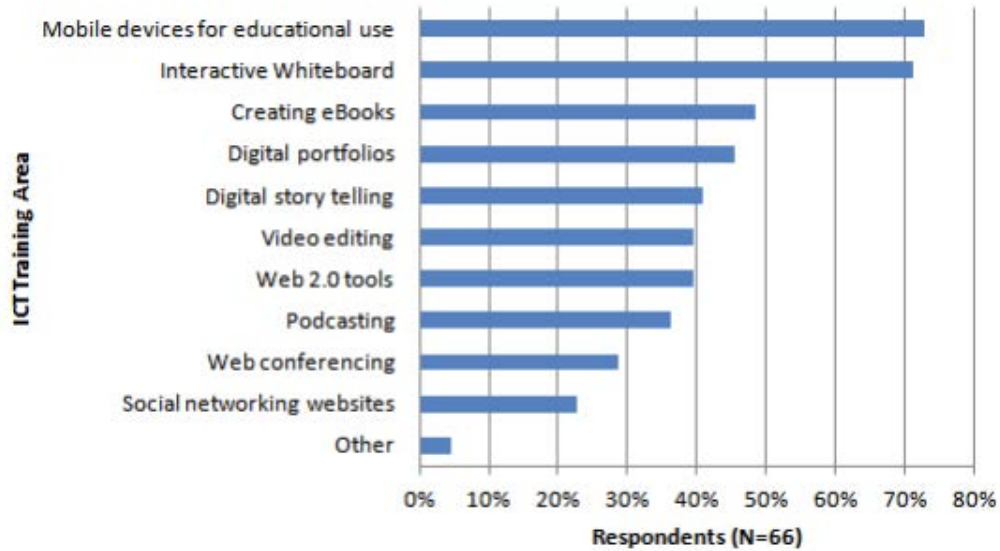
ICT Tool	Percentage Using the Tool (%)	Average Frequency of Use Ranking of the Column 1 Tool by Column 2 Teachers
PowerPoint	75	5
Online language learning sites	67	4
Web 2.0 tools	51	1
Interactive Whiteboard	49	2
Audio/video recording	46	3
Mobile devices	34	6
Web conferencing	15	12
Online surveys and polls	15	10
Google Earth & Google Maps	13	7
Video editing software	13	11
Digital portfolio	13	9
Podcasting	13	15
Social networking websites	11	13
Graphic organizer, content and Mind Mapping software	7	16
Others	5	14
eBook Reader	3	8

Source: Most widely used ICT tools

And for future ICT training wanted, the results show that ranking number one is Mobile devices for education use. The next one is interactive whiteboard. Creating ebooks also has a big percentage. Digital story telling, video editing, web 2.0 tools, podcasting, web conferencing, social networking websites and others are also wanted in the future ICT training area. We can see that digital textbook is a combination of all

of these tools, if a teacher wants to understand how to use digital textbook to teach then he or she needs to learn all the digital techniques.

Graph 10: Future ICT training wanted



Source: Future ICT training wanted

About the learning result with digital devices, there are some studies about it. In the year 2012, Paul Lam and Alden Tong (Lam, P., & Tong, A. 2012) from the Chinese University of Hong Kong investigated the desirability of allowing digital devices in class to explore the factors that influence the success of the practice. They conducted two studies. The first study students are allowed to use computers in the class the whole semester then they are asked to reflect upon the learning benefits. The second study teachers are involved in the experiments, teachers are asked to comment openly on the use of digital devices for guided purposes. The results show that many positive learning benefits relating to using digital devices in class, but there is a major concern that students may use the technology for irrelevant purposed in class. So the author gives the conclusion that the answer to whether or not to use digital devices in class is not a simple yes or no, but is a series of suggestions concerning when and how to do it more appropriate.

Peng Xiaoxin (2013) did a research about applying multimedia in teaching primary oral Chinese. She found that multimedia has some advantages, such as multimedia brings more possibilities in teaching, saving time for the teachers to write on the blackboard and give more time for students to practice. Multimedia includes video, sound and pictures that can trigger the interest of students. It can also enrich the teaching content, which can make the students more active to participate in the learning process. But if sometimes multimedia gives too much information for the students, it can distract their attention and lose the interest of learning Chinese. If the teacher is not good at using multimedia, it can also effect teaching time.

Chapter 3: Experiments and conclusions

The author conducted experiment in Kongzi Chinese school. The experiment lasted for one year time, to find out the teaching and learning results of digital textbook in teaching Chinese.

Experimental materials

The book I use is “Zhongwen”, which is published by department of overseas Chinese teaching of Jinan University. This book is very popular around the world and is used by foreign countries to teach Chinese to local born Chinese. The book has 12 different levels and every level has two exercise books. Overseas Chinese Language and Culture Education also conducted a digital learning platform along with this book. So with the same content there are two kinds of teaching materials.

Graph 11: Zhongwen textbook and exercise books



Graph 12: Zhongwen digital learning platform



The participant choice

The experiment is conducted in Kongzi Chinese School. Kongzi is the largest Chinese schools in Spain, which has 2000 students learning Chinese. I am one of the Chinese teachers in this school. I am teaching the first grade, I choose my students as the participants. In my class there are 27 students. Their level of Chinese is beginner level, with the basic knowledge of Chinese. They are all Chinese students born in Spain and their mother language is Spanish and Catalan, they speak Chinese dialect with their parents at home and almost don't speak Mandarin Chinese.

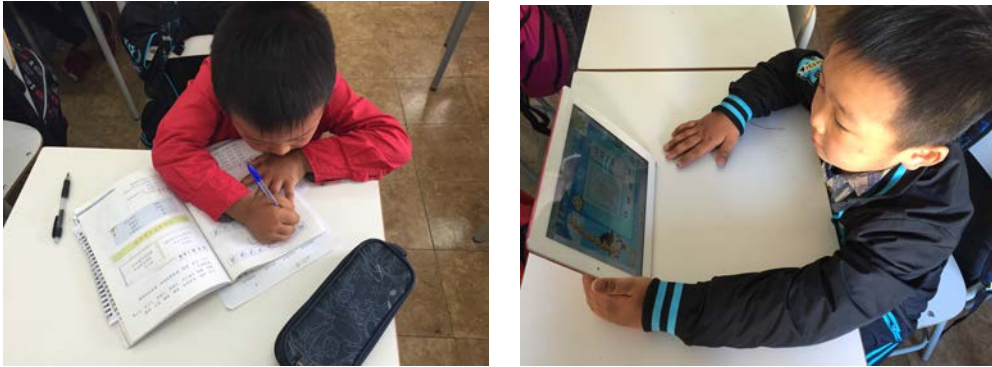
Graph 13: Participant choice 27 students in the class



Experimental design

The experiment lasted one year including two semesters, which started in January 2016 and finished in January 2017. The first semester, which started from January and finished in June, I used traditional paper book to teach the students, and the second semester, which started from September and finished in January, I used digital teaching platform to teach. Digital online platform is the complement of the paper textbook, teachers and students who use this textbook can have access to this online digital platform. It contents pictures, sounds and videos related to the textbook. It also have some exercise for the students to test if they learn well. Students can use it both in the class and at home to study Chinese.

Graph 14: Paper based textbook VS digital textbook



Every month I give students a test to record their learning results. After one year teaching and learning, I collected their scores and also send out questionnaires with the students and interview their parents. I also did interview with other Chinese teachers in this school, some of them choose to use traditional books and some of them choose to use digital media to teach.

With all of these results to see if digital teaching platform is good for teaching Chinese in school.

Introduction of digital teaching platform of Zhongwen and comparison with the paper-based textbook

The digital teaching platform of Zhongwen is conducted by Overseas Chinese Language and Culture Education Online, it is an open resource and can access through internet, so if you have internet you can use it on computer, tablets and phones etc.

When you enter this platform you will see this screen.

Graph 15: Digital platform start page



It has background sounds, which you can turn off. I used the first book which is the basic level of Chinese, in this screen you can see 4 units, when you click each unit there are three lessons.

Also in this page there are three labels more:

1. Final exercise: This is an exercise to test your learning result after learning all the units of this book. The test is not as boring as the exam in the paper, it contents lots of games, which can attract the students interest in doing this test and also when you choose the right answer you can get a very big reward in voice. For example you need to choose the right characters or phrases according to the recording.

Graph 16: Digital textbook-final exercise



1. Tables: There are three tables very important for learning Chinese, which is the base knowledge you need to know.

Graph 17: Digital textbook-Tables of Chinese characters' strokes

hàn zì bǐ huà míng chēng biǎo
汉字笔画名称表
Table of Chinese Characters' Strokes

bǐ huà 笔画	míng chēng 名称	lì zì 例字	bǐ huà 笔画	míng chēng 名称	lì zì 例字	bǐ huà 笔画	míng chēng 名称	lì zì 例字
丶	点	六	㇇	héng zhé tí 横折提	认	㇇	shù wān gōu 竖弯钩	电
一	横	一	㇇	héng zhé wān gōu 横折弯钩	九	㇇	shù zhé zhé 竖折折	鼎
丨	竖	十	㇇	héng zhé zhé piē 横折折撇	建	㇇	shù zhé zhé gōu 竖折折钩	鸟
ノ	撇	人	㇇	héng zhé zhé zhé gōu 横折折折钩	奶	㇇	xié gōu 斜钩	我
㇇	捺	大	㇇	héng piē wān gōu 横撇弯钩	那	㇇	wò gōu 卧钩	心
㇇	提	习	㇇	shù gōu 竖钩	水	㇇	piē zhé 撇折	给
㇇	横钩	写	㇇	wān gōu 弯钩	家	㇇	piē diǎn 撇点	女
㇇	横折	口	㇇	shù tí 竖提	民	㇇	héng piē 横撇	又
㇇	横折钩	月	㇇	shù zhé 竖折	山	㇇	shù wān 竖弯	西

[汉字笔画名称表](#) [写字笔顺规则表](#) [汉语拼音方案](#) [返回目录](#)

Graph 18: Digital textbook-Table of stroke order

xiě zì bǐ shùn guī zé biǎo
写字笔顺规则表
Table of Stroke Order

guī zé 规则	lì zì 例字	bǐ shùn 笔顺	guī zé 规则	lì zì 例字	bǐ shùn 笔顺
xiān héng hòu shù 先横后竖	十	一 十	cóng wài dào nèi 从外到内	同	丨 冂 冂 同 同 同
	干	一 二 干		向	丨 丨 冂 向 向 向
xiān piē hòu nà 先撇后捺	八	ノ 八	cóng nèi dào wài 从内到外	山	丨 止 山
	天	一 二 于 天		这	丨 一 一 文 文 文 这
cóng shàng dào xià 从上到下	三	一 二 三	xiān lí tóu 后封口	日	丨 冂 日 日
	早	丨 冂 日 旦 早	yuán 园	丨 冂 冂 冂 冂 园 园	
cóng zuǒ dào yòu 从左到右	地	一 丨 土 地 地	xiān zhōng jiān 后两边	小	丨 丨 小
	说	丨 丨 丨 丨 说 说 说 说	shuǐ 水	丨 丨 水	

由于汉字结构形式比较复杂，有的字很难按上面笔顺规则书写，只能按习惯笔顺。如，力(丂力)、与(一与与)、女(㇇女女)、也(㇇也)等。

[汉字笔画名称表](#) [写字笔顺规则表](#) [汉语拼音方案](#) [返回目录](#)

Graph 19: Digital textbook-Phonetic System of the Chinese Language

hàn yǔ pīn yīn fāng àn
汉语拼音方案
Phonetic System of the Chinese Language

(1957年11月1日国务院全体会议第60次会议通过)
(Endorsed at the 60th meeting of the Plenary Session of the State Council on November 1st, 1957.)
(1958年2月11日第一届全国人民代表大会第五次会议批准)
(Approved at the 5th Session of the 1st National People's Congress of February 11st, 1958.)

一、字母表
The Alphabet

字母 (Alphabet)	Aa	Bb	Cc	Dd	Ee	Ff	Gg
名称 (Name)	ㄚ	ㄅㄝ	ㄘㄝ	ㄉㄝ	ㄜ	ㄝㄝ	ㄍㄝ
	Hh	ll	Jj	Kk	Ll	Mm	Nn
	ㄏㄚ	ㄌ	ㄐㄌㄝ	ㄎㄝ	ㄝㄌ	ㄝㄇ	ㄋㄝ
	Oo	Pp	Qq	Rr	Ss	Tt	
	ㄛ	ㄆㄝ	ㄑㄌㄨ	ㄚㄌ	ㄝㄌ	ㄊㄝ	
	Uu	Vv	Ww	Xx	Yy	Zz	
	ㄨ	ㄨㄝ	ㄨㄚ	ㄒㄌ	ㄌㄚ	ㄗㄝ	

∨ 只用来拼写外来语、少数民族语言和方言。
The letter ∨ is only used in loan words, ethnic minority languages and dialects.
字母的手写体依照拉丁字母的一般书写习惯。
The letters are written in the same way as the Latin alphabets.

[汉字笔画名称表](#)
 [写字笔顺规则表](#)
 [汉语拼音方案](#)
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Database.

In the database there are three tables:

Graph 20: Digital textbook-Alphabetic Vocabulary

yīn xù shēng zì biǎo jiǎn fán duì zhào
音序生字表 (简繁对照)

Alphabetic Vocabulary
(Comparison between Simplified and Traditional Chinese Characters)

A	ài	爱7(愛)																		
B	bā	八1	bà	爸9	bái	白6	bǎi	百1	běi	北11										
C	cǎo	草6	chē	车8(車)	chóng	虫6(蟲)	chū	出4	chuān	穿12	chūn	春5								
D	dà	大2	dài	戴12	dào	到12	de	的9	dì	地5	diàn	电5(電)	dōng	东11(東)	dōng	冬5	duō	多2		
E	ér	儿10(兒)	ěr	耳2	èr	二1														
F	fāng	方11	fēng	风5(風)																
G	gāo	高8	gè	个10(個)																
H	hǎo	好8	hé	禾3	hé	和9	hēi	黑6	hóng	红6(紅)	hòu	后10(後)	huā	花10	huáng	黄6	huǒ	火3		
J	jì	季10	jiā	家9	jiàn	见8(見)	jiǔ	九1												
K	kāi	开8(開)	kàn	看10	kǒu	口2														

生字表 生词表 句子表 返回目录

Graph 21: Digital textbook-Alphabetic Glossary

yīn xù shēng cí biǎo
音序生词表

Alphabetic Glossary

A	ài	爱7																				
B	bā	八1	bàbà	爸爸9	bái	白6	bǎi	百1	běi	北11												
C	cǎo	草6	chē	车8	chóng	虫6	chū	出4	chuān	穿12	chūn	春5										
D	dà	大2	dàjiā	大家12	dà mén	大门10	dài	戴12	dào	到12	de	的9	dì	地5	diàn	电5	dōng	东11	dōng	冬5	duō	多2
E	ér	儿10	ěr	耳2	èr	二1																
F	fāngxiàng	方向11	fēng	风5																		
G	gāoxìng	高兴8	gè	个10																		
H	hǎo	好8	hǎokàn	好看10	hé	禾3	hé	和9	hēi	黑6	hóng	红6	hòu	后10	hòu mén	后门10	hòu mian	后面11	huā	花10		
J	huāyuán	花园10	jiā	家9	jiàn	见8	jiǔ	九1														

生字表 生词表 句子表 返回目录

Graph 22: Digital textbook-Sentences



All the tables are the most important knowledge of this book, they are the conclusion after learning all the book. When the student finished learning this book they know what they already learn and what knowledge is the most important and what to revise.

In the textbook you can also find all these exercises, tables and database in the end of the book.

When you enter the first lesson you can see this screen. Include the labels of the text, characters, news and expressions, sentences, dialogue, reading, appreciation and exercise.

1. Text

Graph 23: Digital textbook-Text



The text is a video with cartoons, which is very interesting that can attract the kids' attention. The kids can watch the video and understand better about the knowledge. If the content is new to the learners, it is very difficult to understand if they only read a paper based textbook, because there is no explanation of the meaning of the text, it needs a Chinese teacher to help a learner to learn the new content. But if the learner learn through this online platform it is much easier, the video help the learner understand what the meaning is the text.

Graph 24: Digital textbook-Text video



Also the text has translations in English, if a new learner already know English and is learning Chinese, it is easier, because he or she can see all the translations of the new content, in the other sense, if a new learner doesn't know English, after she or he learned the new content of Chinese, it is also a platform for him to learn English.

Graph 25: Digital textbook-Text in English



Besides text and translation, there is also additional material.

For example there is content that introduce the original strokes came from one character, and it consists of the basic strokes of Chinese. The additional knowledge is not written in the paper-based book, it needs a teacher to explain all these knowledge, but with this digital platform, which is easier for the learners to learn by themselves. All the characters are written with Pinyin, which helps pronounce the word.

Graph 26: Digital textbook-Text additional material



2.Characters

Enter the characters, it is the most important knowledge of a new lesson, and it is also the most difficult to learn Chinese. Chinese is not that hard to pronounce, not that hard to listen, but it is very difficult to write, all the foreign people see Chinese characters as a drawing inside a box.

Here listed all the new characters that we need to learn in this new lesson. Normally for a new learner, it is difficult to read and write it, but with this digital platform, it seems not that hard.

Graph 27: Digital textbook-Characters



When you click one character, below there are some labels: Pinyin, strokes, radical, phrase. Pinyin helps pronounce. In the paper-based textbook, a new learner doesn't know how to pronounce a new character if only see pinyin, if he know how to pronounce it he doesn't know if his pronunciation is correct or wrong. But with is digital platform, when you click the character, it will pronounce for you, which is very clearly voice that helps you pronounce a new character. Besides pinyin, there is also the traditional Chinese character written below. Simplified Chinese is used in mainland China (PRC) and in Singapore. In Hong Kong, Taiwan, or Malaysia they use the Traditional Chinese method of writing. Two different codes are used for computing in Chinese. Because most of the Chinese are from mainland, so normally a Chinese book is teaching simplified Chinese. In the paper-based textbook it is all written in simplified Chinese, only in this digital platform, it also teach how to write a character in traditional Chinese, incase someone want to learn it.

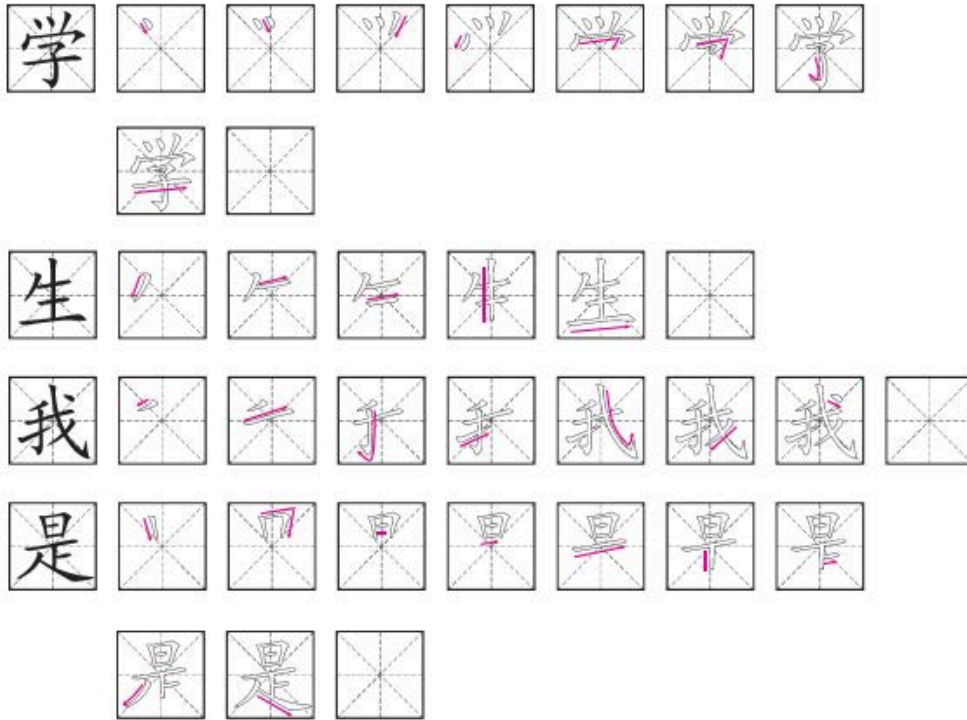
Graph 28: Digital textbook Characters- stroke



The second label is stroke. This is the most difficult part of learning a character, in the paper-based textbook. In order to teach how to write a character, it needs many steps to finish writing one character. And the student can follow each stroke and finish writing one character in many steps. This is the traditional way of learning a new character.

Graph 29: Paper based textbook stroke

1 *miáo yì miáo xiě yì xiě*
描一描，写一写 (Learn to write.)



But with this digital platform, which is much easier. When you click stroke, a video shows you how to write a character with each stroke, as if someone is writing in front of you. Besides, you can watch it as many times as you want. In this way you can learn how to write a character and which stroke goes first, which stroke goes second.

Graph 30: Digital textbook stroke video



When you already learn all this by heart, then it is your turn to write it. You can click the “write the character”, then in the screen appear a Chinese writing brush, you can write it with your finger, if you doesn’t write correctly, you want to write again, you can click the eraser to erase the stroke that you already written. This platform is very lively to show you how to write a character and doing it also triggers more attention from the learners.

Graph 31: Digital textbook-write the character



It is not finished with the character, it has more information in the digital platform than the paper-based textbook. When you click “radical”, you can see very clearly what is the radical of each character, and if you click “Phrase”, it will appear several phrases related to this character.

Graph 32: Digital textbook radical and phrase



2. Words and expressions

Each lesson has some new characters and words and expressions. When you enter the words and expression label, it listed the news words to learn.

Graph 33: Digital textbook words and expressions



While in the paper-based textbook, it also listed in the book the new words.

Graph 34: Paper based textbook words and expressions



But in the paper-based textbook, it is only listed new words, but without explanation. In the digital platform, if you click each word, you can enter a new page, in this page you will see pinyin of this word and a voice icon, when you click it you can hear the sound of the words how to pronounce, also there is translations in English. On the other part, there are several sentences that consist this words, also there is voice icon that can read for you, which is very easy for the learners to learn by themselves.

Graph 35: Digital textbook-explanation of the words



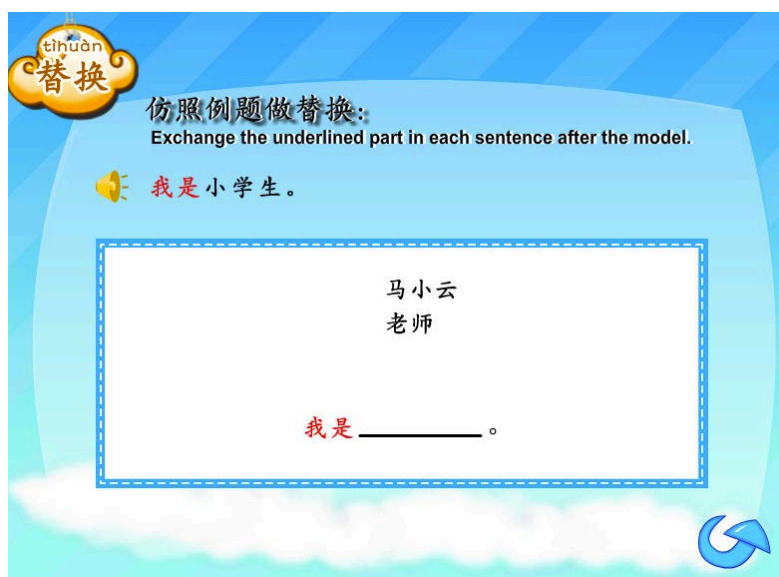
3. Sentences

In this part, there are three labels. Reading sentences, expand and substitute. In each lesson, there is one sentence to learn, when you enter “reading sentences” it appears that sentence and the voice icon, which can read the sentence for you. In the paper-based textbook, there is not this function.

In the “expand” part, it teaches how to form a sentence little by little, and also there is voice icon that can read for you.

In the “substitute” part, it contains exercises that after learned in the reading and expand part, it is a test to see if a learner already understand the most important sentence in this lesson.

Graph 36: Digital textbook-substitute



4. Dialogue

In this part, it includes two labels, situation dialogue and role-play.

Situation dialogue is an exercise in the paper-based textbook. In the paper-based textbook there is only a dialogue even without pinyin (the pronunciation), but in this digital platform, this dialogue is a small video, the conversation between two people and which is better for the learner to understand and the learner can learn by himself.

Graph 37: Digital textbook-dialogue



Role-play is the practice of this dialogue, which is very different from the paper-based textbook. In the screen, it appears the dialogue that we already learned before, it is a dialogue between two or more people, so you can choose a role to read, then the digital platform will read the other role to help you practice reading and pronunciation. Normally practice the dialogue with the traditional paper-based textbook, the teacher need to control the class and named students to stand up and practice with their partner, but with this digital platform, the learner can practice alone with this platform.

Graph 38: Digital textbook- Role-play



5. Reading

In this part, it is the expand reading in the paper-based textbook, usually the teacher doesn't teach in the class, and leave this part as homework for the student to learn by themselves at home. It contains two parts, reading the text and characters.

In the reading part, it is also a video but not like the video of the main text, this video only contains pictures and sounds, which is more simple, but the learner can watch this video many times to learn how to pronounce and understand the meaning of the text.

Graph 39: Digital textbook-Reading



In the character part, when you enter it listed all the new characters that one need to learn, which is different to the characters that we already learn before. The premier characters are more important for this lesson and contain more information of each character which includes how to write it and radical and phrases, but all the characters here not that important, so it only has the pronunciation.

6. Appreciation

In this part, there is a text about this lesson, which is not in the paper-based textbook, it is an extend learning. After learning about this lesson, the learner can understand this text which related to all the characters and expressions that he had learned, so it is also like a test to see how well he already learned about this lesson.

The text is also in the form of video, which can attract the learner's attention to continue learning this text.

Graph 40: Digital textbook- Appreciation



7. Exercise

In this exercise part, it is very interesting. In the paper-based textbook there is no exercise, the learner need to use the exercise book related to the textbook to do the exercise.

When you enter the exercise, there are a lot of games that you can choose to play and each game is an exercise. In different lessons the games are different, for example in lesson seven, there are nine games.

Graph 41: Digital textbook- Exercise main page



Each game is very interesting for the kids, which can attract the kid's attention. For example, the game three monks. The learner needs to choose the correct pinyin after the recording sounds. If your answer is correct, the monk will go to carry the water, if your answer is not correct, then no monk will go to carry the water. Three monks is a very famous Chinese fable and all the kids know this story, so for the kids, this game is more interesting.

Graph 42: Digital textbook- Exercise three monks



Also there are other games also very interesting. Frog crossing the river. You need to choose the right characters to fill in the blanks, if you choose the right one the frog move on, if you choose the wrong one, the frog doesn't move, if you continue choose five answers correctly, then the frog can reach the other side of the river.

Graph 43: Digital textbook- Exercise Frog crossing the river

xuǎn zì tián kòng
选字填空:
Choose the characters to fill in the blanks.

帮助

(3) 学生 () 老师。

A. 是 B. 爱

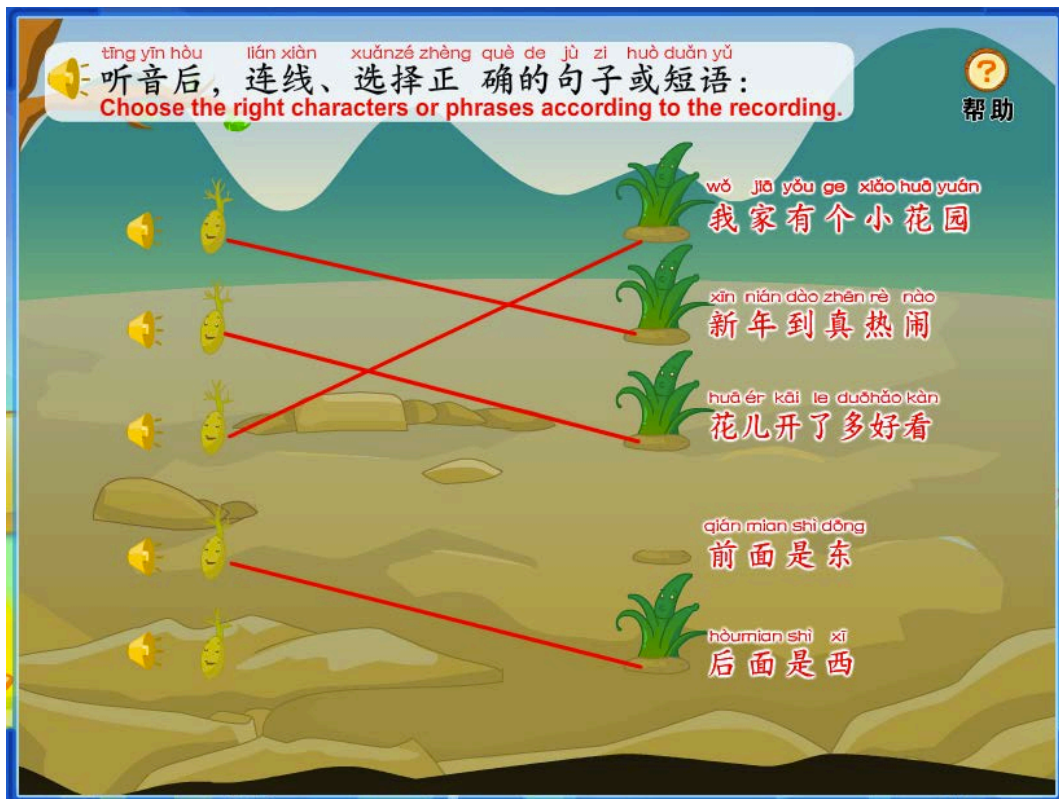
And there is a game named playing basketball, the learner needs to look at the pictures and complete the sentences. If you choose the right answer then the basketball will go inside of the basket, if you choose the wrong answer, the basketball will hit the backboard and come back. This game is very popular among boys.

Graph 44: Digital textbook- Exercise playing basketball



Another game is farming, you need to choose the right characters or phrases according to the recording. If you choose the right answer the little plant will go to the right place and grow into big plant. This game is a for the students who already has a good knowledge of the words, phrases and sentences.

Graph 45: Digital textbook- Exercise farming



Such interesting little games are too many, every lesson has nine different games for the learner to play and review all the knowledge that have learnt. Students find it interesting, while they are playing the game they are reviewing the knowledge.

The difference between paper-based textbook and digital platform

1. Digital platform has a variety source of learning and teaching material.

Compared with paper-based textbook, digital platform contents more learning and teaching materials that don't show in the paper-based textbook. All these materials are support teaching, even if these materials don't write in the paper-based textbook, the teacher need to teach all this knowledge to the learner. If the teacher use digital platform to prepare lesson and teach, it is much easier than with paper-based textbook.

2. Digital platform teach with video and voice that can make learning much easier.

In the paper-based textbook, there are only pictures and words written there, it is very difficult for the learner to learn by oneself, but with this digital platform it is possible to learn by oneself. All the text and characters have voice to read for the learner, if the learner doesn't hear clearly, the learner can also repeat as many times as he or she want. The video also makes the learning process much easier and more interesting. A text only with words written in the book is too difficult for the learner if all the knowledge is new to him, but with the video, one can understand very well even if he doesn't know the content well. Also a video can attract a learner's attention, it makes learning more funny.

3. Digital platform is much more interesting to do exercises for the kids.

Normally with the paper-based textbook, it is boring to do exercise, especially for a kid. Digital platform is different from traditional textbook, it contains pictures, sounds and videos, which can triggers the learner's interest to learn and to do it. All the exercises are little games, which makes learning more fun. The kid want to win the game so he will try his best to learn all the knowledge in order to answer all the questions correct so that he can win the game. So the kid would like to spend time in playing the game and at the same time doing the exercise to review the knowledge they have learnt before.

4. Digital platform is learning by doing.

There is really only one way to learn how to do something and that is to do it. In the traditional teaching system, the teacher only teach the student the theory in the book, ignore the practicing part of the learning. Learning by doing means learning from experiences resulting directly from one's own actions, as contrasted with learning from watching others perform, reading other's instructions or descriptions, or listening to others' instructions or lectures. Digital platform offers a platform for the learners to do and learn by themselves. In the digital platform, the learner can learn how to write a character by writing it on the screen with the finger, the learner can

learn how to pronounce a word by repeat after the voice, the learner can learn and review knowledge by playing the game.

So the digital platform provides a very good methodology for teaching and learning, the learner can learn the knowledge by doing, which is better than the traditional way of teaching and learning.

Usability analysis of digital platform

Usability is important for a digital platform, because a user-friendly interface can help users work in an effective, efficient, and manageable way (Crowther et al. 2004; Wilson and Landoni 2003). Usability is not a single, one-dimensional property of a user interface but subsumes multiple components with a variety of measurable attributes (Rubin 1994; Tullis and Albert 2008; Welie et al. 1999).

The definition of usability rests on four assumptions concerning users:

1. Usability means focusing on users
2. People use products to be productive
3. Users are busy people trying to accomplish tasks, and
4. Users decide when a product is easy to use.

Shackel in the year 1991 proposed four indicators: learnability, effectiveness, flexibility, and user satisfaction (Shackel, 1991). But in the year 1993, Nielsen insists on five: learnability, a low error rate, efficiency, memorability, and satisfaction (Nielsen, 1993). The International Standardization Organization (ISO) 9241-11 lists only effectiveness, efficiency, and satisfaction (ISO 1998). In the year 2002, Rosson and Carroll identify three perspectives that contribute to the general concept of usability (Rosson and Carroll, 2002):

1. Human performance, time, and errors
2. Human cognition, mental models of plans and actions

3. Collaboration, group dynamics, and workplace context.

Usability testing is an evaluation method for computer systems where target users are observed utilizing the system, in order to determine whether a system's functional goals are met (Rubin, 1994; Usability.gov, 2009)

Although different attributes are emphasized by different researchers, the author choose the Nielsen's defines usability in terms of five characteristics:

- Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design?
- Efficiency: Once users have learned the design, how quickly can they perform tasks?
- Memorability: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- Satisfaction: How pleasant is it to use the design?

This is the most widely used usability indicators.

Previous studies on usability have suggested specific usability design principles as well. Nielsen (1993) proposed using simple and natural dialogue, speaking the user's language, minimizing user memory load, striving for consistency, offering feedback, marking exits clearly, providing shortcuts, using effective error messages, preventing errors, and providing help and documentation. Shneiderman and Plaisant (2009) produced eight similar rules for designing human-computer interfaces: striving for consistency, creating universal usability, offering informative feedback, designing dialogs to yield closure, preventing errors, permitting easy reversal of actions, supporting an internal locus of control, and reducing short-term memory load.

Specific design principles such as these can be inferred from each of the general

attributes of usability (Folmer and Bosch 2004; Seffah et al. 2001). Dix et al. (1998) suggest, for instance, that the design factors contributing to increased learnability include predictability, consistency, familiarity, generalizability, and synthesizability, so to facilitate learnability, the user interface should be designed to meet the user’s expectations and be consistent in terms of function and visual display (Baxley 2003; Nielsen 1993). To increase efficiency, the interface should be designed to minimize the user’s memory load and help the experienced user operate the system with flexibility and speed (Ardito et al. 2006; Hu et al. 2008). To increase effectiveness, the interface should be designed to prevent errors, enable prompt recovery from errors, provide adequate feedback or help in problem solving, and make the internal operations of the system observable to users (Ardito et al. 2006; Hu et al. 2008). Finally, to increase user satisfaction, the interface should be designed to allow students control over their learning and to meet their aesthetic needs (Baxley 2003).

In this paper I take the Nielsen’s five characteristics to design my experiment to test the usability of this Zhongwen digital textbook. I choose some of the indicators and did the experiment with the students. The experimental design is referring to Table.

Table 7: Usability Text of the digital textbook

Usability Text of the digital textbook	
Learnability	<p>Questionnaire:</p> <ol style="list-style-type: none"> 1. Is it easy to find what you want? Score 1-5. 2. The first time you have it, how much time you spend learning it?
Efficiency	<p>Questionnaire:</p> <p>Is it convenient for you to find what you want?</p> <p>I give three tasks:</p> <ol style="list-style-type: none"> 1. Please find a picture related to “choose a new word he learn that day”. See how long he needs to finish the task. 2. Upload his homework on the platform and send teacher an email to make appointment. See how long he needs to finish the task. 3. Open a webpage and search for one paper. See how long he

	needs to finish the task.
Memorability	Teach how to upload homework and send emails one time, after 1 month, test again to see if the student still remembers.
Errors	When he does the tasks in “efficiency” part, observe how many mistakes he make during the tasks.
Satisfaction	Questionnaire: Do you like to use this digital textbook? Score 1-5.

Data analysis of the usability

I did the questionnaire with 27 students who use the digital textbook to study Chinese, all of them answered all the questions in the questionnaire.

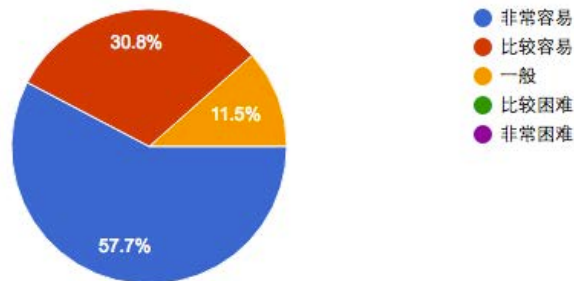
1. Learnability

a. Is it easy to find what you want in this digital textbook of Zhongwen?

According to Graph 46, 15 students think it is very easy to find the things they want in the digital textbook, which represent 57.7% of the total number that is marked in the color blue. 8 students think it is a little easy to find the information they want, which represent 30.8% of the total number that is marked in the color red. And 3 students think it is normal, which represent 11.5% of the total number that is marked in the color yellow. There is no student think it is a little difficult or too difficult to find the things they need in this digital platform.

Graph 46: Is it easy to find what you want in this digital textbook of Zhongwen?

你很容易找到电子课本（多媒体ipad）里面的学习内容吗？ (26 responses)

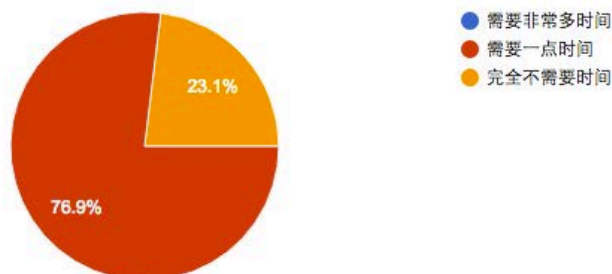


b. The first time you got this digital platform, how much time do you need to learn how to use it?

According to Graph 47, 6 students don't need time to learn how to use this digital platform, which represent 23.1% of the total number that is marked in the color yellow, they know how to use it at the same time you got the tablet. 20 students need a little time to learn how to use this digital platform, which represent 76.9% of the total number that is marked in the color red. No students choose that they need to spend a lot of time to learn how to use this digital platform.

Graph 47: The first time you got this digital platform, how much time do you need to learn how to use it?

第一次接触电子课本（多媒体ipad）需要花很长时间学习如何使用吗？ (26 responses)



So according to the learnability, this digital platform is very easy for the students to use, they can easily find all the information they want and don't need to take a long time to learn how to use this digital platform.

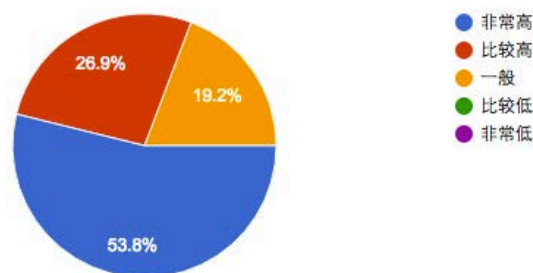
2. Efficiency

After learning how to use this digital textbook, the students feel how about the efficiency of using?

According to Graph 48, 14 students choose they have a high efficiency of using the digital textbook, which represent 53.8% of the total number that is marked in the color blue. 7 students choose they have a relatively high efficiency of using it, which represent 26.9% of the total number that is marked in the color red. And 5 students choose normal, which represent 19.2% of the total number that is marked in the color yellow. No students choose low efficiency and very low efficiency to use this digital textbook.

Graph 48: After learning how to use this digital textbook, the students feel how about the efficiency of using?

已经学会使用电子课本（多媒体ipad）后，操作和使用的效率如何？
(26 responses)



So the students have a relatively high efficiency to use this digital textbook.

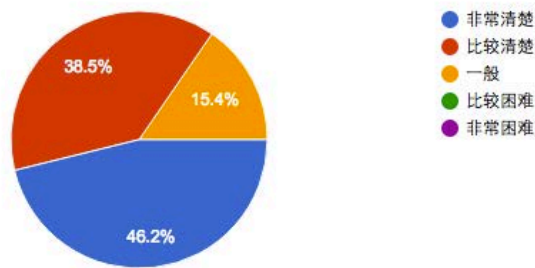
3. Memorability

After using a period of digital textbook and stop using it for one month, after one month do you still remember how to use this digital textbook?

According to Graph 49, 12 students choose after one month without using the digital textbook they still can remember clearly how to use it, which represent 46.2% of the total number that is marked in the color blue. 10 students choose that they can more or less remember how to use it after one month without the digital textbook, which represent 38.5% of the total number that is marked in the color red. 4 students think they can remember a little how to use it, which represent 15.4% of the total number that is marked in the color yellow. There is no students choose a little difficult and very difficult to remember how to use it.

Graph 49: After using a period of digital textbook and stop using it for one month, after one month do you still remember how to use this digital textbook?

学习使用电子课本后停用一个月，再次使用还记得如何操作吗？ (26 responses)



So the students have a relatively high memorability of using this digital textbook.

4. Errors

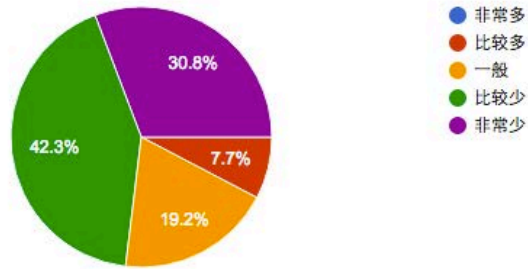
How many mistakes did you make during the using period?

According to Graph 50, 8 students choose that they make very little mistakes during the using period, which represent 30.8% of the total number that is marked in the color purple. 11 students choose that they make a little mistake while using the digital textbook, which represent 42.3% of the total number that is marked in the color green. 5 students choose that they make normally mistakes during the using period, which represent 19.2% of the total number that is marked in the color yellow. And 2 students choose they make some of the mistakes while using the digital textbook, which

represent 7.7% of the total number that is marked in the color red. There is no student that choose they make a lot of mistakes during the using period.

Graph 50: How many mistakes did you make during the using period?

在使用的过程中出现过多少次错误? (26 responses)



So the students make relatively little mistakes while using this digital textbook.

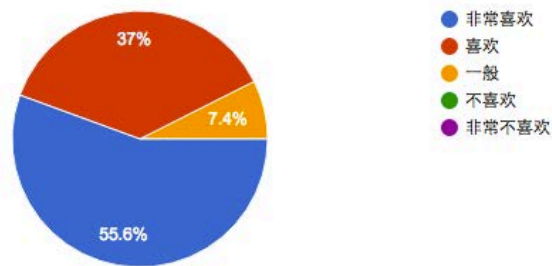
5. Satisfaction

Do you like to use this digital textbook to study?

According to Graph 51, 15 students choose that they like very much to use this digital textbook to study, which represent 55.6% of the total number that is marked in the color blue. 10 students choose they like to use this digital textbook to study, which represent 37% of the total number that is marked in the color red. 2 students choose normal, which represent 7.4% of the total number that is marked in the color yellow. There is no students choose that they don't like to use this digital textbook to study.

Graph 51: Do you like to use this digital textbook to study?

你喜欢使用电子课本（多媒体ipad）学习吗？ (27 responses)



So the satisfaction of this digital textbook is relatively high.

After the usability text we can see that this digital textbook has a relatively high usability for the young students.

Data analysis of the learning results with digital textbook from the students' perspective

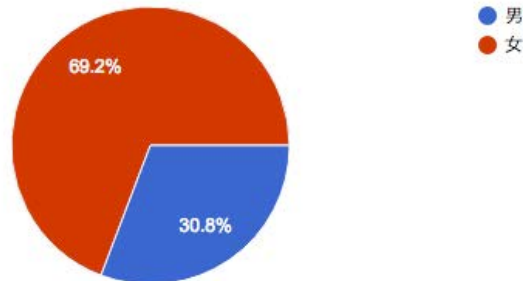
The author did a questionnaire with all the students from the class, there are 27 students, and receive 27 feedbacks, because the students are only 5 to 7 years old, they don't understand clearly the contents in the questionnaire, so the professor help the students with the questionnaire and one or two questionnaire is lack of some of the information. In the end got 26 feedbacks and the questionnaire-reclaiming efficiency is 96.3%.

1. Gender-students

According to Graph 52, there are 18 girls answered the questionnaire, which represent 69.2% of the whole class that is marked in the color red, and there are 8 boys answered the questionnaire, which represent 30.8% of the whole class that is marked in the color blue. There are more girls than the boys in the class.

Graph 52: gender-students

您的性别 (26 responses)

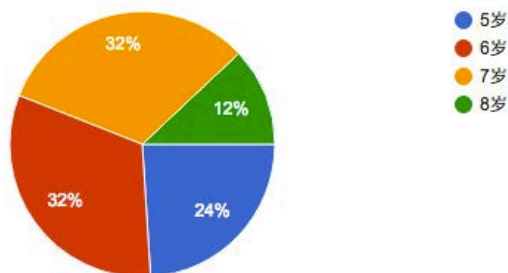


2. Age-students

According to Graph 53, because the Chinese level is different according to each kid, the experiment is conducted in the beginner level, the age of the kids is arranged from 5 years old to 8 years old. There are 6 kids with 5 years old, which represent 24% of the whole class that is marked in the color blue. There are 8 kids with 6 years old, which represent 32% of the whole class that is marked in the color red. There are 8 kids with 7 years old, which represent 32% of the whole class that is marked in the color yellow. There are 3 kids with 8 years old, which represent 12% of the whole class that is marked in the color green.

Graph 53: age-students

您的年龄 (25 responses)

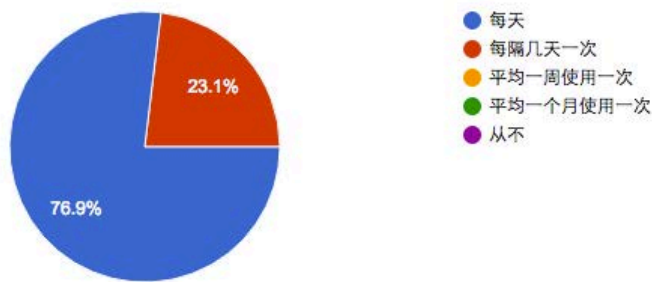


3. Frequency

Do you often use digital textbook to learn? According to Graph 54, 76.9% of the students choose they use digital textbook to learn everyday, it means 20 students of the whole class learn through digital textbook everyday that is marked in the color blue. 6 students choose they use digital textbook every two or three days, it consists of 23.1% of all the students that is marked in the color red. There is no students choose that they use once a week or once a month or never. It means that the frequency of using digital textbook among the students is high, most of the students use digital textbook to learn everyday and some of them use one time two or three days.

Graph 54: Do you often use digital textbook to learn?

经常使用电子课本（多媒体ipad）学习吗？ (26 responses)



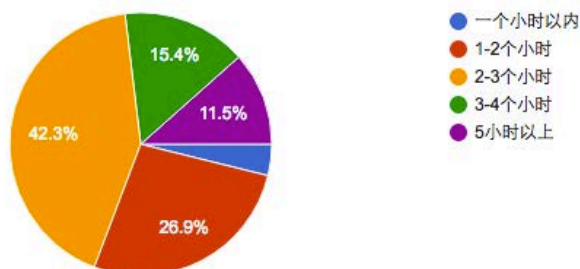
4. How many hours do you use digital textbook everyday?

According to Graph 55, 3 students choose they use more than 5 hours everyday, which consists 11.5% of all the students that is marked in the color purple. 4 students choose that they use digital textbooks 3 to 4 hours per day, which consists 15.4% of all the students that is marked in the color green. 11 students choose they use 2 to 3 hours per day to study with digital textbook, which consists 42.3% of the students in the class that is marked in the color yellow. 7 students choose that they use digital textbook one to two hours per day, which consists 26.9% of the students that is marked in the color red. Only one student choose that he use less than one hour per

day, which only consists 3.8% of all the students that is marked in the color blue. So most of the students use digital textbook to study from one hour to three hours.

Graph 55: How many hours do you use digital textbook everyday?

每天使用多长时间? (26 responses)

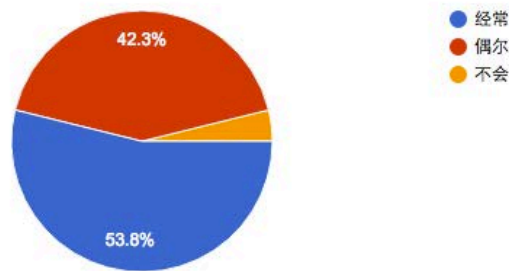


5. Do you use digital textbook to preview the lesson that you are going to learn?

According to Graph 56, 14 students choose that they always use digital textbook to preview the lesson that they are going to learn, which represents 53.8% of the whole class that is marked in the color blue. 11 students choose that they sometimes use digital textbook to preview the lesson, which represents 42.3% of the whole class that is marked in the color red. Only one student choose that he or she never use digital textbook to preview the lesson, which represent 2.9% of the whole class that is marked in the color yellow. So we can see that most of the students have a habit of preview the lessons before the teacher teach in the class. It is really good for study Chinese, they can have a knowledge map in their mind that what they are going to learn, and if they don't understand some information, they can highlight it and wait for the teacher to explain, if they already understand all the information they can review again in the class with the teacher, which can have a every effective result of learning.

Graph 56: Do you use digital textbook to preview the lesson that you are going to learn?

会使用电子课本预习要学习的内容吗? (26 responses)

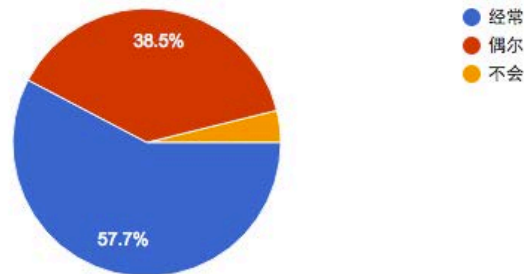


6. Do you use digital textbook to review the content that you have learnt?

According to Graph 57, 15 students choose that they always use digital textbook to review the content that they have learnt, which represents 57.7% of the whole class that is marked in the color blue. 10 students choose that they sometimes use digital textbook to review the content that they have learnt, which represents 38.5% of the whole class that is marked in the color red. And one student choose that he or she never use digital textbook to review the content, which represents 3.8% of the whole class that is marked in the color yellow. So most of the students use digital textbook to review the lesson they have learnt, which is good for learning a new knowledge.

Graph 57: Do you use digital textbook to review the content that you have learnt?

会使用电子课本复习学习的内容吗? (26 responses)

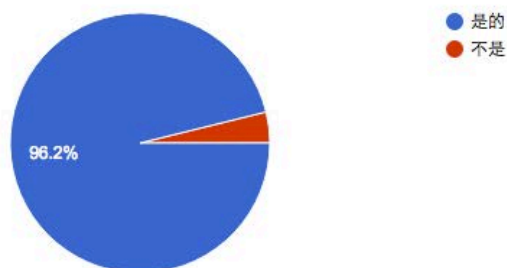


7. Can digital textbook make learning Chinese more interesting?

According to Graph 58, 25 students choose that digital textbook make learning Chinese more interesting, which represents 96.2% of the whole class that is marked in the color blue. Only one student choose that digital textbook doesn't make learning more interesting, which only represents 3.8% of the whole class that is marked in the color red. So we can see that digital textbook with videos, sounds and little games for exercises that triggers more interest of the students. Almost all the students agree that digital textbook makes learning Chinese more interesting.

Graph 58: Can digital textbook make learning Chinese more interesting?

电子课本（多媒体ipad）让你对学习中文更加感兴趣吗? (26 responses)

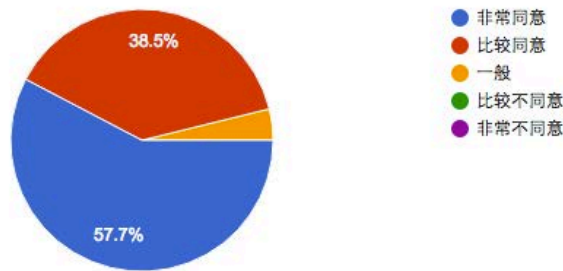


8. Is it much easier to understand the learning content with digital textbook?

According to Graph 59, 15 students choose strongly agree with the statement that it is much easier to understand the learning content with digital textbook, which represents 57.7% of the whole class that is marked in the color blue. 10 students choose relatively agree with the statement, which represents 38.5% of the whole class that is marked in the color red. Only one student choose normal, which represents 3.8% of the whole class that is marked in the color yellow. There is no student choose that they relatively don't agree with the statement or strongly disagree with the statement. So almost all the students agree that digital textbook help students understand the learning content better.

Graph 59: Is it much easier to understand the learning content with digital textbook?

使用电子课本后你更加清楚的理解学习的内容吗? (26 responses)

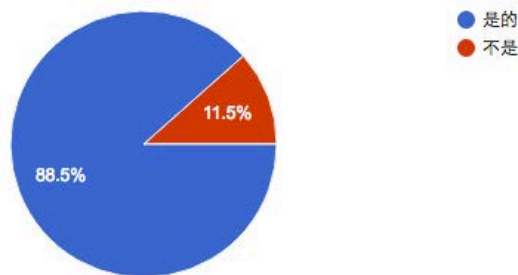


9. After using the digital textbook, my score obviously improved.

According to Graph 60, 23 students agree that after using the digital textbook, their score obviously improved, which represents 88.5% of the total students in the class that is marked in the color blue. 3 students don't agree that after using the digital textbook, their score improved, which represents 11.5% of the total students in the class that is marked in the color red. So most of the students agree that digital textbook help them improve the score.

Graph 60: After using the digital textbook, my score obviously improved.

使用电子课本（多媒体ipad）后我的成绩明显提高了？ (26 responses)

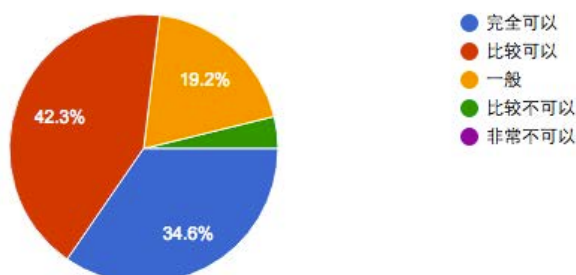


10. Can you learn the new lesson all by yourself with digital textbook?

According to Graph 61, 9 students think they can learn the new lesson all by themselves with digital textbook, which represents 34.6% of the total students in the class that is marked in the color blue. 11 students think that they almost can learn the new lesson by themselves with digital textbook, which represents 42.3% of the total students in the class that is marked in the color red. 5 students think it is normal that they learn the new lesson by themselves with digital textbook, which represents 19.2% of the total students in the class that is marked in the color yellow. Only one student think that maybe he could not learn the new lesson by himself with digital textbook, which only represents 3.8% of the total students in the class that is marked in the color green. There is no students choose that they obsoletely can't learn the new lesson all by themselves with digital textbook. So with digital textbook, almost most of the students can learn a new lesson all by themselves.

Graph 61: Can you learn the new lesson all by yourself with digital textbook?

你可以完全使用电子课本自学新课的内容吗? (26 responses)

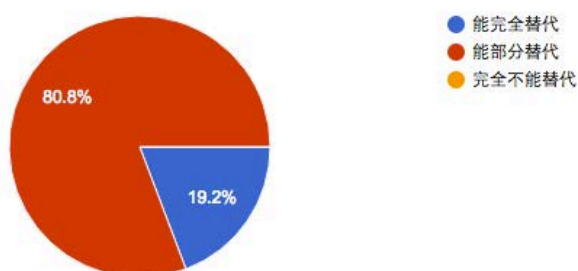


11. Do you think that digital textbook can replace traditional paper-based textbook?

According to Graph 62, 5 students think that digital textbook can absolutely replace traditional paper-based textbook in all the aspect, which represents 19.2% of the total students in the class that is marked in the color blue. 21 students think that digital textbook can replace traditional paper-based textbook in some aspects, but not all, which represents 80.8% of the total students in the class that is marked in the color red. There is no students think that digital textbook can't replace traditional paper-based textbook. So most of the students agree that in some sense and some aspect, digital textbook can replace paper-based textbook, but not all.

Graph 62: Do you think that digital textbook can replace traditional paper-based textbook?

你觉得电子课本（多媒体ipad）能替代传统的纸质课本吗? (26 responses)



So with the questionnaire of students we have some conclusions:

1. Students use digital textbook to study very often, most of the students, they use almost everyday, or every two or three days.
2. Students spend more time in digital textbook. Everyday most of the students spend one to three hours on digital textbook.
3. Most of the students use digital textbook to preview the lesson they are going to learn and review the lesson that they have learnt.
4. Digital textbook makes learning more interesting.
5. With digital textbook, it is much easier to understand the content.
6. Most of the students' score improved after using digital textbook in comparison with learning through traditional paper-based textbook.
7. Most of the students can learn all by themselves through digital textbook.
8. Digital textbook can replace a part of the traditional paper-based book, but it can't replace all.

Data analysis of the Students' Chinese learning result

After one year's experiment, there are two formal exams in the end of each semester, the first semester I only use paper-textbook to teach the students Chinese, the second semester I use digital textbook. The results of the two exams can be seen from the Table 8. The average score of the first semester with only paper-based textbook is 72.56, the average score of the second semester with digital textbook is 79.78. So we can see from the score, the students have a little improvement in their Chinese learning.

Table 8: Score of students of paper-based textbook and digital textbook

Number	Score with paper-based textbook	Score with digital textbook
1	87	95
2	89	98
3	90	98
4	98	90
5	78	82
6	75	86
7	99	96
8	60	88
9	100	100
10	76	60
11	85	90
12	60	80
13	76	70
14	55	30
15	20	46
16	100	100
17	0	25
18	86	95
19	60	76
20	58	77
21	100	99
22	10	40
23	65	80
24	86	90
25	90	100
26	80	85
27	76	78
Sum	1959	2154
Average	72.56	79.78

Interview with students

I did three interviews with students to see if they prefer the new way of learning with digital textbook.

Student A 7 years old

Q: Do you like to use digital textbook to study Chinese?

A: Yes I like it, because it is interesting, and there are a lot of games, I like playing games. The book is boring.

Q: Can you learn all by yourself at home?

A: Yes, but it is much better to learn with you.

Q: If we don't use book, we only use digital textbook, is it ok?

A: Oh that's perfect, because I love it, I can spend a lot of time everyday to play with digital textbook, the book I don't even want to look at it.

Q: But digital textbook is not only for playing, it is for you to study Chinese, do you know it?

A: Yes I know, I am learning while playing, in this way I can learn and I love it.

Student B 6 years old

Q: Do you like to study Chinese with digital textbook?

A: Of course, who doesn't? I really wish all the subjects in my school have a digital textbook, so I can have ipad all the day.

Q: But ipad is not for you to play, do you know it? It is used for studying.

A: Yes I know, playing while studying is interesting, I prefer digital textbook than paper-based textbook.

Q: Tell me which is your favorite part of digital textbook?

A: I like to read after the voice, the video is interesting and the voice sounds good. Also I like the small games in the end of the text, I can finish all of them correctly.

Q: You are so good! I hope your Chinese can improve a lot, so will you recommend digital textbook to your friends?

A: Yes, it is so interesting, so why not.

Student C 6 years old

Q: Do you like to study with digital textbook?

A: Yes, I like it so much, it is much better than paper-based textbook.

Q: Why digital textbook is much better than paper-based textbook?

A: Because it is more interesting and with a lot of animations, I like them, paper-based textbook is a little boring. I can also write directly on digital textbook.

Q: Now do you like learning Chinese?

A: Yes, with digital textbook, I like to learn Chinese more.

Analysis of the interview with students

1. Word Frequency analysis.

According to table 9, the word textbook is mentioned 18 times during the interview, which represent 9.23% of the whole interview. And the word digital is mentioned 14 times, which represent 7.18% of the whole interview. The word interesting is mentioned 5 times, which represent 2.56% of the whole interview.

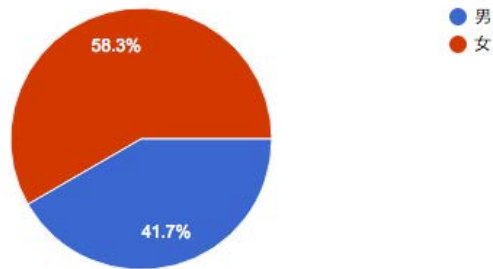
Table 9: Word Frequency-student

Word	Length	Count	Weighted Percentage
textbook	8	18	9.23%
digital	7	14	7.18%
like	4	11	5.64%
yes	3	7	3.59%
chinese	7	6	3.08%
interesting	11	5	2.56%
based	5	4	2.05%
know	4	4	2.05%
learn	5	4	2.05%
lot	3	4	2.05%
much	4	4	2.05%
paper	5	4	2.05%
playing	7	4	2.05%
study	5	4	2.05%
better	6	3	1.54%
book	4	3	1.54%
games	5	3	1.54%
learning	8	3	1.54%
old	3	3	1.54%
student	7	3	1.54%
use	3	3	1.54%
years	5	3	1.54%

Also you can see more clearly in the graph that the interview is about using digital textbook learning Chinese, and students' attitude is they feel the digital textbook very interesting.

Graph 64: Gender-parents

您的性别 (12 responses)

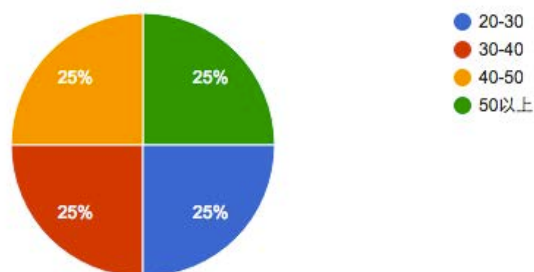


2. Age-parents

According to Graph 65, there are 3 parents with the age of 20 to 30 years old, which represent 25% of the total amount that is marked in the color blue. There are 3 parents with the age of 30 to 40 years old, which represent 25% of the total amount that is marked in the color red. And there are 3 parents with the age of 40 to 50 years old, which represent 25% of the total amount that is marked in the color yellow. And also there are 3 parents with the age of more than 50 years old, which represent 25% of the total amount that is marked in the color green.

Graph 65: Age-parents

您的年龄 (12 responses)

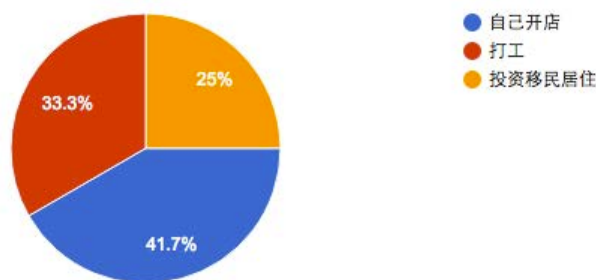


3. Profession-parents

According to Graph 66, 5 parents own their own business, some of them have a restaurant or a shop in Barcelona, accounting for 41.7% of the total amount that is marked in the color blue. 4 parents are employees and work for other companies, accounting for 33.3% of the total amount that is marked in the color red. 3 parents are immigrations they moved here to live because they want to give their children a better education environment and social welfare, they have a very good economic condition that they don't need to work, which accounting for 25% of the total amount that is marked in the color yellow. There are mainly three types of Chinese living in Barcelona.

Graph 66: Profession-parents

您在西班牙做什么？ (12 responses)

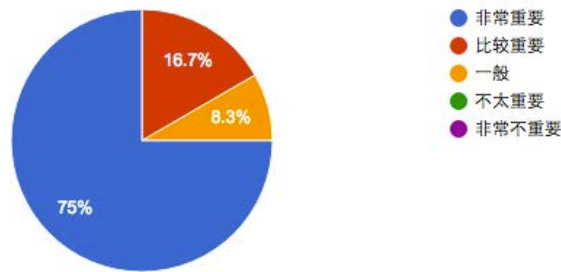


4. Do you think learning Chinese is important for your kid?

According to Graph 67, 9 parents choose that learning Chinese is very important for their kids, which account for 75% of the total number that is marked in the color blue. 2 parents choose that learning Chinese is relatively important for their kids, which account for 16.7% of the total number that is marked in the color red. Only one parent thinks that it is normal for their kids to learn Chinese, which account for 8.3% of the total number that is marked in the color yellow. There is no parent choose that learning Chinese is not important or not important at all for their kids. So most of the parents agree that learning Chinese is important for their kids while living in Spain.

Graph 67: Do you think learning Chinese is important for your kid?

您觉得中文学习对孩子重要吗? (12 responses)

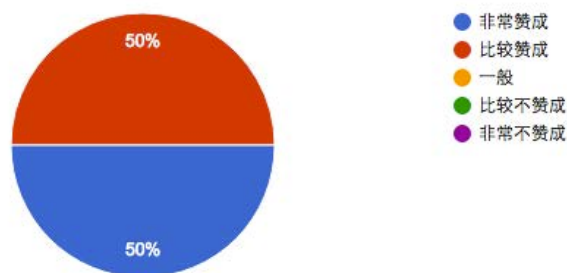


5. Do you agree that your kid use digital textbook to learn Chinese?

According to Graph 68, there are 6 parents strongly agree on using digital textbook to learn Chinese, which account for 50% of the total number that is marked in the color blue. And there are 6 parents agree that their kids use digital textbook to learn Chinese, which account for 50% of the total number that is marked in the color red. There are no parents choose that they disagree or strongly disagree about their kids using digital textbook to learn Chinese. So all the parents vote for digital textbook for their kids to learn Chinese.

Graph 68: Do you agree that your kid use digital textbook to learn Chinese?

您赞成孩子使用电子课本学习中文吗? (12 responses)

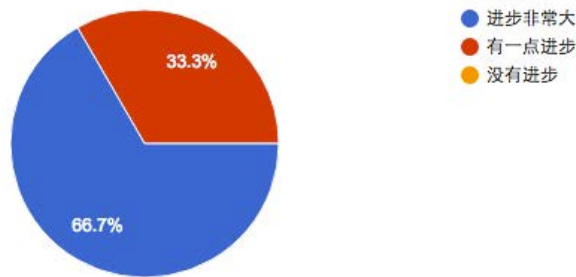


6. After this semester's study, do you think that your kids improved in learning Chinese?

According to Graph 69, 8 parents think that after this semester's study, their kids improved a lot in Chinese, which represent 66.7% of the total number that is marked in the color blue. 4 parents think that their kids' Chinese improved in some extent, which represent 33.3% of the total number that is marked in the color red. There is no parent think that their kid's Chinese has no improve after this semester's study. This semester the teacher using digital textbook as the teaching tool to teach Chinese, so the teaching result is good, all the parents think their kids' Chinese improve a lot or improved in some extent.

Graph 69: After this semester's study, do you think that your kids improved in learning Chinese?

通过一学期的学习，您觉得孩子的中文有进步吗？ (12 responses)

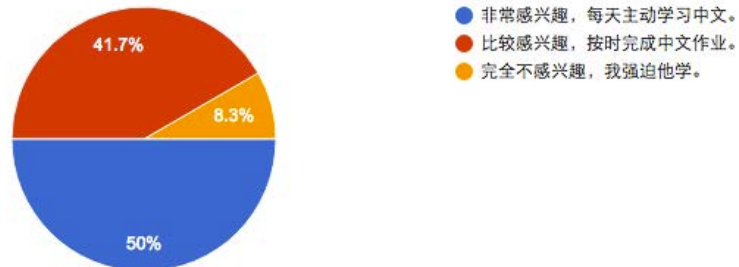


7. What's the learning attitude of your kid while learning Chinese?

According to Graph 70, 6 parents choose that their kids are very interested in learning Chinese and everyday their kids take the initiative to learn Chinese by themselves, there is no need to advice them, which consists of 50% of the total amount that is marked in the color blue. 5 parents choose that their kids are interested in learning Chinese, they can finish their homework on time without forced by their parents, which consist of 41.7% of the total amount that is marked in the color red. Only one parent choose that the kid is not interested in Chinese at all, the parent need to forced the kid to learn, which only consists of 8.3% of the total amount that is marked in the color yellow. Most of the kids show interest in learning Chinese and most of them can learn Chinese by themselves with their strong interest.

Graph 70: What's the learning attitude of your kid while learning Chinese?

孩子表现出来的学习状态如何? (12 responses)

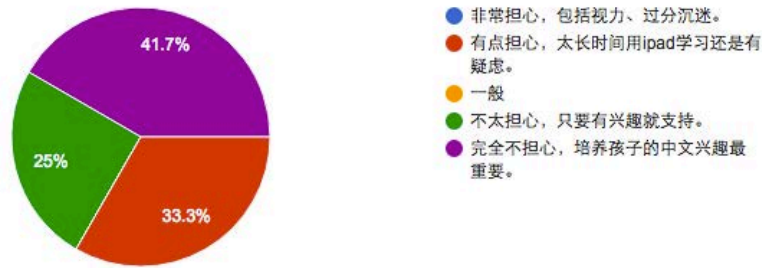


8. Are you worried about your kids using digital textbook?

According to Graph 71, 5 parents choose that they are not worried about their kids using digital textbook at all, the most important thing is to trigger their kids' interest in learning Chinese, which represents 41.7% of the total number that is marked in the color purple. 3 parents choose that they are not worried about their kids using digital textbook, if their kids have interest in learning Chinese they need to support it, no matter what tools they use to learn, which represents 25% of the total number that is marked in the color green. 4 parents choose that they are a little worried about their kids using too much time with digital textbook, which represents 33.3% of the total number that is marked in the color red. Too much technology makes them worried. So some of the parents don't worry about studying with digital textbook, but some of the parents worried about studying with digital textbook.

Graph 71: Are you worried about your kids using digital textbook?

您对孩子使用电子课本学习中文有担心吗? (12 responses)



So with the questionnaire of parents we have some conclusions:

1. Most of the parents agree that learning Chinese is important for their kids. The kids are all born in Spain with the Spanish nationality, their mother tongue is Spanish and Catalan, but most of the parents think Chinese is important for their kids.
2. All the parents agree about their kids using digital textbook to learn, but some of them are worried about studying with digital textbook, they don't know about the side effect of using digital textbook, but they feel a little worried about using too much time on digital textbook.
3. All of them agree that with one semester's study with digital textbook, their kids' Chinese improved in some extent.
4. The attitude of the kids in learning Chinese, most of the kids show interest in learning Chinese.

Interviews with parents

After the two semesters Chinese class, I organized a parent meeting with all the parents of my students, and I interviewed three of them.

Parent A 29 years old

Q: Are you satisfied with his attitude of learning Chinese?

A: I am very satisfied, I think he is very interested in learning Chinese now. Me and his father we arrived to Spain many years ago, we had a restaurant, and our kid was born here and entered the public school in Barcelona, there is no environment for him to learn Chinese, in my family we all speak Qingtian dialect. We want our kid speak mandarin Chinese, so we sent him to this Chinese school, and this year we can feel that he improved a lot in Chinese, we are so happy.

Q: I can also notice his progress, and I am happy for you. This semester I taught Chinese with digital textbook, do you have some suggestions?

A: I think digital textbook is good, because after school my kid can study Chinese online at home through ipad, at least he is very interested in Chinese, and everyday after school he is studying with ipad, we are just worried about playing games, if you use ipad to study, we are all support him.

That's good, thank you so much.

Parent B 35 years old

Q: Has your child improved her Chinese this semester?

A: Yes, she improved a little in Chinese. My child's Chinese foundation is very good, we immigrated here for two years, before we immigrated she already have the basic recognition of Chinese. During the two years here, we felt the child's Spanish and English have improved very fast, I am very afraid that she forget Chinese, in fact, we speak Mandarin at home, we are afraid of the Chinese environment, because here is an Spanish environment, we want our child to have a Chinese environment, because after all, Chinese is very important for her future.

Q: Your child's Chinese is the best in the class, certainly it is related with her growing up in the domestic environment, now in China they also use digital textbooks, right?

A: In China, digital textbooks are very popular a few years ago, because I was a teacher, I have a better understanding of this situation, my child was very small when

we were in China, but she already hold the ipad every day to watch the video and playing simple games to learn English. You do not have to teach a little kid how to use ipad, she know how to use it. I see that this semester you are also use digital textbooks to teach, children's enthusiasm should be very high, don't they?

Q: They are more concentrated than before, because I have 27 students, they are very young, if you do not teach in an interesting way, then they will do whatever they want and talk in the class. This semester with the digital textbooks, the situation is much better, the students can focus on the study in the class. What is your opinion about teaching with digital textbook?

A: This is a very good attempt, I support it, but you have to control the using time, you need to take out a part of the time to explain the knowledge structure, because there are some knowledge is not in the digital textbook, you are the teacher you need to control it. At home parents like us also need to control their using time, we can not let the child use ipad for too long time, because it is not good for their vision.

Parent C 37 years old

Q: Is there any progress of her Chinese?

A: I can feel her progress in this semester is very big, before she only speak Spanish with other Chinese kiss, now she begin to talk in Chinese, and I feel very happy. Because my children grew up in Spain without the Chinese language environment, parents like us are very busy every day, we have a shop, there is no time to take care of our children and their studies. I recently found that she began to speak Chinese.

Q: This semester I have been using digital textbook to teach, do you support it?

A: I noticed that she goes home every day with ipad to study, I am very happy about it, I do not know technology such as computers, I never use these electronic products. I feel that this digital textbook is very good, you can click it and it will read for you, the child repeat with the voice at home. There are also some games, I think she is very interested in playing the game, as long as she is learning Chinese, it doesn't matter

through what method, the most important thing is improve her Chinese. Only one thing I am a little worried about, I hope she is not addicted to the games in digital textbook.

Q: I have homework for them everyday to review the lessons that I have taught and preview the lessons that we are going to learn, you can specify her daily use time of the digital textbook, so you can control it. Do you have any suggestions?

A: My advice is to make children interested in Chinese, it is the most important thing. As long as she want to learn, she will make great progress and improve very fast. We force her to learn is not a good way, my child is rebellious. I hope you can trigger her interest in learning Chinese.

Analysis of the interview with partents

1. Word Frequency analysis.

According to table 10, the word digital is mentioned 12 times during the interview, which represent 2.87% of the whole interview. And the word environment is mentioned 6 times, which represent 1.44% of the whole interview. The word control is mentioned 4 times, which represent 0.96% of the whole interview.

Table 10: word frequency-parents

Word	Length	Count	Weighted Percentage
chinese	7	28	6.70%
digital	7	12	2.87%
child	5	9	2.15%
textbook	8	8	1.91%
use	3	8	1.91%
good	4	7	1.67%
ipad	4	7	1.67%
years	5	7	1.67%

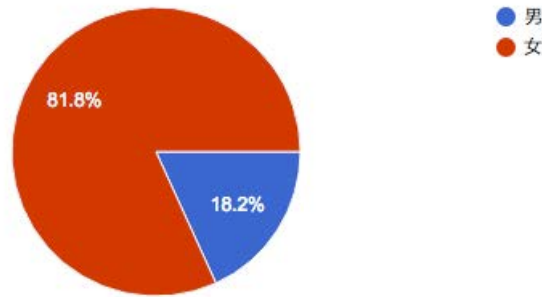
environment	11	6	1.44%
semester	8	6	1.44%
time	4	6	1.44%
also	4	5	1.20%
home	4	5	1.20%
learn	5	5	1.20%
speak	5	5	1.20%
children	8	4	0.96%
class	5	4	0.96%
control	7	4	0.96%
feel	4	4	0.96%
games	5	4	0.96%
happy	5	4	0.96%
improved	8	4	0.96%
interested	10	4	0.96%
kid	3	4	0.96%
learning	8	4	0.96%
parent	6	4	0.96%
progress	8	4	0.96%
school	6	4	0.96%
study	5	4	0.96%
teach	5	4	0.96%
textbooks	9	4	0.96%
want	4	4	0.96%

So we can see from the word frequency graph 72, parents are concerned about using digital textbook to learn Chinese. Parents agree that digital textbook trigger the students' interest in learning Chinese and they are happy about the learning progress

Chinese females prefers to be a teacher, because it is more stability and teacher is respected by other people, it is a very good choice for Chinese females.

Graph 73: Gender-teacher

您的性别 (11 responses)

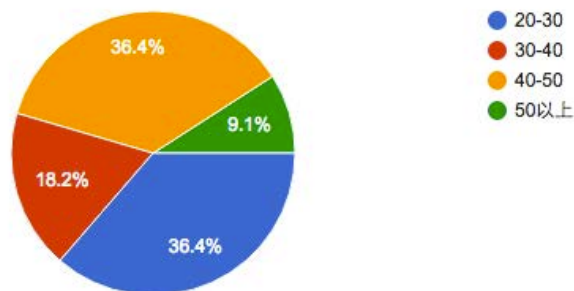


2. Age-teacher

According to Graph 74, there are 4 teachers with the age 20 to 30 years old, which represent 36.4% of the total number that is marked in the color blue. There are 4 teachers with the age of 40 to 50 years old, which represent 36.4% of the total number that is marked in the color yellow. There are 2 teachers with the age 30 to 40 years old, which represent 18.2% of the total number that is marked in the color red. There is only one teacher with the age more than 50 years old, which represents 9.1% of the total number that is marked in the color green.

Graph 74: Age-teacher

您的年龄 (11 responses)

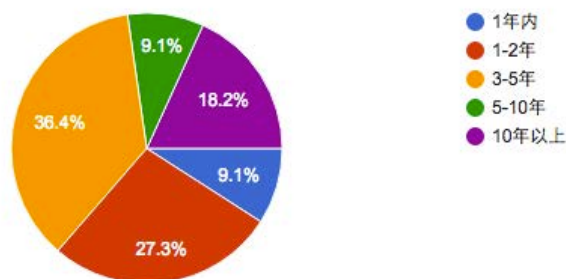


3. Chinese teaching experience

According to Graph 75, there are 4 teachers have the Chinese teaching experience of 3 to 5 years, which represent 36.4% of the total number that is marked in the color yellow. There are 3 teachers have the Chinese teaching experience of 1 to 2 years, which represent 27.3% of the total number that is marked in the color red. There are 2 teachers have the Chinese teaching experience of more than 10 years, which represent 18.2% of the total number that is marked in the color purple. There is one teacher with the experience of teaching Chinese only less than one year and also there is one teacher with the experience of 5 to 10 years, which represent 9.1% and 9.1% of the total number that is marked in the color green and blue. So in this school there are teachers with more than 10 years experience and there are teachers with one year or two or less than one year's teaching experiences.

Graph 75: Chinese teaching experience

您中文教学的时间 (11 responses)

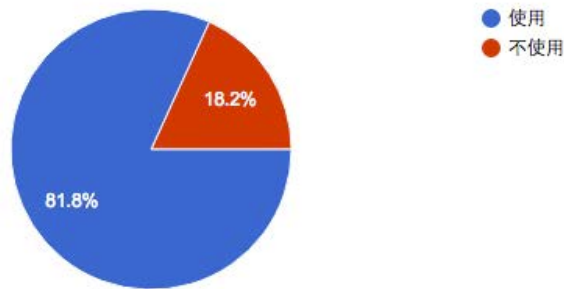


4. Do you use digital textbook in the class?

According to Graph 76, there are 9 teachers use digital textbook in the class, which represents 81.8% of the total number that is marked in the color blue. And there are 2 teachers don't use digital textbook in the class, which represent 18.2% of the total number that is marked in the color red. So most of the teachers use digital textbook to teach Chinese in their class, only some of the teachers don't use digital textbook in the class.

Graph 76: Do you use digital textbook in the class?

您使用教材配套的电子课本进行课堂教学吗? (11 responses)

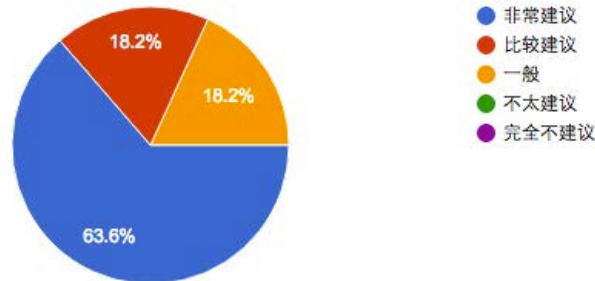


5. Do you suggest using digital textbook to teach Chinese in language school?

According to Graph 77, 7 teachers strongly agree on suggesting using digital textbook to teach Chinese in language school, which represent 63.6% of the total number that is marked in the color blue. 2 teachers agree on suggest using digital textbook to teach Chinese in language school, which represent 18.2% of the total number that is marked in the color red. 2 teachers choose normal which means not that agree or disagree on suggesting using digital textbook in teaching Chinese, which represent 18.2% of the total number that is marked in the color yellow. From the result we can see that most of the teachers are agree on this topic, they support on using digital textbook to teach Chinese in language school.

Graph 77: Do you suggest using digital textbook to teach Chinese in language school?

您建议中文学校使用电子课本进行教学吗? (11 responses)

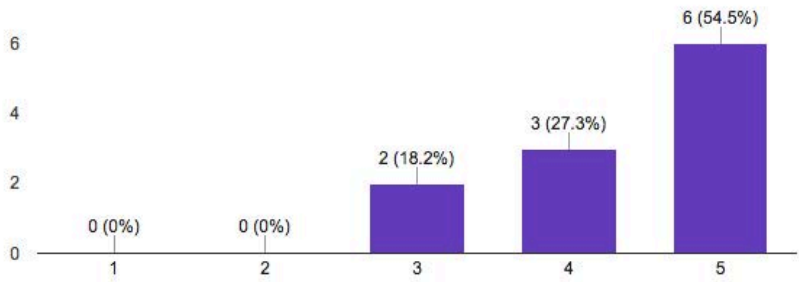


6. Teacher centered teaching mode is changed with digital textbook.

According to Graph 78, 6 teachers strongly agree on digital textbook changed teacher centered teaching mode, which represent 54.5% of the total number. 3 teachers agree on digital textbook changed teacher centered teaching mode, which represent 27.3% of the total number. And there are 2 teachers choose neutral on this topic, which represent 18.2% of the total number. So most of the teacher agree that digital textbook changed teacher centered teaching mode. Teacher centered mode is popular used in all the traditional teaching systems, with digital textbook, this mode is changed to student centered mode.

Graph 78: Teacher centered teaching mode is changed with digital textbook. (1 means totally not agree, 2 means not agree, 3 means normal, 4 means agree, 5 means totally agree)

以老师为中心的课堂模式改变了。(请根据您的同意程度从1-5打分。1-非常不同意, 2-比较不同意, 3-一般, 4-比较同意, 5-非常同意)
(11 responses)

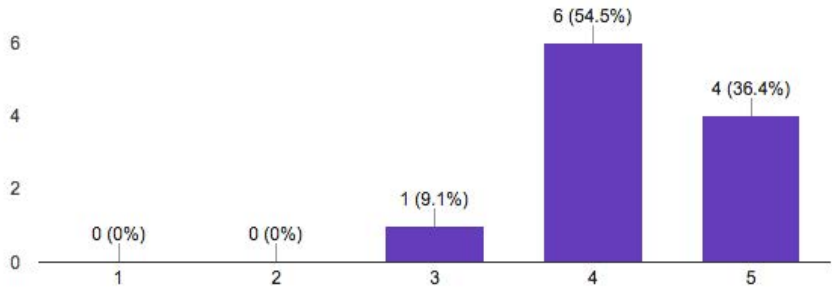


7. Students' information seeking ability improved with digital textbook.

According to Graph 79, there are 4 teachers strongly agree on the topic that students' information seeking ability improved with digital textbook, which represent 36.4% of the total number. There are 6 teachers agree on this topic, which represent 54.5% of the total number. And there is one teacher choose neutral on this topic, not agree and not disagree, which represent 9.1% of the total number.

Graph 79: Students' information seeking ability improved with digital textbook.

学生寻找信息的能力提高了。(11 responses)

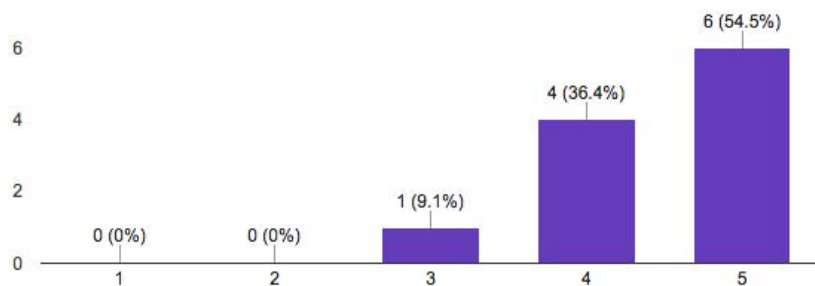


8. Students improved the techniques of using electronic devices.

According to Graph 80, 6 teachers strongly agree that students improved the techniques of using electronic devices, which represent 54.5% of the total number. 4 teachers agree on this topic, which represent 36.4 of the total number. Only one teacher choose neutral on this topic, not agree and not disagree, which represent 9.1% of the total number. So most of the teachers agree that students improved their techniques of using electronic devices as they use digital textbook to study.

Graph 80: Students improved the techniques of using electronic devices.

学生使用电子产品的技术提高了。 (11 responses)

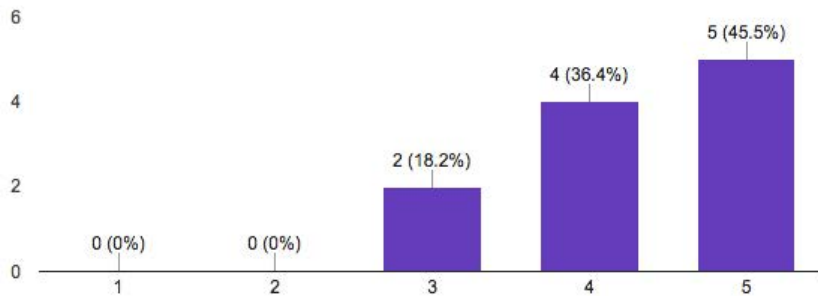


9. Students' communication and discussion ability and the ability to summarize are improved with digital textbook.

According to Graph 81, 5 teachers strongly agree that the students' communication and discussion ability and the ability to summarize are improved with the use of digital textbook, which represent 45.5% of the total number. 4 teachers agree with this topic, which represent 36.4% of the total number. And there are 2 teachers choose neutral on this topic, not agree and not disagree, which represent 18.2% of the total number. So most of the teachers agree through using digital textbook, students' communication and discussion ability and the ability to summarize are improved.

Graph 81: Students' communication and discussion ability and the ability to summarize are improved with digital textbook.

学生的沟通讨论和总结能力提高了。 (11 responses)

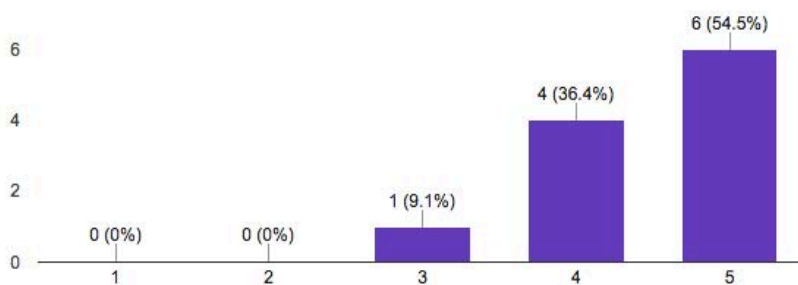


10. Students' learning results improved with digital textbook.

According to Graph 82, 6 teachers strongly agree that the students' learning results improved with digital textbook, which represent 54.5% of the total number. 4 teachers agree with this topic, which represent 36.4% of the total number. Only one teacher choose neutral on this topic, not agree and not disagree, which represent 9.1% of the total number. So most of the teachers believe that after learning with digital textbook, students learning results improved.

Graph 82: Students' learning results improved with digital textbook.

学生的成绩提高了。 (11 responses)



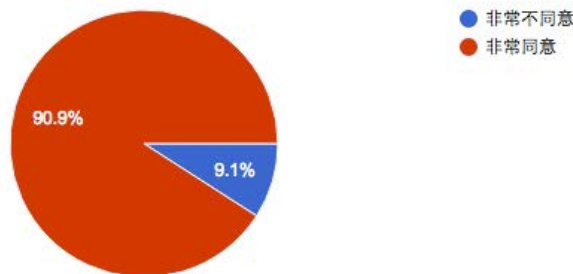
10. With digital textbook, the method of evaluating students is more diversified.

According to Graph 83, 10 teachers strongly agree that with digital textbook, the method of evaluating students is more diversified, which represent 90.9% of the total

number that is marked in the color red. Only one teacher choose strongly disagree on this topic, which represent 9.1% of the total number that is marked in the color blue. So most of the teachers agree that digital textbook make the evaluating method more diversified.

Graph 83: With digital textbook, the method of evaluating students is more diversified.

评价学生的方法更加多元化了。 (11 responses)

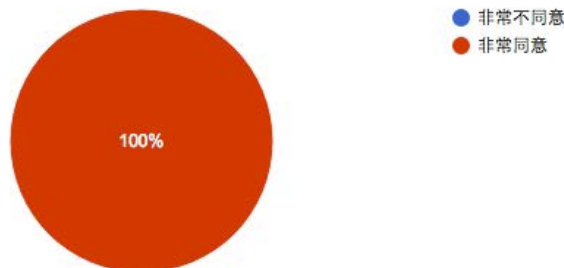


11. My teaching method changed with digital textbook.

According to Graph 84, 11 teachers all choose strongly agree that their teaching method changed with digital textbook, which represent 100% of the total number that is marked in the color red. So all the teachers agree teaching with digital textbook changed their teaching method.

Graph 84: My teaching method changed with digital textbook.

我的教学方式改变了。 (11 responses)

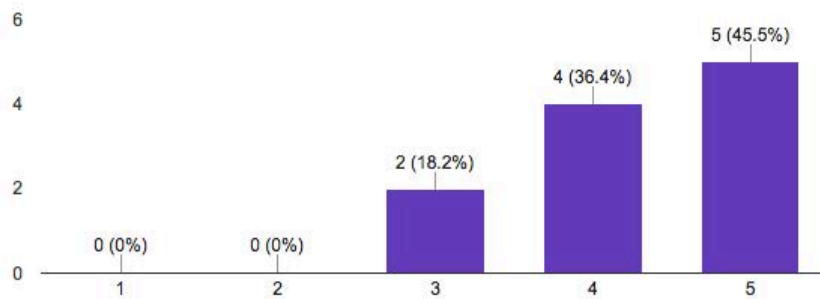


12. My teaching ability has improved with digital textbook.

According to Graph 85, 5 teachers strongly agree that their teaching ability has improved with digital textbook, which represent 45.5% of the total number. 4 teachers agree with this topic, which represent 36.4% of the total number. Only two teacher choose neutral on this topic, not agree and not disagree, which represent 18.2% of the total number. So most of the teacher agree that using digital textbook to teach in class, their teaching ability have improved.

Graph 85: My teaching ability has improved with digital textbook.

我的教学能力提高了。 (11 responses)

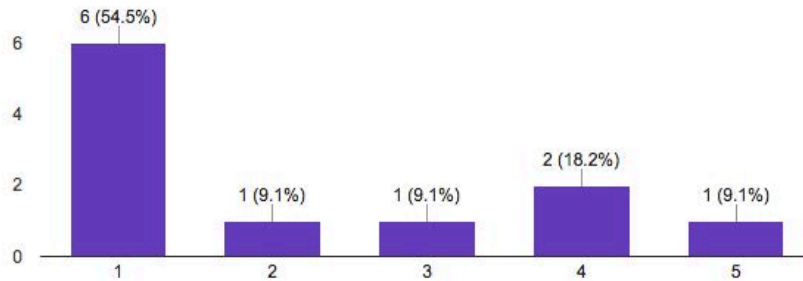


13. Using digital textbook to prepare the class is a burden for me.

According to Graph 86, 6 teachers strongly disagree that using digital textbook to prepare the class is a burden, which represent 54.5% of the total number. One teacher disagrees on this topic, which represents 9.1% of the total number. And one teacher choose neutral on this topic, not agree and not disagree, which represents 9.1% of the total number. 2 teachers agree that using digital textbook to prepare the class is a burden, which represent 18.2% of the total number. And one teacher strongly agrees on this topic, which represents 9.1% of the total number. So some of the teachers think digital textbook is a burden for them to prepare the class and some of the teachers don't think so, it depends on the person and how they use digital textbook.

Graph 86: Using digital textbook to prepare the class is a burden for me.

使用电子课本给我备课造成了负担。(11 responses)

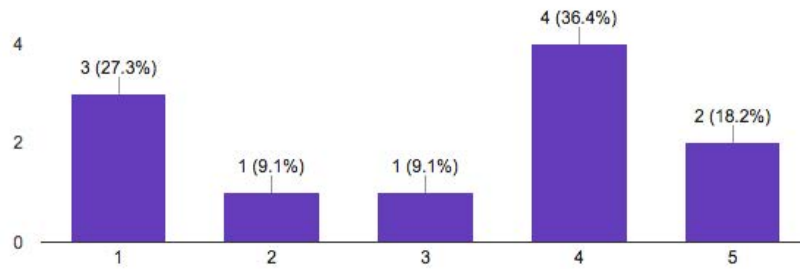


14. Digital textbook is only the mean of assisted teaching, it will not changed traditional mean of teaching.

According to Graph 87, 3 teachers strongly disagree that digital textbook is only the mean of assisted teaching, it will not changed traditional mean of teaching, which represent 27.3% of the total number. One teacher disagrees on this topic, which represents 9.1% of the total number. And one teacher choose neutral on this topic, not agree and not disagree, which represents 9.1% of the total number. 4 teachers agree that Digital textbook is only the mean of assisted teaching, it will not changed traditional mean of teaching, which represent 36.4% of the total number. And two teachers strongly agree on this topic, which represent 18.2% of the total number. So we can see that some of the teachers think digital textbook can change the traditional way of teaching, and some of the teachers think digital textbook is only assisted traditional teaching.

Graph 87: Digital textbook is only the mean of assisted teaching, it will not changed traditional mean of teaching.

电子课本只是辅助教学的手段，它完全不会改变传统的教学。(11 responses)

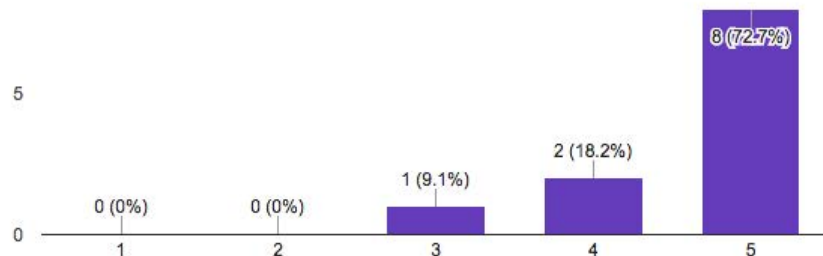


15. Digital textbook makes atmosphere in the class more active.

According to Graph 88, 8 teachers strongly agree that digital textbook makes atmosphere in the class more active, which represent 72.7% of the total number. 2 teachers agree on this topic, which represent 18.2% of the total number. And one teacher choose neutral on this topic, not agree and not disagree, which represents 9.1% of the total number. So most of the teachers agree that digital textbook makes atmosphere in the class more active.

Graph 88: Digital textbook makes atmosphere in the class more active.

使用电子课本后课堂气氛更加活跃。(11 responses)



16. I like to communicate with students online.

According to Graph 89, 4 teachers strongly agree that they like to communicate with students online, which represent 36.4% of the total number. There are 3 teachers agree on this topic, which represent 27.3% of the total number. And there are 2 teachers choose neutral on this topic, not agree and not disagree, which represents 18.2% of the total number. One teacher disagree that he or she likes to communicate with students online, which represent 9.1% of the total number, and one teacher strongly disagree on this topic, which represent 9.1% of the total number. So we can see that most of the teachers prefer the new way of communication, they like to communicate with the students online, but still some of the teachers are not used to the new way of communication with the students.

Graph 89: I like to communicate with students online.

我喜欢在网上跟同学进行交流。 (11 responses)



17. I agree to promote digital textbook in schools.

According to Graph 90, 7 teachers strongly agree to promote digital textbook in schools, which represent 63.6% of the total number. 2 teachers agree on this topic, which represent 18.2% of the total number. And there is one teacher choose neutral on this topic, not agree and not disagree, which represents 9.1% of the total number. There is also one teacher doesn't agree to promote digital textbook in schools, which represent 9.1% of the total number. So most of the teachers would love to promote digital textbook in schools, but a small mount of the teachers don't want to promote digital textbooks in schools.

Graph 90: I agree to promote digital textbook in schools.

我赞成在学校推广电子课本。 (11 responses)

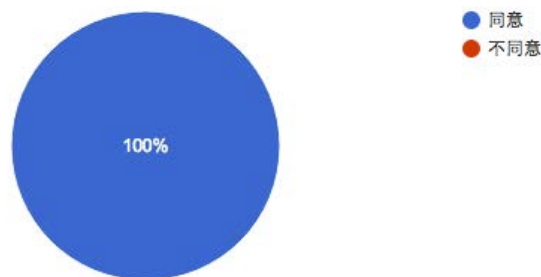


18. Do you agree that using digital textbook to teach can improve the teaching results?

According to Graph 91, all 11 teachers agree that using digital textbook to teach can improve the teaching results, which represent 100% of the total number that is marked in the color blue. So we can see that digital textbook is helpful to improve the teaching results.

Graph 91: Do you agree that using digital textbook to teach can improve the teaching results?

您同意使用电子设备教学可以提升教学效果吗? (11 responses)



So with the questionnaire of teachers we have some conclusions:

1. Most of the teachers use digital textbook to teach Chinese in class, only a small amount of the teachers still using the traditional way of teaching.
2. Most of teachers suggest using digital textbook to teach Chinese in class, only a small amount of the teachers are neutral on this topic.
3. Most of the teachers believe that digital textbook has changed teacher centered teaching mode, it becomes more student centered.
4. Most of the teachers believe that students' abilities improved with the use of digital textbook, for example, information seeking ability, techniques of using electronic devices, communication and discussion ability and the ability to summarize. Digital textbook makes atmosphere in the class more active. The most important is the learning results has improved. Most of the teachers like to communicate with the students online.
5. From the teacher's side, most of the teachers believe that with digital textbook, the method of evaluating students is more diversified, their teaching method is changed, and their teaching abilities have improved.
6. But some of the teachers think digital textbook is a little burden for them to prepare the class, and some of them believe that digital textbook is only a means of teaching, it will not replace the traditional way of teaching.
7. Most of the teachers would love to promote digital textbook in schools, and all of them believe that using digital textbook to teach can improve the teaching results.

Interview with teachers

So with the conclusion, I did 3 interviews with the teachers in this Chinese language school.

Teacher A: The first teacher is very young, only has 28 years old, and only one year teaching experience.

Q: Do you use digital textbook to teach in class?

A: Yes, I like to use electronic devices very much, I also used in the classroom, because the children prefer this way of teaching, which can make the classroom atmosphere more active.

Q: Do you need a lot of time to prepare the class?

A: Every time I need to prepare for a long time, because this set of teaching materials are the first time for me to teach, so I need to prepare and reference a lot of materials, I use digital textbooks, I also use multimedia assisted teaching in the class, I spend a lot of time to find materials, such as interesting little animations, which can attract students' interest that take a lot of time. The most important thing is my students love my class.

Q: Do you need paper-based textbook in the class?

A: I almost don't need it. But I need it when I am preparing the lessons, I need to prepare the materials and exercises according to the content of paper-based textbook. I need to teach all the knowledge points that are mentioned in the syllabus. In the class, basically I do not need textbook. I also do not require students to bring textbook in class. As long as the students follow my ideas, digital textbook is enough. But after the class they need the paper-based book, because I will leave some exercises for them.

Q: Do you want to share something about the advantages and disadvantages of using digital textbook?

A: The biggest advantage of digital textbook is the increasing of the students' participation. The original classroom model is based on the teacher, and digital textbook is student-centered, the teacher only plays a guiding role. Students' performance is more active in the class and they can focus their attention because they need to do it and participate in the process of learning. The disadvantage is that the teacher should have a good preparation of the lesson and guide the students, teachers

can not let the students learn according to their own rhythm, because with only a little careless, there is no way to control them. Although there are a lot of contents in the digital textbook, but the teacher still need to add a lot of teaching materials. If the teachers only use the material in digital textbook, it is not enough. In order to let the students have a better understanding of all the contents, the preparation time is much longer.

Q: Are there any improvement in the students' abilities?

A: I have been always used digital textbook to teach in my class. I can feel that the students' progress is very fast. Cultivate their interest is very important. Their Chinese improved a lot, their results improved, they become more focused on their study, their abilities of using electronic products is improved. Also their teamwork and competition awareness are improved.

Q: Do you recommend other teachers to use digital textbook to teach?

A: I strongly recommended. Personally I like it, and I also feel very comfortable in the process of teaching. I love to see my students in the good atmosphere in the classroom, so I strongly recommended.

Thank you.

Teacher B: She already taught Chinese for 4 years, and a good experience of teaching Chinese, the students like to learn Chinese with her.

Q: Do you use digital textbook in class?

A: I recently started to use digital textbook, almost one year time. I didn't use it before. In the beginning, I only use paper-based textbook in teaching Chinese. This year I found this digital textbook, I wanted to try to use it in my teaching and I feel pretty good. My students also found it very interested. So I began to use digital textbook in my class.

Q: Do you also use paper-based textbook in the class?

A: Yes, because according to my experience, it is much better if my students do some markings in the book. I think that the key point they need to write on the book, if not it is difficult to review. Digital textbook is suitable for classroom in teaching process, but the key knowledge I still ask the students to write down. Because there is a very famous saying in China: The palest ink is better than the best memory. It means the best way to learn is to write. In this way, it is easier to review before the exam. Because my students are very young, they need to write and write to remember how to write the Chinese characters. I give them homework to copy each Chinese character 10 times everyday. The digital textbook can not let the students remember the writing of the words, I think writing is the only way to remember.

Q: How about the teaching in the class?

A: I use digital textbook to teach in the class, and arrange some activities. I like to give some task in the class to the students, such as some Chinese-related creative works. For example in Mother's Day, I give a task for my students to make a greeting card for mum, written in Chinese blessings. For example, during the Chinese New Year, I teach students paper cutting to do a New Year painting, I divided them into several groups, so each group work together to finish the task together, in the end we see which group complete the task faster and better. Also with the task of the digital textbook, I divided the students into two big groups to answer the questions, two groups compete with each other. In the end which group answered more questions correctly has a small reward. The students are very active, and also love to participate in the activities. I design some activities everyday according to the content, it is much more funny than explaining the boring content in the class, all my students love those activities, so it is the motivation for me to think of more interesting activities.

Q: It is really good, so do you think the students improved during this semester?

A: The final exam results show that they have made great progress, there is no students fail the exam and most of them are excellent. I hope they will have greater progress next year.

Teacher C: She already taught for 11 years, has a very long experience of teaching Chinese.

Q: Do you use digital textbook to teach in the class?

A: No, I do not use it. I already taught Chinese for more than ten years. I only use paper-based teaching materials and blackboard, because I am already used to teach with traditional teaching methods. I think that the most traditional way is more suitable for learning Chinese. I am 56 years old this year. I don't know how to use those advanced technology, such as digital textbook. And I have never used it before. I wanted to learn, but it is too difficult for me. I saw other teachers using digital textbook to teach in the classroom, and it is very interesting, I thought to try to learn it last year, but it was too difficult for me. So I still continue to use my traditional way to teach.

Q: Can you introduce about your traditional teaching model?

A: It is mainly blackboard. Every time I have Chinese class I write characters full of blackboard with chalks. The knowledge I teach is all according to the knowledge points from the paper-based book. The way I teach the pronunciation of Chinese characters is I read it one time and all my students repeat after me. I also selected a leader of my class. Every morning during the morning class the leader will lead all the students read the new words and text. The way I teach how to write Chinese characters, I write on the blackboard each stroke of the character. In this way the students imitate how to write a character in their own notebook. Also there are characters written in the book in red, so that the student can copy and trace each stroke and write the character as a practice. So each character I teach, the students need to copy a line of the same character to practice. In China there is a famous saying: practice makes perfect. So the students need to practice more to remember how to write the character. After teaching the characters then I teach them phrases related to each character. First I ask them to do phrases then I write several phrases on the blackboard, then let the students copy them on the book, in order to review all the

knowledge more convenience and easier. I often ask questions during the class, but I do not like to let one student answer the question. I like to let everybody answer together. The whole class tell me the answer at the same time, in this way I can catch all the students' attention.

Q: Will you consider using digital textbook in the future?

A: Maybe, I think teachers also need to keep pace with the times. We need to continue to learn new teaching methods. I also want to learn how to use digital textbook. But I am a little old, and learning is not so easy for me. So for now I will still use traditional teaching methods to teach Chinese. But at the same time I begin to learn digital technology, if not I will be out of this digital society.

Q: Are you worried about the students about using digital textbook?

A: I feel a little bit worried yes, because digital textbook are very attractive to them. They learn faster than me, I am afraid they addicted to it, ignoring the real knowledge. Now in my class, I can let all the students keep the attention on the knowledge, if they use digital textbook, their attention will certainly be scattered. This is the only thing I am worried about.

Analysis of the interview with teachers

1. Word Frequency analysis.

According to table 11, the word digital is mentioned 28 times during the interview, which represent 3.3% of the whole interview. And the word teaching is mentioned 18 times, which represent 2.12% of the whole interview. The word write is mentioned 13 times, which represent 1.53% of the whole interview.

Table 11: word frequency-teachers

Word	Length	Count	Weighted Percentage
textbook	8	31	3.66%

students	8	29	3.42%
digital	7	28	3.30%
class	5	24	2.83%
use	3	22	2.59%
chinese	7	18	2.12%
need	4	18	2.12%
teaching	8	18	2.12%
teach	5	17	2.00%
also	4	13	1.53%
write	5	13	1.53%
time	4	12	1.42%
way	3	11	1.30%
learn	5	9	1.06%
based	5	8	0.94%
character	9	8	0.94%
paper	5	8	0.94%
teacher	7	8	0.94%
year	4	8	0.94%
knowledge	9	7	0.83%
let	3	7	0.83%
lot	3	7	0.83%
book	4	6	0.71%
characters	10	6	0.71%
classroom	9	6	0.71%
like	4	6	0.71%
materials	9	6	0.71%
teachers	8	6	0.71%
think	5	6	0.71%

Chapter 4: Conclusions and Implications

Conclusions

After the one-year experiment, teaching with digital textbook and traditional paper-based textbook, students are happy with digital textbook, and parents show a little concern about it and teachers would love to promote digital textbook in Chinese class. The findings are as follows:

1. Students learning results improved with the digital textbook.
2. Students like learning through digital textbook, they almost use it everyday or every two or three days. They spend a lot of time on digital textbook everyday. Most of the students can use digital textbook to preview and review the lessons. And most of them can learn all by themselves through digital textbook.
3. And students can concentrate more in class with digital technique, because digital platform can offer more interesting activities that make learning more fun.
4. Because Chinese is complicated, especially written in Chinese, with digital platform students can understand better and memorize better.
5. Most of the parents believe that Chinese is important for their kids and using digital textbook is good for their kids to learn Chinese because their kids show more interest in learning Chinese with digital textbook, but some of them are worried about the side affect of digital textbook.
6. Most of the teachers use digital textbook in Chinese class, and support using digital textbook. But some of the teachers still using the traditional way of teaching and they don't suggest on using digital textbook.
7. Most of the teacher believe that digital textbook has changed teacher centered teaching mode and it becomes more student centered. And students' abilities improved, such as information seeking ability, techniques of using electronic devices, communication and discussion ability and the ability to summarize. Digital textbook makes atmosphere in the class more active.

8. Most of the teachers believe that with digital textbook, the method of evaluating students is more diversified and their teaching method is changed and their teaching abilities have been improved.
9. Traditional textbook is not useless, it is an supplement for digital teaching. Digital textbook will not replace the traditional way of teaching. And some of the teacher also think digital textbook is a little burden for them to prepare the class.
10. Most of the teachers would love to promote digital textbook in schools and they believe digital teaching in Chinese language is a trend.

Implications

The role of the teacher

The role of the teacher in the digital information age should be rethink, and it will be the most important thing in the Chinese class. In traditional teaching model class, teacher centered teaching model should be changed, teacher plays a role to trigger the students' learning interest and a student centered class model need to be formed. Teachers should continue to lead the rhythms of the teaching and learning process and create, facilitate and manage learning interactions. Teachers should take action to control the flow of the teaching action to be more creative, more productive and more accessible.

In traditional Chinese class, students can get all the information from the textbook, teacher need to explain the text and new words. While with digital textbook, students can find all the information in it and in some extent can learn by themselves. So should we eliminate teachers in the class? The answer is teacher will not be eliminated is for sure. Teacher plays a role to conduct a series of questions and let the students think and find the answers by themselves. Teacher should control the learning flow and find the students' interest and help them grow this interest to try to learn and solve the problems by themselves.

Teachers may develop specialist responsibilities for organize group work or practice. It is important that the students learn by doing. So teacher should play a role to organize different activities that all the students can participate alone or in a group. For example, in my class, I organize a competition at the end of each unite. I divided the whole class into two groups. I prepared 10 questions and the two groups compete to be the first to answer the questions correctly. So which group gives the right answer first will get one point, then add the point together to see which group win the competition. All the students are excited and eager to participate in this activity and in the same time through all the questions they can review the knowledge that learned today. The other example is the activity of role-play. While learning the text, there is always a conversation between two persons, so I always let two students play the role and practice the conversation in front of the class. All the students are competing to be chosen to do the role-play in front of the class because they think it is very interesting and would love to participate in it. In this way they can practice Chinese. During the holidays such as Mother's day and Father's day, I also organized activities for students. For example make a holiday card to their parents with drawings and writings in Chinese. Students will search for the information they need to make a card and write their feelings and greetings on the card. So the teacher should always think of new activities for the students to trigger their interest and they will learn by themselves under the supervision.

So the teacher should understand his or her role and lead the class in a good way.

Make full use of the data

In the digital age, appear a lot of data. If you can make good use of the data then you can catch a lot of invisible information.

Teacher also needs to make good use of data of each student. In the digital textbook, there are a lot of exercises for the students. Each test and exam will provide data for teachers to understand better each student. The teacher should know very well of each student, for example who know everything but always make mistakes, and who is not

good at writing Chinese characters, who is not good at grammar but the pronunciation is very good. All these data will be collected and the teacher should analyze the data and apply it on every student. Not all the students are the same and not all the students suit the same way of learning, so teacher should make good use of data to analyze each student and teach with different methods according to each student.

Each student will have its own personal data recorded in the platform then all these data can will be collected to observe each student and engaged to special learning activity for each one.

Personalized learning

In the traditional teaching model, it is difficult to teach each student with different method. Normally the teacher prepares the lesson with one teaching material. But in the digital teaching era, personalized teaching is possible. Each student has an individually negotiated learning content. Parents, teachers and students can work together to choose the suitable content for the student, to increase the efficiency of learning.

Digital textbook provide a platform and a learning environment that the learners would feel comfortable in. The platform offers a lot of content for the students to choose, so the students choose according to their interest and personalized learning plan to study.

Personalized learning increased interaction between teacher and student, and this help teacher understand student better. If the teacher know very well of a student, the teacher can help the student develop a learning method only for the student to increase the efficiency of learning.

Students not only use digital textbook in the class, they also use it at home to preview and review the lessons. In the class, the teacher can help the student form their own learning pace, and at home, students should learn how to do self-learning and control their learning rhythm. In the beginning, parents should help their kids to control their

learning content and using time, and then little by little the kids will form a good habit of learning by themselves and no longer need regulations from parents.

So with digital textbook, school becomes a science and an art of self-learning, participation, personalized learning. The role of the teachers and students are changing.

Self-regulated learning

In the experiment, parents and teachers have great concern about the using time of digital textbook. Because digital textbook offers many interesting content and the kids are too young to control the using time. This requires the kids develop self-regulated learning ability during their learning period. No matter how self-regulation is defined by the various authors, there is general agreement that it involves strategic action, motivation and awareness of one's own learning goals, needs, thoughts and achievements, and that its final aim is to help learners make a better use of their resources.

The teacher should take the role to teach the students develop the good learning habit-self regulation, which is not only for learning, but also in all the profession and conditions. The teachers, in particular, need it to cope with the variety of situations they face in the classroom and to adjust to curricular revisions and the fast evolution of technological and cultural tools at disposal.

Closing remarks

The advantages of using digital textbook are shown in the experiment, which improve the learning result and that the use of new learning tools such as interactive games or activities involve the students' know-how and their daily routine. However, teachers and parents are concerned about the using time and the students spend their spare time surrounded by technologies such as computers, mobiles, mp3s, ipads, videogames etc. So the future study should be focus on how to measure the using time of digital textbook and control the chance to use the same tools to learn and not only to play or

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Questionnaire with students

Hello, our research group is very grateful to you for completing the questionnaire in order to understand the status of student use in digital textbook.

1. Your gender

- Boy
- Girl

2. Your age

- 5 years old
- 6 years old
- 7 years old
- 8 years old

3. Do you like to use this digital textbook to study?

- I like it very much.
- I like it.
- Normal.
- I don't like it.
- I don't like it at all.

4. Do you often use digital textbook to learn?

- I use it everyday.
- I use it every two or three days.
- I use it once a week.
- I use it once a month.

I never use it.

5. How many hours do you use digital textbook everyday?

Within one hour.

1-2 hours.

2-3 hours.

3-4 hours.

More than 5 hours.

6. Do you use digital textbook to preview the lesson that you are going to learn?

Yes, often.

Yes, sometimes.

No, never.

7. Do you use digital textbook to review the content that you have learnt?

Yes, often.

Yes, sometimes.

No, never.

8. Is it easy to find what you want in this digital textbook of Zhongwen?

Yes, very easy.

Yes, a little easy.

Normal.

No, a little difficult.

No, very difficult.

9. The first time you got this digital platform, how much time do you need to learn

how to use it?

- I need to spend a lot of time to learn how to use it.
- I need to spend a little time to learn how to use it.
- I don't need time to learn how to use it.

10. After learning how to use this digital textbook, the students feel how about the efficiency of using?

- Very efficient.
- Kind of efficient.
- Normal.
- Not very efficient.
- Very inefficient.

11. After using a period of digital textbook and stop using it for one month, after one

month do you still remember how to use this digital textbook?

- Yes, I can remember very clearly.
- Yes, I can remember a little.
- Normal.
- No, a little difficult.
- No, very difficult.

12. How many mistakes did you make during the using period?

- A lot of mistakes.
- Some mistakes.

- Normal.
- Little mistakes.
- Very little mistakes.

13. Can digital textbook make learning Chinese more interesting?

- Yes.
- No.

14. Is it much easier to understand the learning content with digital textbook?

- I strongly agree with it.
- I relatively agree with it.
- Normal.
- I relatively don't agree with it.
- I strongly don't agree with it.

15. After using the digital textbook, my score obviously improved.

- Yes.
- No.

16. Can you learn the new lesson all by yourself with digital textbook?

- Yes, I can learn all by myself.
- Yes, I almost can learn all by myself.
- Normal.
- No, I couldn't learn all by myself.
- No, I couldn't learn at all by myself.

17. Do you think that digital textbook can replace traditional paper-based textbook?

- o I think digital textbook can absolutely replace traditional paper-based textbook.
- o I think digital textbook can partly replace traditional paper-based textbook.
- o I think digital textbook can't replace traditional paper-based textbook.

18. Do you have other suggestions? _____

Questionnaire with parents

Hello, our research group is very grateful to you for completing the questionnaire in order to understand how parents think about their kids using digital textbook.

1. Your gender.

- Male.
- Female.

2. Your age.

- 20-30 years old.
- 30-40 years old.
- 40-50 years old.
- More than 50 years old.

3. Your profession in Spain?

- I have my own business.
- I work for companies.
- I am immigration and I invest to come to live here.

4. Do you think learning Chinese is important for your kid?

- Very important.
- Relatively important.
- Normal.
- Not so important.
- Not important at all.

5. Do you agree that your kid use digital textbook to learn Chinese?

- o I am very agree with it.
- o I am a little agree with it.
- o Normal.
- o I am not so agree with it.
- o I am not agree with it at all.

6. After this semester's study, do you think that your kids improved in learning Chinese?

- o My kid's Chinese improved a lot.
- o My kid's Chinese improved a little.
- o My kid's Chinese didn't improved at all.

7. What's the learning attitude of your kid while learning Chinese?

- o My kid is very interested in learning Chinese and everyday my kid take the initiative to learn Chinese by themselves.
- o My kid is interested in learning Chinese, he or she can finish the homework on time without forced by me.
- o My kid is not interested in Chinese at all, I need to forced him or her to learn.

8. Are you worried about your kids using digital textbook?

- o I am very worried about it, including his eyesight and addicted to it.
- o I am a little worried about it, I have concern my kid spend to much time on it.
- o Normal.
- o I am not so worried, if my kid is interested in it, I will support him or her.

- o I am not worried at all, the most important thing is to trigger my kid's interest in learning Chinese.

Questionnaire with teachers

Hello, our research group is very grateful to you for completing the questionnaire in order to understand how teachers think about the students using digital textbook.

1. Your gender.

- Male.
- Female.

2. Your age.

- 20-30 years old.
- 30-40 years old.
- 40-50 years old.
- More than 50 years old.

3. Your Chinese teaching experience.

- Within one year.
- 1-2 years.
- 3-5 years.
- 5-10 years.
- More than 10 years.

4. Do you use digital textbook in the class?

- Yes.
- No.

5. Do you suggest using digital textbook to teach Chinese in language school?

- I strongly agree.

- o I agree.
- o Normal.
- o I don't agree.
- o I don't agree at all.

6. Teacher centered teaching mode is changed with digital textbook. (Please give a score according to the degree of your agreement from 1 to 5. 1-I don't agree at all, 2-I don't agree, 3-Normal, 4-I agree, 5-I strongly agree)

1	2	3	4	5
I don't agree at all.			I strongly agree.	

7. Students' information seeking ability improved with digital textbook.

1	2	3	4	5
I don't agree at all.			I strongly agree.	

8. Students improved the techniques of using electronic devices.

1	2	3	4	5
I don't agree at all.			I strongly agree.	

9. Students' communication and discussion ability and the ability to summarize are improved with digital textbook.

1	2	3	4	5
I don't agree at all.			I strongly agree.	

10. Students' learning results improved with digital textbook.

1	2	3	4	5
I don't agree at all.			I strongly agree.	

11. With digital textbook, the method of evaluating students is more diversified.

I don't agree.

I agree.

12. My teaching method changed with digital textbook.

I don't agree.

I agree.

13. My teaching ability has improved with digital textbook.

1 2 3 4 5

I don't agree at all.

I strongly agree.

14. Using digital textbook to prepare the class is a burden for me.

1 2 3 4 5

I don't agree at all.

I strongly agree.

15. Digital textbook is only the mean of assisted teaching, it will not changed

traditional mean of teaching.

1 2 3 4 5

I don't agree at all.

I strongly agree.

16. Digital textbook makes atmosphere in the class more active.

1 2 3 4 5

I don't agree at all.

I strongly agree.

17. I like to communicate with students online.

1 2 3 4 5

I don't agree at all.

I strongly agree.

18. I agree to promote digital textbook in schools.

1 2 3 4 5

I don't agree at all.

I strongly agree.

19. Do you agree that using digital textbook to teach can improve the teaching results?

- Yes, I agree.
- No, I don't agree.

Thank you for your cooperation.