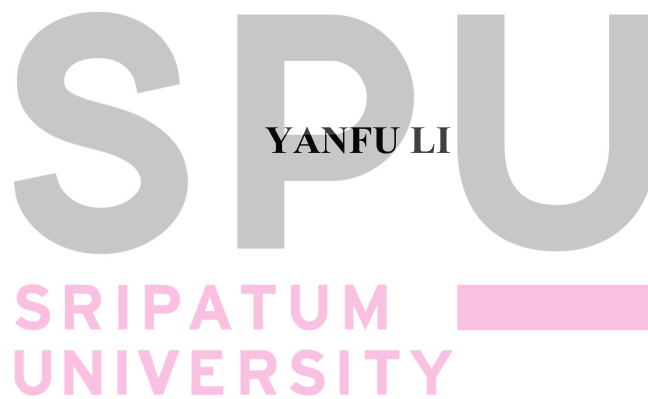


**THE DEVELOPMENT OF CHINESE CHARACTER-BASED
TEACHING USING A BLENDED-LEARNING APPROACH
TO ENHANCE STUDENTS' CHINESE CHARACTER
RECOGNITION ABILITY IN A THAI BILINGUAL SCHOOL**



**A THEMATIC PAPER SUBMITTED IN PARTIAL FULFILLMENT OF
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CHINESE CHARACTER RECOGNITION ABILITY IN A THAI BILINGUAL
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KEYWORD CHINESE CHARACTER RECOGNITION, BLENDED LEARNING,
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ABSTRACT

The study was a single-group experimental study. The objectives of this study were to (1) design an instructional program to help provide students with Chinese character recognition skills by using a blended learning strategy based on Chinese characters, and (2) explore a blended instructional approach based on Chinese characters to improve students' Chinese character recognition skills. (3) Investigate students' perceptions of learning Chinese characters and using blended learning methods to improve their Chinese character recognition skills. The sample consisted of 12 elementary 6/1 students from the first semester of the 2022 school year at Tawat Sawetchat Bilingual School (โรงเรียนทิวศิวาลัย) in Khon San District, Bangkok, Thailand. Data were analyzed by means of descriptive statistics, and paired-sample t-test, and the results of the study are as follows. A comparative analysis of the pre-test and post-test revealed that the subjects' scores improved from 30.67 on the pre-test to 35.75 on the post-test. Second, the questionnaire results showed that the lesson plans developed based on the blended learning strategy were effective in helping the subjects improve their Chinese character recognition skills. Some subjects indicated that they should learn as early as possible. The alpha coefficient of the scale was 0.98, indicating a high internal consistency of the scale items.

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YANFU LI

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CHAPTER 1

INTRODUCTION

Background

In a bilingual Thai-Chinese school in Bangkok, Thailand, I am the Chinese class teacher for the 6th grade. I would like to point out that Chinese Language has become very popular in Thailand, both on campus or in private language schools. I have been teaching Chinese in Thailand for three years and I have observed that Chinese language learning in primary and secondary schools is mainly for basic daily communication. But my current school (โรงเรียนวัดเสด็จ Wat Sawetachat School) is unique in that students are required to study five subjects in Chinese, including Chinese, math, science, art and physical health. The goal of learning Chinese is clear: not only to master the language of everyday communication, but also to be able to apply Chinese to solve general problems in other fundamental subjects. In general, different subjects have different subject vocabulary and reading materials, so focusing solely on listening and speaking Chinese is insufficient for our school's daily teaching activities.

Causes and Motivations

Chinese Proficiency Grading Standards for International Chinese Language Education, was published by the Language and Literature Committee of the Ministry of Education of the People's Republic of China on March 24, 2021. The master list of quantitative language indicators stipulates that students must be able to recognize 300 Chinese characters, which means that they have reached the first level of the Chinese language. I conducted the following tests on a sample of twelve sixth-grade Chinese-Thai bilingual students: I arranged the sequence of the correspondence between twenty Chinese characters and their Hanyu Pinyin equivalents on the blackboard, choosing from the first to the twentieth characters in the "5.1 Level 1 Chinese Character List." The children were asked to complete a matching exercise, and even the top performers in the class got less than half of the answers right. Then, after removing the pinyin and merely leaving the Chinese characters, I questioned the kids as to what the characters meant. The student's performance was reluctant, and they later started to guess the

interpretation; their accuracy rate was also low. The majority of the kids in the class were able to correctly translate the pinyin expressions after I preserved the pinyin and removed the Chinese characters. The results of the aforementioned test demonstrated that the students were proficient in utilizing Chinese Pinyin and frequently used Thai phonetic transcriptions and Hanyu Pinyin for subjects other than Chinese. In other words, the Chinese characters, which are what distinguish Chinese from other languages, were ignored by the students. I think that interventions ought to be done right now. The basic information about the students will be introduced next, followed by the basic information about the teachers. Students at my school are divided into small groups. My class is in sixth grade, and there are twelve Thai students in the class. Except for a few transfer students who have never studied Chinese systematically, the majority of students begin learning Chinese in first grade. After a semester of bonding and observation, I discovered that the students were very adept at using Chinese Hanyu Pinyin and relied heavily on it and Thai annotations for subjects other than Chinese. To put it another way, students are overlooking the most important aspect of the Chinese language: the Chinese characters.

Why use blended-learning approach?

I began by observing the behavioral routines of the pupils. Every child in the class has a smartphone, so I divided the mobile programs they use the most frequently into two groups: social networking apps (like Facebook and Line) and games for smartphones (Roblox, Minecraft). The only thing I need to do to ensure that the child understands that smartphones may also be used for learning is to govern and lead them since they are adept at finding the applications they require. Then, a new issue is raised: how can traditional classroom activities be integrated with mobile apps? Or, how may classroom instruction be extended outside of the classroom? At that same moment, the words "integration," "sharing," "scalability," "flexibility," and "learner-centered design" sprang to mind. In the end, I was able to concentrate my teaching model on blended learning, and it was just the solution I needed, thanks to my study at SPU (Sripatum University) and the assistance of Google search engines.

If it is the students who are neglecting the Chinese characters, it is better to say that the Chinese teachers are not paying attention to the Chinese characters instruction. One reason is that it is relatively easy to teach Hanyu pinyin (Chinese), and the effectiveness of learning can be observed and assessed. On the other hand, I think students find Chinese characters complicated and difficult to master and are not interested in learning them. Compared with Chinese characters, Hanyu pinyin is more effective for the same amount of time, especially if the learner's native language background is also a spelling style. In addition to these two reasons, there is a common problem faced by teachers of every subject, namely, most students do not like to do homework, and only a very small number of students continue to study independently after school. So subject knowledge points, over time, are gradually forgotten. Is there a teaching method for Chinese characters that the learner remembers firmly and makes forgetting slower, or even not forgotten? If there is a ready-made method, I will argue through an experimental design, and if not, this study attempts to design a teaching method that will likewise be argued through an experimental design.

Research Questions

1. How to design instructional plans using Chinese character-based Teaching with the blended-learning approach to help improve students' character recognition in Chinese?
2. To what extent does the Chinese character-based Teaching with the use of the Blended-learning approach improve students' character recognition in Chinese?
3. What are students' opinions towards the Chinese character-based Teaching with the use of the Blended-learning approach?

Research Objectives

1. To design lesson plan using Chinese character-based and blended learning approaches to help improve students' character recognition in Chinese.
2. To investigate the student's learning outcomes (Chinese character recognition ability) through a teaching strategy utilizing a Chinese character-based and blended learning approach.

3. To investigate students' opinions towards the Chinese Character-based Teaching with the use of the Blended-learning approach to improving students' character recognition in Chinese.

Research Hypothesis

Students' Chinese character recognition ability was enhanced through Chinese Character-Based Teaching using a Blended-Learning approach.

Scope of Research

1. Target Group

Three girls and nine boys in the sixth grade of an elementary school were invited to participate in this study. The study was slated to formally begin in May 2022, at the start of the new semester. Students who had just transitioned from the fifth to the sixth grade participated in the study. The instructional and assessment approaches employed in this study were developed as a result of experiments and explorations conducted in the second semester of the 2021 academic year.

2. Dependent Variable

The dependent variable in this study was the students' Chinese character recognition ability. It indicates the student's ability to know the meaning of a Chinese character when he or she sees it. Please note that this study only discusses the ability of the study participants to transfer the character form to the character meaning (f2m), however the ability to transfer the character form to the pronunciation is not the focus of attention (f2p).

3. Independent Variable

The independent variable in this study was a blended learning approach based on Chinese characters. The lesson plan will be constructed around the principles of f2m and implemented through a blended learning approach. Specifically, the blended learning approach specifies how subjects should learn Chinese characters in and out of the classroom, how the learning materials are adapted to the learners' usage habits, and other factors. He would influence the students' Chinese character recognition skills.

I recruited twelve students from my own class to take part in this study because it was convenient for my work. The students in this study were in 6th grade at Tawat Sawetchat School in Bangkok, Thailand. Before the research could begin, it was necessary to provide some background information. I began observing the students' learning status in the second semester of the 2021 school year, in November 2021. As a result of the coronavirus, the teaching method was changed to online learning. For one month, I taught fifth-graders, and then, due to a job transfer, I was assigned to the Chinese classroom for sixth grade. Additionally, I'd like to draw attention to the fact that approximately 14 government schools in Bangkok's Khlong San district and other areas are implementing this Thai-Chinese bilingual curriculum. If each primary school has six grades and has a bilingual special class with 20 kids in each grade, then 1680 persons will be indirectly covered by this study. I'm hoping that this study's findings will be useful for this program.

Definition of Terms

1. **Chinese Character-Based:** The linguistic research idea of using Chinese characters as the basic structural unit of Chinese became called [Chinese Character-based]. Tong Qiang Xu formally proposed the theory in 1994, arguing that Chinese characters are a unique structural unit of Chinese and that there is no similar structure in Indo-European languages. This study focuses on the Chinese character-based approach as opposed to the phonetic-based and word-based teaching and learning approaches that are used in the teaching of Chinese as a foreign language.

2. **Blended Learning:** The definition of the blended learning model used in this study does not go beyond the definitions provided by Oxford Dictionaries and Wikipedia." Blended learning, also known as blended learning, is a method of education that combines online educational materials and opportunities for online interaction with traditional local classroom methods." ("Blended Learning," 2022, "Definition," para. 1). "a way of studying a subject that combines being taught in class with the use of different

technologies, including learning over the internet." (The Oxford Advanced Learner's Dictionary, 2022)

3. **Undecomposable Chinese Character:** Characters made up of strokes that cannot or should not be split up again and can form a combined character. The Ministry of Education of the People's Republic of China released the specification of the Undecomposable Characters Commonly Used in the Modern Chinese on March 24, 2009. This standard identifies 256 commonly used modern Undecomposable Characters. The 40 teaching characters used in this study are taken from the list of commonly used modern Undecomposable Characters in this standard.

4. **Chinese Character Recognition Ability:** The concept definition is discussed in this study to identify the meaning based on the character structure of Chinese characters, without the aid of Hanyu Pinyin.

Expected Benefits

1. An experiment of blended learning strategies in teaching Chinese characters, including the production of teaching materials, the assessment of learning effects, and the operation of blended learning (online and offline, integration of traditional teaching and information technology, etc.).

2. To use the identification of monograms of Chinese characters as a starting point for research to serve as a reference or benchmark for future research, to investigate and demonstrate the viability of designing teaching and learning activities with Chinese characters at their center.

Conceptual Framework

The relationship between the variables in this study design is shown in Figure 1.

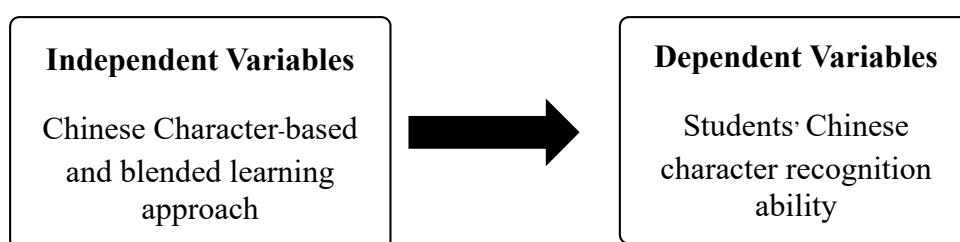


Figure 1.1 Research Framework

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this study is to effectively increase students' Chinese character literacy, and the teaching approach adopted is information visualization and blended learning. It is divided into two main parts, theories and related studies.

Part 1. Teaching Chinese Characters as a Foreign Language

- Chinese Characters Recognition
- Chinese Characters Acquisition
- Assessment and Evaluate in Chinese Characters

Part 2. Psychology and Pedagogy Theory

Part 3. Blended Learning

- Blended Learning Practice Review
- Pedagogy And Information Processing Technologies Integrated with Blended Learning
- Assessment And Evaluate on Blended Learning

Part 1 Teaching Chinese Characters as a Foreign Language

1.1 Chinese Characters Recognition

There are three core elements surrounding the learning of Chinese characters, character form, character meaning, and character sound. There are six relationships among the three elements. Character form to character meaning(f2m), character meaning to character form(m2f), character form to character sound(f2s), character sound to character form(s2f), character sound to character meaning(s2m), and character meaning to character sound(m2s). Due to the issues explored in this study, and the limited time available for research. Only f2m is discussed. First, the ability of f2m is related to the development of learners' reading skills. Naturally, I need to define the scope of the review and will not focus on listening and speaking. It also needs to be separated from acquisition of writing skills because of the specificity of Chinese characters, and one of the benefits of separating the ability to recognize Chinese

characters from the ability to write them is that it reduces the difficulty of learning. Secondly, I would review the causes of the learning disabilities of Chinese characters. Then we need to clarify the purpose of curriculum in order to design lesson plans and materials that are appropriate for the learners. Finally, we need to determine the number of Chinese characters for beginning learners.

1.1.1 Chinese Characters Recognition or Identification Need be Kept Separate from The Requirements for Writing and Utilizing.

Zhou (2007) said that when compared to Pinyin characters, one of the distinguishing characteristics of Chinese characters is that they are difficult to write yet easy to recognize (identify). This is because alphabetic pinyin characters are sequentially arranged and linearly distributed according to the hyphenation rule, whereas square Chinese characters, with a complex character structure, obvious features, and high visual resolution, use a flat surface as the form of information distribution. Zhou (2007) further said the fact that Chinese characters are easy to recognize and complex to write is a distinguishing feature of them. We should pay attention to the psychological aspects of reading in our Chinese character education, use these qualities to differentiate the requirements of recognizing and writing, and aim to increase students' literacy. Zhou (2007) also highlighted that with the rise in popularity of computer use, an increasing number of people rely on computer-assisted writing. They can easily get the Chinese characters they need from the computer font list if they understand the pronunciation of characters and words, as well as the outline and fuzzy shapes of Chinese characters. Recognition may be more important than writing when it comes to reading and utilizing computers. As a result, there is a distinction to be made between recognizing Chinese characters, writing Chinese characters, and employing Chinese characters.

1.1.2 The direct reason of Chinese character learning disability

Zhou (2007) gives examples that the first Chinese lesson will cover the three words "你好hello", "谢谢thank you", and "再见goodbye" as well as the five characters "你you", "好good", "谢thank", "再again" and "见see" which should all be taught at the

same time. While these three words are practical and simple to understand, the five Chinese characters are more difficult. When non-native learners learning Chinese for the first time view these Chinese characters, they mistake them for pictures, and they develop the mental block that "Chinese characters are difficult to learn" at first. The "difficulty in learning Chinese characters" is clearly caused by the "language and Contents as a whole" and "word-based" teaching approach.

1.1.3 Purpose of teaching Chinese character courses

Zhou (2007) argues that in Chinese character training, there are two basic teaching goals. The first step is to learn and memorize a set of Chinese characters. The second goal is to master the structural characteristics of Chinese characters, as well as the laws of phonetic and ideographic expressions and a systematic knowledge of the Chinese character system based on cognitive knowledge of a set of Chinese characters, to get a better understanding of the relationship between Chinese characters and the Chinese language, as well as to build self-organized Chinese character study skills. As a result, the second is the more important goal.

What exactly is the number of Chinese characters in this set? This number changes depending on the learner's linguistic proficiency. In the experimental design part below, I will discuss the quantity of readable characters that a beginner who is learning Chinese as a second language should master.

1.1.4 How many Chinese characters must a beginner acquire in order to read and understand Chinese?

The Chinese Proficiency Grading Standard for International Chinese Language Education (CPGS). The Quantitative criteria of CPGS, the table states that elementary level or level one bands learners need to master three hundred Chinese characters. (Education Ministry China, 2021).

The Specification of the Undecomposable Characters Commonly used in Modern Chinese (the Specification of UCCUC) from Education Ministry China (2009). in this file, the terminology and definitions section of the specification shows that there is a distinction between the monomeric structure (UCCUC) and the syncretic structure

of Chinese characters. Among them, monomeric characters (UCCUC) have the following features: they consist of strokes, cannot or should not be split up again, and can form a combined character (the syncretic structure). The specification identifies 256 modern universal Chinese characters (UCCUC).

Zhou (2007) suggested that there are thirty-two characters (UCCUC) that should be learned first for Chinese as second language learners. according to the relevant statistics, there are thirty-two Chinese characters (UCCUC) with more than thirty characters in the composition of the formed character parts. this suggestion was adopted for the teaching characters in this study.

Shen, Wang & Tsai (2009) counted 100 high-frequency radicals from the 9999 Chinese characters in the modern Chinese Dictionary, and I pick up from which eight additional characters (UCCUC) selected for this study, together with the thirty-two characters mentioned above, for a total of forty Chinese characters for the study purposes.

As was already indicated, this is how the Chinese character list was come out in this research. The following two key parts I will covered are typical blended learning setting method and evaluation methods for Chinese character identification.

1.2 Chinese Character Acquisition

Jian & Zhao (2001), According to their investigation and research on Chinese characters learning strategies of foreign students at the beginners' stage, they have compiled six Chinese character learning strategies, which I have listed in the table below Table 2.1

Table 2.1 Chinese character learning strategies

Table 1. Chinese character learning strategies	
strategies	explanation
(1) Stroke	i.e., learning the stroke order and writing in accordance with the stroke order.
(2) Phonetic	i.e., focus on the pronunciation and meaning of the characters.
(3) Morphological	i.e., focus on the overall shape of the character and simple repetition.
(4) Generalization	i.e., generalization of characters with similar shapes, homophones, and morphophonemic characters, and learning Chinese characters by using sound symbols and meaning symbols.
(5) Review	i.e., to review the learned characters.
(6) Application	i.e., applying Chinese characters for reading and writing, learning Chinese characters through practical application.

About basic Chinese character teaching techniques and abilities. Recognize first, then write. Although the structural relationships and morphological features of Chinese characters are relatively obvious and easy to recognize, writing them is more difficult for non-native learners, so they can first perceive the character patterns, understand their meanings, remember their sounds, and reduce the writing requirements. Recognize first, then write, and as you get better at it, you'll be able to recognize more and write less. Because most Chinese characters can represent morphemes and are made up of a unity of form, sound, and idea(meaning), it's necessary to blend form, sound, and idea(meaning) as much as possible when studying them (Zhou, 2007).

Teach the Undecomposable Characters That Can Be Used as Parts First, And Then Teach Combined Characters That Contain Learned Undecomposable Characters. According to the data, there are thirty-two Chinese characters in common use, and they can build the total number of other composable Chinese characters, more than thirty. It is recommended that you remember the first thirty-two Chinese characters. However, the principle of "from parts to whole" is simply a generic one that cannot be absolute. Because the brain's cognitive system includes a combined pathway from parts to whole as well as an analytical pathway from whole to parts (Zhou, 2007).

1.3 Assessment and Evaluate in Chinese Characters

The Chinese Ministry of Education commissioned Beijing Language and Culture University to create a standardized language test for non-native Chinese learners for the Chinese Proficiency Test (HSK) in 1984, and the first set of test questions was completed in 1985. It is currently China's most representative national standardized test of Chinese as a second language.

The research of Chan et al. (2022) established a set of inspection methods for the evaluation of children's Chinese character acquisition, and the research results gave me a lot of inspiration. Their research team conducted a Chinese character acquisition assessment on 173 secondary kindergarten students aged 5-6 in Hong Kong, measuring their ability to associate the form, sound and meaning of Chinese characters.

Part 2 Psychology and Pedagogy Theory

The authors in this section organize and describe the pertinent theories using the literature research methodology. The theoretical framework for this study is provided by blended learning, namely from the standpoint of fusing teaching and learning methods. The theoretical underpinnings for particular instructional application are primarily provided by problem-based learning, information visualization (infographic), GIF animation, and Google Classroom. For formative assessment and evaluation, Multiple Intelligences, Forgetting Curve will serve as the foundation. The ultimate objective is for kids to learn on their own initiative and voluntarily (self-directed learning).

2.1 Blended learning

In Horn & Staker's (2015) book, a study is mentioned where they interviewed over 150 educators behind blended learning programs starting in 2010. The definition for blended learning is given in three parts (1-In Part through Online Learning, 2-In Part in a Supervised Brick-and-Mortar Location, 3-An Integrated Learning Experience). and gives further explanations as follow.

First, blended learning is any formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace. (p. 34)

The second part of the definition is that the student learns at least in part in a supervised brick-and-mortar location away from home. (p. 35)

The third part of the definition is that the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience. (p. 35)

The results of Tayebinik & Puteh (2013) show that blended learning may become the most important educational model in the future, and point out that it is a range of delivery methods to meet the course objectives.

Hrastinski (2019) study noted that the breadth of conceptualizations means that essentially all types of education that include some aspect of face-to-face learning and online learning are being described as blended learning in the literature.

About "How should we organize such learning environments in order to support learning effectively?": Güzer & Caner (2014) give the answer is that we should study to integrate constructivist and collaborative models into blended learning environments and aim to educate more creative and curious students who reads, writes and produces for the world.

2.2 Self-directed learning (Active learning)

The Partnership for 21st Century Skills (P21, 2001) recently pointed out that "self-directed learning" is one of lifelong and vocational skills, and students need to equip themselves with "self-directed learning" to meet the needs of study and work. Williamson (2007) believes that "self-direction" is the foundation of all learning, whether it is conventional or unconventional learning. Self-directed learning can be regarded as a learning process (the learner is the main person in charge of the learning process). Knowles (1975) defined autonomous learning as a process in which learners actively analyze their learning needs, plan learning goals, identify learning resources, select

appropriate learning strategies, and evaluate their learning outcomes.

Self-directed learning, as a transition between teaching and learning, involves teachers and learners discussing learning goals, learning methods and activities, and assessment Brockett & Hiemstra (2018). It also includes interacting with other learners to develop a deeper understanding of the subject and interest in learning.

Skager (1984)'s research project identifies self-direction in learning as a key human factor in the implementation of the principles of lifelong education and the school as the critical social institution in the development of self-direction.

2.3 Problem-based Learning

Problem-based learning (PBL) is a real-world, student-centered approach to education pioneered by U.S. neurology professor Barrows at McMaster University in Canada in 1969. It has since become one of the most popular teaching methods worldwide.

Problem-Based Learning (PBL) is a teaching method in which complex real-world problems are used as the vehicle to promote student learning of concepts and principles as opposed to direct presentation of facts and concepts. In addition to course content, PBL can promote the development of critical thinking skills, problem-solving abilities, and communication skills. It can also provide opportunities for working in groups, finding and evaluating research materials, and life-long learning (Duch et al, 2001).

The Maastricht 7-jump involves seven steps, which are: (“Problem-based learning”, 2022).

1. Discuss the case and make sure everyone understands the problem.
2. Identify the questions that need to be answered to shed light on the case.
3. Brainstorm what the group already knows and identify potential solutions.
4. Analyze and structure the results of the brainstorming session.
5. Formulate learning objectives for the knowledge that is still lacking.

6. Do independent study, individually or in smaller groups: read articles or books, follow practical or attend lectures to gain the required knowledge.
7. Discuss the findings.

2.4 Multiple Intelligence

The theory of multiple intelligences was first proposed by Howard Gardner in his 1983 book "Frames of Mind", where he broadens the definition of intelligence and outlines eight distinct types of intellectual competencies (Linguistic Intelligence, Logical-mathematical intelligence, Spatial intelligence, Bodily kinesthetic intelligence, Musical intelligence, Interpersonal intelligence, Intrapersonal intelligence, Naturalistic intelligence) (Marenus, 2020).

2.5 Ebbinghaus Forgetting curve

German psychologist Hermann Ebbinghaus wanted to understand more about why we forget things and how to prevent it. His research produced the Forgetting Curve – a visual representation of the way that learned information fades over time. Ebbinghaus (2013). Ebbinghaus experimented with his own ability to remember using a list of nonsense syllables, which he attempted to recall after different lengths of time. His experiences and results revealed a number of key aspects of memory: (1) Memories weaken over time. (2) The biggest drop in retention happens soon after learning. (3) It's easier to remember things that have meaning. (4) The way something is presented affects learning. (5) How you feel affects how well you remember. Rasch & Born (2013). Ebbinghaus's research dates back to the 1880s, but it is still widely used and highly regarded. In 2015, a research team successfully reproduced his findings, and concluded that his methods and theories still held true (Murre & Dros, 2015).

2.6 Infographic

Wikipedia offers the following definition: Infographics (a clipped compound of "information" and "graphics") are graphic visual representations of information, data, or knowledge intended to present information quickly and clearly. They can improve cognition by utilizing graphics to enhance the human visual system's

ability to see patterns and trends. Similar pursuits are information visualization, data visualization, statistical graphics, information design, or information architecture. Infographics have evolved in recent years to be for mass communication and thus are designed with fewer assumptions about the readers' knowledge base than other types of visualizations. Isotypes are an early example of infographics conveying information quickly and easily to the masses. (Infographic, 2022, April 20)

2.7 Animation GIF

The Graphics Interchange Format (GIF; *.gif*) is a bitmap image format that was developed by a team at the online services provider CompuServe led by American computer scientist Steve Wilhite and released on 15 June 1987.^[1] It has since come into widespread usage on the World Wide Web due to its wide support and portability between applications and operating systems. (GIF, 2022, July 8)

Animated GIF is an extension of the GIF standard, which allows animated images to be created by cramming a set of frames into a single file for sequential playback. Even with multiple images on the same file, the file size can still be made small because of the way GIF is encoded and because of a limited color palette. This means that the resulting image lacks detail and is of lower visual quality compared to other image formats. (What Is Animated GIF, 2016, August 5)

Animated GIFs are a quick-and-easy way to present dynamic content, especially on Web pages. Their file sizes are small compared to other alternatives for creating dynamic content like Java and Flash and therefore can be downloaded by the browser easily, allowing for a faster browsing experience. (What Is Animated GIF, 2016, August 5)

2.8 Google classroom

In general, Google Classroom is nothing more than a program that facilitates distance learning by offering a series of sharing possibilities and total synergy with the classic functions of the Google world. Available for free for six years and already widely used by many teachers, the program has become the most used by

teachers in these times of pandemics. Its functions allow you to assign exercises, tests, and questionnaires, store didactic material in a shared space, share videos, and exchange messages quickly and quickly (Smith, 2020).

Google Classroom has a lot of options but, more importantly, it can allow teachers to do more to help educate students remotely or in hybrid settings. A teacher is able to set assignments and then upload documents that explain what is required for completion, and also provide extra information and a place for students to actually work. Google Classroom also allows for the export of grades into a student information system (SIS) making it far easier to use automatically school-wide. Google offers an originality report feature that lets teachers run a check against other student submissions from the same school. It is the great way to avoid plagiarism (Edwards, 2022).

Part 3 Blended Learning

I looked through the literature in an effort to come up with a workable answer. My idea is as follows, first of all, we must analyze the study habits and learning ability of the research subjects, and of course the learning environment. as I know through observation, there are many Chinese-Thai dictionaries in the classroom, all of which are new, and students never use them because they don't know how to look up Chinese characters and common words quickly and efficiently. and All students have experience with smartphones. I need to find the right way to integrate the students' existing abilities and the learning environment.

It is necessary to reiterate the core issue of this research, most of the students in the class cannot adapt to the learning environment without the assistance of Hanyu (Chinese) Pinyin. I need to design effective teaching methods to help students build bridges, transition to less use of Pinyin, and finally, get used to learning scenarios without Pinyin. For example, core characters and words are marked with pinyin, which is helpful for correct pronunciation, and high-frequency characters are not used in Chinese Pinyin.

The article in Lim (2020) summarizes six simple steps to help you on your

language learning journey. 1) Set realistic learning goals. 2) Understand the background of the language. 3) Make learning a daily habit. 4) Adopt effective learning strategies. 5) Learn with real people and situations. 6) Don't forget to have fun. The six-step method, I think, can be used as a general strategy for language learning. But for a specific language, go deep into it, and build a complete set of teaching models around the learner. I think there is still a need to review more. These six steps provide the language learner with a roadmap for learning from a macro perspective. However, when it comes to very specific problems, such as those in this study, we need to continue to analyze and study them in depth to find suitable methods.

3.1 Blended Learning Practice Review

Kim et al. (2021) Through the study of Chinese characters and terminology used in daily life, their research broadly combines a blended learning model to build intellectual information processing skills and creative thinking skills in second-grade students in two middle schools. The researchers employed an innovative coin method to make students understand the value of learning Chinese characters, a brainstorming technique to foster learners' capacity for original thought, and a clever integration of smartphone apps to foster learners' aptitude for information processing. The study's findings are not overtly biased and are comparatively neutral. Their research tools and pedagogical implementation are highlights and well worth learning from.

Ivanova et al. (2020). Their research proves that using a blended learning model enables students to achieve good learning outcomes. The specific content is as follows. The research objects are college students from three colleges of Russian universities. The researchers designed and developed a set of blended learning courses for general English courses and conducted questionnaires. The study was conducted in experimental and control groups, and needed to observe students' motivation levels and self-responsible learning abilities, as well as students' satisfaction with the course. The results show that ideal effects are achieved in all three aspects.

Wanyan & Anchalee (2021), The results of their study suggest that blended learning is an effective teaching method for improving Chinese listening skills. The specific content is as follows; their research object is 31 middle school students of Mathayom Suksa Four. Research tools are achievement tests, questionnaires and interviews. From a statistical point of view, it is proved that the blended learning model can effectively improve students' listening skills. Not only that, but also develop students' self-directed study skills and problem-solving skills.

The research report of Thanavathi (2022) caught my attention. The research made a comprehensive review and analysis of the teaching model. Including meanings, definitions and functional models. The model is further divided into three types, philosophical teaching model; psychological model; modern teaching model. The report concludes by pointing out an issue of vital importance to every educator, that an important purpose of discussing models of teaching is to assist the teacher to have a wide range of approaches for creating a proper interactive environment for learning. An intelligent use of these approaches enables the teacher to adopt him to the learning needs of the students.

Using the CoI framework (Community of Inquiry Framework), which consists of three primary components: teaching presence, social presence, and cognitive presence. Daspit & D'Souza's (2012) sought to examine how wiki technology can be used as a tool to contribute to a blended learning environment and how the technology can be gainfully incorporated into course design and instruction. they applied this framework to advance their understanding of how learning occurs in the wiki environment. their findings empirically confirm that the instructor (i.e., teaching presence) is invaluable to the learning environment notwithstanding the infusion of wiki technology in the classroom, and offer recommendations in three specific areas: wiki platform selection, pedagogical issues, and operational implications.

Through observation, I found that subjects in the sixth grade of primary school use mobile phones during recess, and flexibly play with social networking applications (Facebook), and mobile games (Roblox). I began to think about whether it is possible to design a teaching model, focusing on the learner and helping them improve their Chinese reading ability, of course, at this stage, the task of character recognition is ranked first. Future research will gradually transition to the development and establishment of a complete set of Chinese reading ability training programs.

At this time, what first appeared in my mind was not some well-known design and development models, but a general mixed concept. My psychological expectation was to focus on the learner, so that classroom teaching activities and spare time after class could be fully effective. organization and utilization. That is now the focus of this research report, blended learning strategies. New questions arise, how is the mix effective? Have other researchers done similar research? What is certain is that blended learning strategies belong to the modern teaching model mentioned in research from Thanavathi (2022) report above.

A study by Sandanayake (2019) affirms OER (Open Educational Resources)-based blended learning method. The research focuses on how to incorporate OER material into Online course development in undergraduate study. At the same time, how to effectively evaluate teaching activities. This research is inspiring to me. The lesson plan in this research report is based on the development of Chinese character recognition ability based on a blended learning strategy. It is my attempt first, that is, how to organize Chinese character learning materials by means of information technology, so that learners can use them easily.

3.2 Pedagogy and information processing technologies integrated with blended learning

If to discuss just only blended learning methods or models without discussing the supporting content within them would be to fall into formalities. so, in this section about the expanded literature review, I will focus on problem-based teaching methods, and information graphic, and 2D animation. This idea comes from the unique

properties of Chinese characters themselves, namely the pictographs feature (glyph shape representation).

3.2.1 Problem-based Learning on Teaching and learning

Jang et al. (2019). Their research was conducted in a Chinese-specialty class at a Korean university, demonstrated the effectiveness of PBL in Chinese classroom teaching. PBL not only improves learning ability and problem-solving ability, but also enhances students' learning motivation, improves their attention and interest in Chinese character learning, and cultivates autonomous learning ability. The researchers reminded that since the main function of PBL is to master basic knowledge, when PBL is combined with traditional classroom teaching, teachers should design and apply curriculum to maximize the advantages of PBL.

Ghufron & Ermawati (2018) analyzed and summarized the advantages and disadvantages of adopting PBL in learning writing courses through questionnaires, in-depth interviews and observations among 60 English language education students at a private university in Indonesia. Their research proves that PBL has the following advantages: problem-solving ability, self-directed learning ability, reducing students' tension, improving students' self-confidence and motivation, improving students' sense of responsibility for learning, easy sharing and exchange of ideas among students, enabling students to learn more actively, enable students to explore many learning resources to solve problems, enable students to have a positive learning attitude, etc. The downside of PBL is that it is difficult to implement, requires more time, more preparation, is well managed, and is confusing for some students.

Liu & Pásztor (2022). Their study conducted a meta-analysis by synthesizing 50 relevant empirical studies from 2000 to 2021, involving 5,210 participants and 58 effect sizes, analyzing the impact of PBL instructional interventions on critical thinking formation. The results of the study showed that the intervention was effective. Factors that may affect the effect of PBL include teaching type, sample type, and group size.

3.2.2 Infographic on Teaching and learning.

As you can see in Abdul et al. (2020), they classify infographic into three types (Static Infographic, Animated Infographic, and Interactive Infographic) in literature view session. Based on the results of the analysis of the students' needs, the need to develop an animated infographic module in Arabic grammar learning was justified. The module is presented in video format and uploaded to a dedicated YouTube channel for easy access by students.

Shih-Ting et al. (2022, Sep). In their study, a dynamic infographic system was designed and developed to assist elementary school resource classes (elementary school students with mild disabilities or learning difficulties) in Taiwan to learn science thematic content. The final results showed that the motion infographic system could improve the learning outcomes of the resource class. By applying infographics to resource classes, content can be simpler, clearer, and more memorable. The use of a digital motion infographic system can improve the continuous presentation of content and the fluency of content.

The research report by Abilock & Williams (2014) explained that an infographic is a claim expressed through visual metaphor, conveying the creator's fresh understanding of relationships, expressed through a judicious selection and arrangement of visuals, evidence, and text acquired during inquiry research within a discipline. They describe a process in which students develop a research question within a domain, investigate a variety of claims and evidence wherever they lead, play with connections and assess contradictions, and wonder about the possible significance of their findings.

3.2.3 Animation on Teaching and learning

The aim of the study by Kaushal & Panda (2019) was to find out under which conditions animation-based teaching leads to better learning outcomes. Experimental results show that prior knowledge is a key factor when providing animations and should only be provided to HPK (high prior knowledge) students. They

recommend that sufficient knowledge regarding concept must first be shared with LPK (low prior knowledge) students before teaching them with animations.

A study by Hwang et al. (2012) identified factors that limit the successful use of animation in teaching. Important success factors we found included the detailed explanation of content, a good balance between clear presentation and beautiful interface, the speed of running/ loading of the animations, and the provision of more references, etc.

The research by Islam et al. (2014) began by creating multimedia animated learning materials for elementary science classes, teaching three different groups of students, the first using traditional teaching methods, the second using only visual learning materials, and the third Teaching using multimedia animated videos combined with teacher guidance. The results of the study show that the introduction of animated learning aids can promote learning and quickly adapt to the learning materials.

3.3 Assessment and Evaluate on Blended Learning

Bowyer & Chambers (2017) focused on evaluating blended learning programs and introduced some evaluation frameworks. And describe some evaluation frameworks in the literature. Finally, it introduces a new framework. The framework for assessing blended learning includes four levels, situations, courses, individual, and outcomes. Please refer to the specific details of the framework.

Summary

First of all, during the literature review, it can be found that the traditional teaching method of Chinese characters emphasizes the learners' memory, constant repetition, and consolidation of knowledge points. How to improve or update the traditional teaching methods after the introduction of information technology tools. This issue becomes more and more obvious, at least, the author did not find a complete set of Chinese character teaching methods (for non-native speakers of Chinese) that could go to a mixed environment of online and offline. Secondly, the teaching ideas and methods became gradually clearer by observing the learning habits of the subjects in

this study and recording and analyzing the general problems of the subjects. Finally, in the design of the Chinese character recognition course reported in this study, the online learning environment adopted an animation (Chinese character strokes) approach, the offline learning environment adopted a problem-based learning approach, and the teaching board was designed with an information pictorial approach. All of these components were unified and integrated through Google Classroom.



CHAPTER 3

RESEARCH METHODOLOGY

The purpose of this study was to develop an instructional program to improve students' Chinese character recognition skills and to stimulate interest in learning. A quasi-experimental research design and mixed methods were used. This is a Single class EXD (Experimental Design) and non-random sampling. Quantitative data are from pre-test and post-test scores and questionnaires with 5 scales. Qualitative data were obtained from Open-end questions by Google Forms Paragraph type. The independent variable of this study was a unique instructional program which included the production of instructional materials, the implementation of blended learning strategies, and the effective integration of online and offline instructional tasks through information technology. The dependent variable was students' Chinese character recognition ability. The main research instruments I used were lesson plans, pre-test and post-test papers, questionnaires and interviews.

3.1 Research Design

The subjects of this study are twelve students in the 6th Grade class, three girls and nine boys. To demonstrate the effectiveness of experimental variables (a unique blended learning teaching scheme). This experiment will use a single group pre-test and post-test design. The scale used to assess Chinese character recognition ability is measured 2 times, once before and once after exposing a group of non-randomized participants to a specially designed Chinese character teaching method. The pre-test scores can show the students' existing Chinese character recognition ability, and the post-test scores can show whether the students' Chinese character recognition ability has been developed after the experimental intervention. Questionnaires can collect the attitudes and suggestions of the experimental subjects on the experimental variables. In order to observe the implementation of teaching strategies at a finer level, in my lesson

plan, suggestions for effect acceptance feedback are given for each teaching step. Please refer to the attached lesson plan for details.

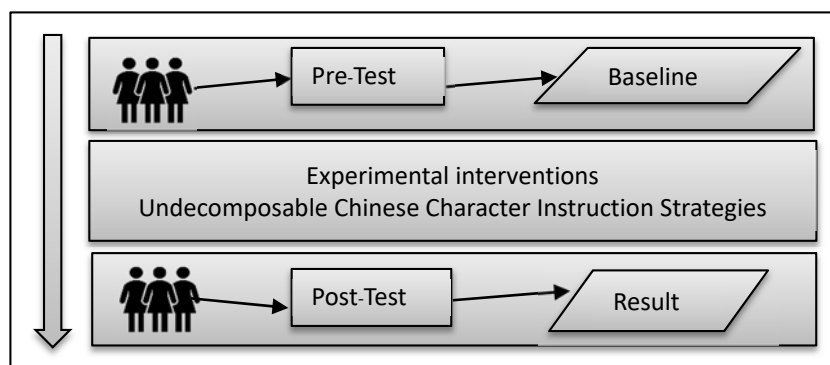


Figure 3.1 Integral Design

As shown in the figure 3.1, in the pre-test phase, the aim is to have the study subjects placed on the same starting baseline.

3.2 Research Process

The top-level construction logic of this research process is based on the Design Thinking model. The model consists of five components: empathy, definition, ideation, prototyping, and testing. In an article by Siang (2022), it is summarized that design thinking is a methodology which provides a solution-based approach to solving problems. It's extremely useful when used to tackle complex problems that are ill-defined or unknown—because it serves to understand the human needs involved, reframe the problem in human-centric ways, create numerous ideas in brainstorming sessions and adopt a hands-on approach to prototyping and testing. The article concludes with a special emphasis on "The iterative, non-linear nature of Design Thinking means that you and your design team can go through these stages simultaneously, repeat them, and even cycle back to previous stages at any point in the Design Thinking process."

What happens when design thinking is paired with a blended learning model? How to demonstrate flexibility is also sub-question that this study attempts to explore. Design thinking not only provides strong support for the progress of this study,

but also provides ideas for the development of lesson plans.

1-Empathy (Identify Problem)

The core questions of this study are as follows.

1. how can learners' Chinese character recognition ability be improved?
2. how to assess learners' mastery of the ability?
3. how do learners perceive the whole learning process?

The progression of further related sub-questions is shown below.

4. what are the characteristics of Chinese characters?
5. How is the ability to recognize Chinese characters defined? Is it that the learner sees the Chinese character and knows the meaning? Or does the learner see the character and know the meaning and pronunciation? Or does the learner see the Chinese character and know the meaning, pronunciation, and writing? And so on.
6. what learning strategies should be used to enable the learner to develop the competency?
7. How can the curriculum be iteratively and continuously improved?

2-Define (Identify Given)

Second, it is necessary to identify as many known conditions associated with the problem as possible. the experimental subjects of this study were the sixth-grade students of Thai bilingual schools in the primary. The purpose of the study was to improve the subjects' Chinese character recognition skills through a specific teaching strategy. The subjects included nine male and three female students who had been exposed to Chinese since the first grade of elementary school and whose current listening and speaking skills were stronger than their reading and writing skills. The subjects' native language, Thai, was used comfortably in listening, reading, and writing. All subjects were observed to be proficient in using smartphones. In addition, there were smart TVs inside the classroom. I would like the students to use their smartphones to learn Chinese characters outside of the classroom, while inside the classroom, using the limited facilities and equipment to reinforce the Chinese characters they have learned.

Researchers can create their own digital instructional materials that can be projected, via computer, onto smart TVs for students to learn on their own. The curriculum for Chinese character recognition would then be divided into online and offline components, with the online component consisting mainly of instructional material presentation and learning outcome assessment, and the offline component consisting of problem-based learning approaches and multiple intelligence-based instructional implementations in the classroom. Before the start of the experiment, the subjects were informed in advance that they would participate in a research study. Clearly tell the subjects that the pre-test and post-test scores will not be regarded as the final grades, so as to dispel the subjects' concerns, pave the way for the pre-test, and prevent students from cheating by using mobile phone translation software.

3-Ideate (Brainstorm)

Brainstorm in the third phase. I had to determine the variety of Chinese characters that required to be recognized in order to improve learners' ability to recognize Chinese characters. According to the Chinese Ministry of Education's International Chinese Language Education Standards, primary level Chinese learners need to master 300 Chinese characters in the first stage. Because I was limited by the two-month research time, I needed to further narrow down the range of Chinese characters. The first one is the Theory and Methodology of Teaching Chinese Characters by Zhou (2007), which clearly provides 32 Chinese characters suitable for beginner-level Chinese learners. The second is The One hundred Chinese Radicals by Shen, Wang & Tsai (2009), and the third is the Quantitative Analysis-based Chinese Characterology on Teaching and Learning Chinese as A Foreign Language by Wang & Shu (2015). I have selected eight more Chinese characters from it as a supplement. The final set of 40 target Chinese characters used in this study was developed. Next, learning materials need to be created, followed by the development of learning strategies, and finally, a method for assessing learning effectiveness.

Regarding the production of the learning materials, I wanted the learners to be able to open their smartphones and see the learning materials whenever they had free time, not just limited to within the classroom. I call this "self-organized learning materials". In addition to the informational learning materials, there are also physical materials, i.e., a pocket-sized bilingual Thai dictionary that is readily available to students. The learning materials were created using Google Slides and then tied together using Google Classroom. After viewing the online learning materials, learners are required to add comment information within Google Classroom, whereby the teacher can view the browsing history. The next question was how to organize the teaching activities when learners returned to the classroom. Combining the structural features of Chinese characters, the triad of meaning, shape, and sound, the classroom needs to set up progressive questions to guide students to make associations, generalize and speculate about Chinese characters based on everyday objects. Classrooms are set up with tasks that engage as much of the learner's left and right brains as possible. Students can adopt drawing, or movement, or role-play, or storytelling. The teacher then shows the history of the evolution of Chinese characters through a smart TV. Next show the ability of that target Chinese character to make basic part characters that can give rise to new combined characters. Next break down the target character to get the basic strokes of the character to achieve a review of the prior knowledge points. Finally, four Chinese characters associated with the target Chinese character are shown with their corresponding Thai meanings. The assessment of classroom learning effectiveness can be done by group sampling. A post-test is given when the forty Chinese characters have been learned. The post-test uses the Google questionnaire tool. Students can take the quiz in class as well as at home. Considering that this study needs to circumvent the use of cell phones by the subjects to cheat, which can contaminate the experimental data, it is recommended to arrange for the subjects to take the test uniformly in the classroom. If individual conditions are encountered, such as students being sick, taking time off from home, and other unexpected situations. Subjects can complete the test at home.

Once the post-test is completed, the questionnaire and interview content collection can be conducted.

As mentioned in the third part of the content above, the target Chinese characters in the online teaching materials will contain informative images and GIF animations, which will eventually be displayed through learners' smartphones and smart TVs in the classroom. The content of learners' feedback after seeing the materials needs to be written into the comments section of Google Classroom as soon as possible. It can help teachers improve their online teaching materials. In the offline teaching session, i.e., inside the classroom, the teacher should record the status of the participant at each step of the teaching activity in a timely manner. Use a timer to measure the exact time period of each task. How did the learners react to the teacher's guided questions? Did the learners understand the meaning of the target Chinese characters? Is the learner's classroom performance positive? They are all questions to look at during the developmental session.

4-Prototype (Execute)

Once the target characters are identified, I need to determine the evaluation form next. Constrained by the two-month study time, I defined the range of Chinese character recognition ability to be such that learners derived meanings from the shapes of the characters. So, I needed to gather information about the images related to the Chinese characters, as shown in the figure 3.2 below. Then prepare pre-reading materials based on the target Chinese characters to correlate with what they have already learned, i.e., the basic strokes of Chinese characters. This is shown in the figure 3.3 below. The animated GIFs of the writing of the Chinese characters were obtained from hanzi5.com and strokeorder.info. Finally, the teaching materials are created with an emphasis on guiding and inspiring students to think and learn the inner and outer derivation of a Chinese character. I will show the slides in the classroom via Smart TV. See the figure 3.4 below.

the lesson is ready to be instruction implemented. Teachers are encouraged to keep track and make timely changes to the instructional materials, or to adjust learning strategies. For example, when learners indicate that a certain set of guiding images or animations suggest a key message that is not clear, the teacher can use the computer in the classroom to immediately replace the infographic with more appropriate information.

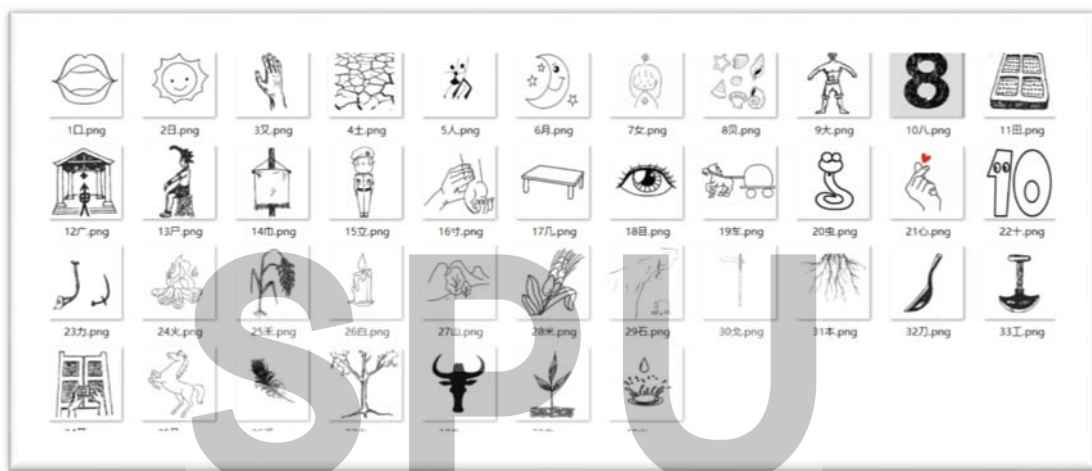


Figure 3.2 Target Characters and Infographic.



Figure 3.3 Pre-Learn materials (partial omission).

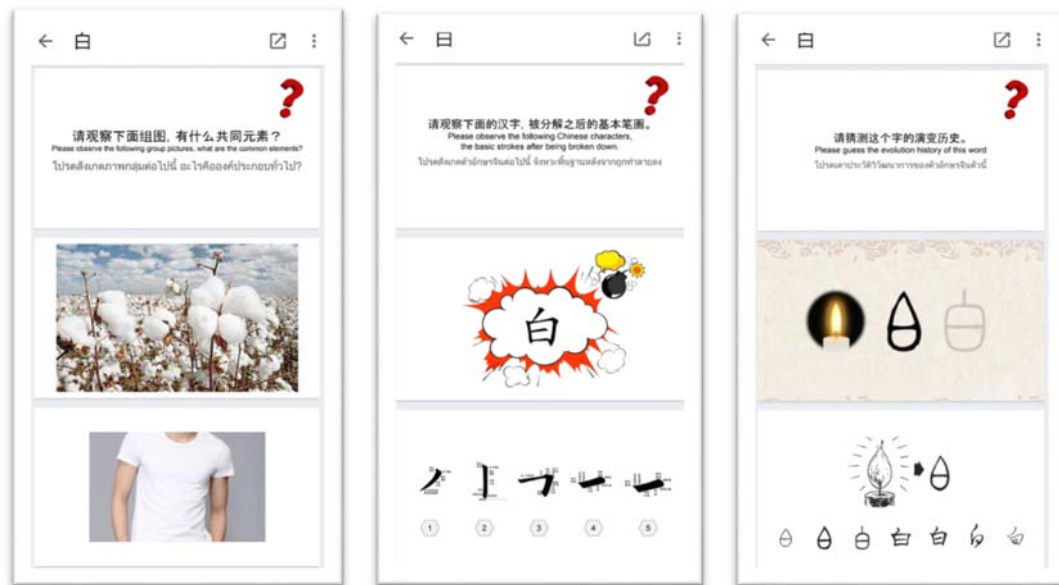


Figure 3.4 Teaching materials of a Chinese character.

5-Test (Evaluate/Check)

Finally, in the assessment phase, the students' Chinese character recognition skills were improved through a blended learning strategy, according to the purpose of the study. The question type of the test paper was set as multiple-choice questions with a total of 40 questions. The test paper could be in paper form (adapted for students who forgot their smartphones on the day of the test). The test paper can also be in Google Forms format. The process of summarizing the scores for the pre-test and post-test is the same, first transcribed into an Excel sheet and finally imported into SPSS. the same is done for the five-point questionnaire, where the Google Form scores are first entered into an Excel sheet first and finally imported into SPSS. the interview content is entered directly into the draft paper from the answers expressed in the Google Questionnaire paragraphs. As shown in Figure 3.5 below.

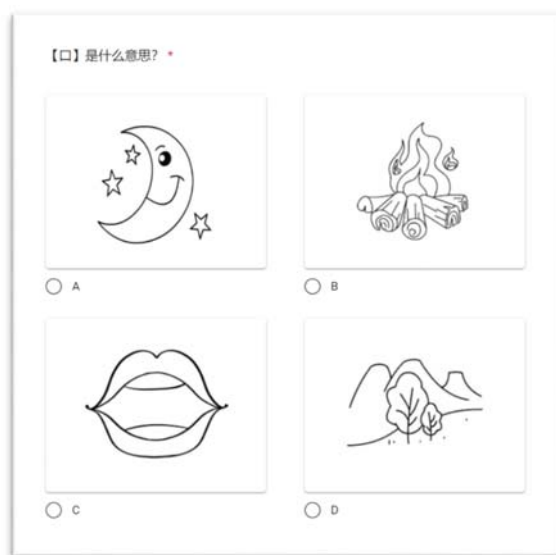


Figure 3.5 One of forty questions.

3.3 Target Group

At this time, I am unable to coordinate all bilingual schools to participate in this experiment together. Because of the convenience of my teaching work, and the limited time for research, my sampling type was convenience sampling. I invited 12 students from the sixth grade at my own school to be the subjects. Next, I would like to give a necessary explanation to the level of Chinese proficiency of the twelve subjects again. Before the experimental intervention, although the subjects began to learn Chinese from the first grade of primary school, and reached the sixth grade, some were good at writing Chinese characters, and some were good at listening and speaking. The common feature was that most of them could use Hanyu (Chinese) Pinyin. The problem was that their Chinese skills were fragmented which it is not comprehensive. For example, they can copy Chinese characters but do not know the meaning of the characters without pinyin assistance, and they have strong listening and speaking ability and weak reading ability.

In the Bangkok area, there are 14 Thai-Chinese bilingual public elementary schools that offer Chinese as a second language and require students to study five subjects using Chinese. The elementary level ranges from grade one to grade six, with

two classes in each grade, one class featuring Thai Chinese and the other class being purely Thai. This study was designed to study the teaching of Chinese characters for the entire elementary level. Based on the above, referring to the average number of students in my school, each grade level, each class has 20 students, so there are 120 students in one school. If other schools had the same or more students than my school, there would be at least 1,680 children in Thai-Chinese bilingual classes in 14 elementary schools in the Bangkok area.

3.4 Research Instruments

Research Instruments, as you can see in Table 3.1, it included instructional instrument (lesson plans and Necessary support notes for software and hardware), quantitative instrument (pre-test and post-test) and questionnaires with five scale, and qualitative instrument (questionnaires with interviews) and validity of research instruments (item-objective congruence, IOC).

Table 3.1 Research Instruments

Table 3.1 Research Instruments				
Research questions	Purposes	Instruments	Data sources	Data analyses
1. How do design instructional plans using Chinese character-based Teaching with the blended-learning approach to help improve students' character recognition in Chinese?	Help students understand and master the meaning and usage of Chinese characters (a) Online preview of the basic strokes of Chinese characters. (b) In the classroom, steps to implement the teaching activities. (c) How to review?	(1) Lesson plan (2) Chinese character-based preview materials (3) Chinese character-based learning materials	The analyses of theories and experts' evaluation scores.	(1) Based on the quality and effectiveness of the randomly checked students' pre-study, the pre-study materials can be improved. (2) The lesson plan can be iterated and improved based on the written records.
2. To what extent does the Chinese character-based Learning with the use of the Blended-learning	(1) Assess students' Chinese character recognition skills. (2) To help analyze assessment results,	Pre-Test & Post-Test of Chinese character Recognition Ability Test	Pre-test and post-test scores	Descriptive statistics (mean, S.D.) and Paired Samples t-Test

Table 3.1 Research Instruments

Research questions	Purposes	Instruments	Data sources	Data analyses
approach improve students' character recognition in Chinese?	confirm quantitative data, and explain how Chinese character-based instruction, through blended learning strategies, can improve Chinese character recognition skills.			
3. What are students' opinions towards the Chinese character-based Learning with the use of the Blended-learning approach?	To find out and summarize content indicating the students' opinions of the intervention.	(1.1) Chinese character-based with blended learning approach questionnaire (1.2) Blended Learning Approach based on Chinese characters open-ended questions?	(1.1) scale of questionnaire (1.2) Text analysis of open-ended questions	(1.1) Descriptive statistics mean, S.D. (1.2) Content analysis, coding, and categorization

3.4.1 Lesson Plan

This lesson plan, using the Chinese character [口] as an example, demonstrates the process of teaching a Chinese character, mainly including what learners need to do outside the classroom, what learners need to do in the classroom, and the teacher's role in guiding, inspiring, and organizing the entire online and offline teaching process.

All forty target Chinese characters are in Table 3.2. The following is a necessary explanation and supplement to the attached lesson plan. Two parts are included, one is outside of the classroom, where students prep and submit assignments. The other is the five teaching steps in the classroom. The online and offline components of instruction need to be integrated to ensure the smooth running of the experiment. After the pre-test was completed, subjects were told to enter the Google Classroom

application and start pre-studying the self-study material for the target Chinese characters, suggested in groups of ten characters, or at the subject's discretion. The supplemental materials were organized and created by the experimenter and presented in a Google slide show.

Table 3.2 Forty Chinese characters

Table 3.2 Forty Chinese characters	
Schedule	List of target Chinese characters
Week 1	01口, 02日, 03又, 04土, 05人, 06月, 07女, 08贝, 09大, 10八
Week 2	11田, 12广, 13尸, 14巾, 15立, 16寸, 17几, 18目, 19车, 20虫
Week 3	21心, 22十, 23力, 24火, 25禾, 26白, 27山, 28米, 29石, 30戈
Week 4	31本, 32刀, 33工, 34开, 35马, 36毛, 37木, 38牛, 39生, 40水

About teaching hours, this study was conducted during the first semester of the 2022 Academic Year, between June and July. The recommended time limit for teaching each Chinese character was twenty minutes or less. There were five Chinese lessons per week, and the first twenty minutes were used to learn the assigned Chinese characters. On Wednesdays, there was one Chinese activity class where they could learn three Chinese characters. There were also five math classes, two science classes, one art class, and one health education class, all of which required instruction in Chinese, and the vocabulary learning sessions in these specialized classes could also be used to learn Chinese characters. This means that the students were able to learn at least ten Chinese characters each week, as shown in Table 3.3.

Table 3.3. At least ten Characters can be learned

Table 3.3 At least ten Characters can be learned					
	Mon	Tue	Wed	Thu	Fri
course	Chinese	Chinese	Chinese.Chinese Club	Chinese	Chinese
Chinese characters	1(+1)	1(+1)	1 + 3	1(+1)	1(+1)

Next you will see a complete lesson plan for the target Chinese character in Table 3.4. I will explain the necessary notes and more information for each teaching step later.

Table 3.4 Chinese character [口] Lesson Plan

Table 3.4 Chinese character [口] Lesson Plan				
Objective	Methods for organizing learning activities	Application	Equipment	Assessment Method
outside classroom 1) Find the baseline about Chinese characters 2) Use of EdTech resources	Take the test before class (30 minutes)	Google Forms	- Smart phone - desktop computer - Internet	pre-exam scores
outside classroom 1) Preview of Chinese characters to be learned 2) It is the Preview Part 3) Use of EdTech resources	1. Teacher 1.1 Learning materials are provided for the monograms that need to be learned this week, including the basic stroke order of Chinese characters and animated GIF demonstrations. 2.2 The materials are provided with QR codes and posted to Google Classroom. 2. Student 2.1 Students need to pre-view Chinese characters in advance at home. Learning resources can be accessed using smart phones or computers.	- Google Classroom - Google Slide - Web Browser (Chrome, Edge, Safari)	- Smart phone - desktop computer - Internet	- For example, students need to know that [口] has three strokes. - Understanding the order of the [口] strokes - In this session, it is not necessary to deliberately ask students to remember the above. It is enough to have a basic impression.
Inside classroom Step one 1) Learning the meaning of the Chinese character [口] (5 min) 2) This is the official learning session 3) Using EdTech Resources Face to Face in the classroom	1. Teacher 1.1 teach in the classroom using slides and blackboard. 1.2 Show pictures of mouths (including human mouths and animal mouths), bowl, and traffic intersections. 1.3 Also ask, "What are these? and What is the connection between them? 1.4 If you were asked to create a Chinese character based on the picture provided earlier, what would you do? 2. Student 2.1 Expand your imagination and respond positively to the teacher. 2.2 Speak openly and write with your hands. Draw what comes to mind on paper or tablet.	- Google Slide or PowerPoint	- Computer - TV - Xiaomi LCD Writing Tablet	Stimulate children's imagination and encourage students to say or draw their answers on the Writing Tablet or Blackboard.

Table 3.4 Chinese character [口] Lesson Plan

Objective	Methods for organizing learning activities	Application	Equipment	Assessment Method
<p>Inside classroom</p> <p>Step two</p> <p>1) Show the evolution of the Chinese character [口] (5 min)</p> <p>2) This is the official learning session</p> <p>3) Using EdTech</p> <p>Resources</p> <p>Face to Face in the classroom</p>	<p>1. Teacher</p> <p>1.1 Show the evolution of the Chinese character [口]. Include the pictographic evolution process, and the calligraphic evolution process.</p> <p>1.2 teacher will demonstrate the most representative fonts from ancient to modern times.</p> <p>1.3 Give instructions to students to prepare pens and paper, or LCD handwriting board.</p> <p>1.4 Demonstrate how to write standard Chinese characters and how to write irregular Chinese characters.</p> <p>2. Student</p> <p>2.1 In four groups of three students each, they will copy the evolution of Chinese characters.</p> <p>2.2 Students need to appreciate where the beauty of Chinese characters comes from? How does the relationship of the plane structure come about?</p>		- Xiaomi LCD Writing Tablet	<p>1.1 Students are trained in spatial structure and modeling skills about Chinese characters.</p> <p>1.2 It is not necessary to ask students to remember the order of strokes. There is no need to increase the students' as well as the burden in this session, only to mobilize them to physically feel the Chinese characters.</p>
<p>Inside classroom</p> <p>Step three</p> <p>1. Demonstrate the ability to synthesize the Chinese character [口] (3 min)</p> <p>2. This is the official learning session</p> <p>3. Using EdTech</p> <p>Resources</p> <p>Face to Face in the classroom</p>	<p>1. Teacher</p> <p>1.1 Show the combined Chinese characters that contain the Chinese character [口], using a google slideshow</p> <p>1.2 There are four characters in total, and each character has a Thai meaning attached to it.</p> <p>1.3 The teacher repeatedly emphasizes and points out the [口] in the combined characters.</p> <p>2. Student</p> <p>2.1 to understand the meaning of the Chinese character [口] and how it relates to the meaning of the composite</p>	- Google Slide or PowerPoint	- Computer - TV	Guide students to observe, appreciate and understand how the original and derived meanings of literalism are reflected in Chinese characters.

Table 3.4 Chinese character [口] Lesson Plan

Objective	Methods for organizing learning activities	Application	Equipment	Assessment Method
	<p>character.</p> <p>2.2 need to use body movements to express the meaning of the combined characters.</p> <p>2.3 to understand the unique logic of Chinese character formation.</p> <p>2.4 create sketches based on the Thai meaning of each amalgamated character, combined with the imagery of [口], And show it to other students.</p>			
<p>Inside classroom Step four 1. Deconstructing the Chinese character [口] (2 min) 2. This is the official learning session 3. Using EdTech Resources Face to Face in the classroom</p>	<p>1. Teacher 1.1 With the aid of a Google slide show, similar to a split-screen script, let students imagine the process of the Chinese character [口] being broken down by detonation. 1.2 At the same time, the teacher asks, "What are the basic structures after decomposition?" 2. Student You need to write [Mouth], the basic strokes after being broken down.</p>	- Google Slide or PowerPoint	- Computer - TV	<p>1. Examine students' mastery of the basic strokes of Chinese characters 2. To achieve the purpose of review and consolidation</p>
<p>Inside classroom Step five 1. Summarize the Chinese character [口] (3 min) 2. This is the official learning session 3. Using EdTech Resources Face to Face in the classroom</p>	<p>1. Teacher 1.1 The pronunciation of the Chinese character [口] can only be written in this session, and no Chinese Pinyin can be used in each of the sessions above. 1.2 The teacher asks, how is this character pronounced? 1.3 The teacher asks, what does this character mean? 1.4 The teacher prepare question, like how do you write this character? 1.5 Ask students to take out their smartphones, open Google Classroom, use Pinyin</p>	- Google Classroom - Gboard	- Smart Phone	Students are required to submit learning outcomes to Google Classroom.

Table 3.4 Chinese character [口] Lesson Plan

Objective	Methods for organizing learning activities	Application	Equipment	Assessment Method
	input method, and send the Chinese character [口] and Thai meaning. 2. Student 2.1 Answer the teacher's questions. 2.2 Send the Chinese character [口] to google classroom. 2.3 Check the Chinese-Thai dictionary or Google Translator, and post the Thai meaning and derivation of [口] to google classroom.			

In step one of the classroom parts, as you can see in figure 3.6, after the instructor asked questions and showed images or GIF animations of information related to the target Chinese character, the subjects were divided into four groups of three. Sketches were created based on what they had just seen. One member of each group was asked to draw the outline of the relevant image associated in the brain on the blackboard, while the remaining three members were also asked to complete the drawing task on paper or tablet, as looks like figure 3.7. The key guiding question for this step was, how do you translate and create the information you observe and receive into a Chinese character if you were the first person to invent it thousands of years ago? The teacher needs to guide and inspire the students to think about it.



Figure 3.6 show the Animation GIF related to the target Chinese character.



Figure 3.7 Subjects try to draw what they associate in their minds.

In step two, after the subjects watched the evolution of the target Chinese characters, they needed to complete the tasks of observing and imitating writing. the participant writes the Chinese character as large as possible, how large is appropriate? Five to ten times larger than the usual Chinese characters written in the homework exercise book. The purpose of this was to deliberately slow down the writing speed so that the subjects could experience the relationship between the spacing and length of the strokes. This part did not need to mind the right order of the strokes to prevent distracting the subject.

In step three, the experimental participants needed to combine the meaning of the target Chinese character with the Thai meaning, infer the meaning of the synthesized Chinese character, and draw the outline of the figure or thing reflected in the mind, or use onomatopoeia, or use body movements. any way. The teacher judged whether the understanding was correct or not.

In step four used the concepts taught about the combination and breakdown of the fundamental strokes of Chinese characters to activate the overlaid impact of the topic knowledge and to consolidate and strengthen it.

In the fifth and final step, the Chinese Hanyu pinyin appeared for the first time, and I wanted to emphasize that it could not appear in all the previous steps. Students could use the Hanyu Pinyin input method and type the target Chinese character into the comments section of Google Classroom or use the Line social application and send it one-on-one to the teacher for checking. This is shown in Figure 3.8

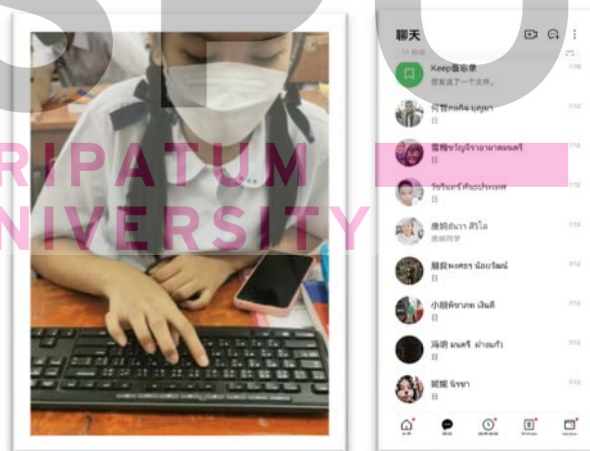


Figure 3.8 Subjects used Pinyin Input Method to find target Chinese characters.






A timer was also used in the classroom, and it was recommended to use the countdown software or timer that came with their phone. This is shown in Figure 3.9

Timer	Timer application of smart phone
	

Figure 3.9 The timer used in each step to control teaching and learning time.

Regarding the effective implementation of the lesson plan, it relied on software and hardware, as well as the support of the network environment. The support of the network environment was described first. Outside of the classroom, subjects relied primarily on their own smartphones, with the network sourced from the ISP. Inside the classroom, the teachers used the network from a shared hotspot on their smartphones. The applications that had to be installed on the subjects' smartphones and the software tools that teachers used to create online instructional materials are described next, referring to the Table 3.5 below.

Table 3.5 Required applications

Table 3.5 Required applications				
Applications to be installed on the subjects' and teachers' smartphones				
 Google Classroom	 Google Chrome	 Google Translate	 Google Gboard	 Line
In addition to the above, teachers need to use the following tools to create teaching materials				
 Google Drive	 Google Gallery	 Google Slide	 Google Form	 GIPHY

3.4.2 Validation of Lesson Plan

Content validity and construct validity were assessed by three experts. The first two experts, they are university lecturers; one is Thai and One is a native speaker. They have been teaching for over 5 years. They are both experts in linguistics and teaching in Chinese. The third was the Chinese program leader of the upper elementary school group to which the authors of this study belonged, a Thai native who had been in charge of teaching at the school for over twenty years. The IOC form of lesson plan using a five-score rating scale Evaluation from 5 to 1 (5 = most relevant / connected / appropriate, 4 = very, 3 = somewhat, 2 = fairly, 1 = least). The overall content and construct validity was 4.55, indicating that the lesson plan was appropriate for the students.

3.4.3 Pre-test and Post-test of Chinese character Recognition Ability Test

In the pre-test part, it mainly includes the following points. 1) Test papers are published in Google Classroom. 2) The test time is controlled within 30 minutes, and a total of 40 multiple-choice questions need to be completed. 3) In order to prevent individual subjects from forgetting to bring their mobile phones on the pre-test day, three test papers were printed in advance. 4) The test paper is made using google form. For details of pre-test, please refer to the appendix at the end of the article.

Once all the Chinese characters were learned, it was time to move on to the post-test session. The overall process was similar to that of the pre-test session, with subjects voluntarily choosing to complete the Google Sheets questions in the classroom or at home. The difference is that the order of the answer options for the post-test questions was disrupted. For details of post-test, please refer to the appendix at the end of the article.

There are a total of forty multiple-choice questions on the paper, with one point for each correct question and no points for the incorrect question. The test papers are created and displayed by the Google Forms application and eventually published to Google Classroom. The question format is shown below in Figure 3.10

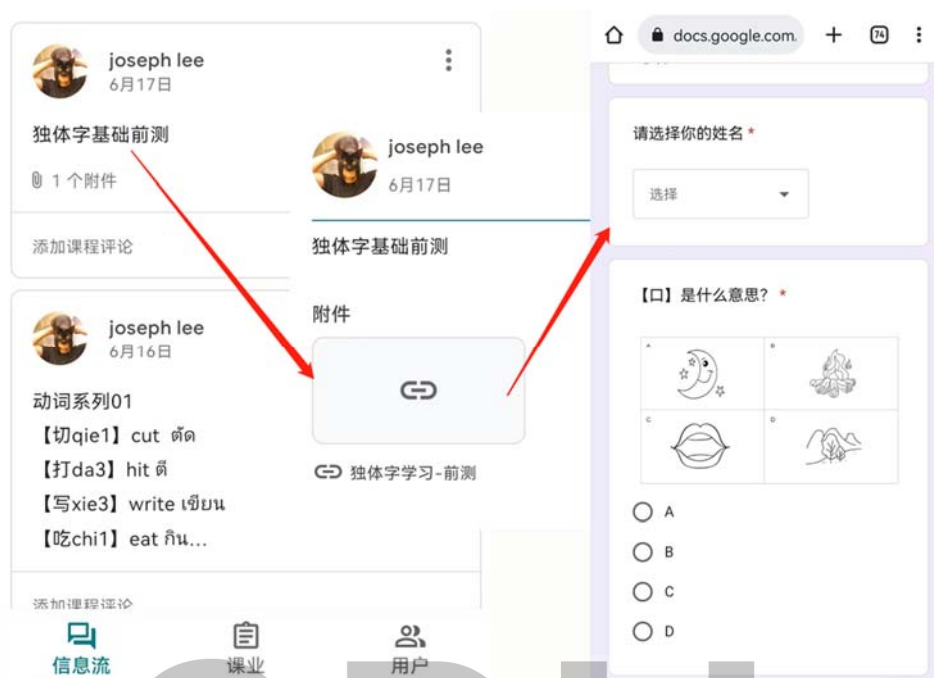


Figure 3.10 The process of entering the test from Google Classroom.

3.4.4 The Item Objective Congruence (IOC) of Pre-Test and Post-Test

Content validity and construct validity were still assessed by three experts, who were the same as the experts who assessed the lesson plans, and the study used the Index of Objective Consistency (IOC) method for items. A three-point rating scale, -1=incongruent, 0=problematic, 1=consistent, was provided to the experts. Mean scores were generated based on the results, with an overall content and construct validity of 0.70, indicating that the test content was appropriate for the students and measured the subjects' mastery of Chinese characters.

3.4.5 Questionnaire with 5 scale

This questionnaire was written in English and shared with Google Classroom with the help of the questionnaire function of Google Forms. The teacher just needed to explain clearly to the students in the classroom the dos and don'ts of filling out the questionnaire, such as how to set up the English to Thai conversion when using a smartphone to fill out the form. When explaining that there are five different levels of options for each question, do not guide or imply how students should answer.

Instead, the teacher needs to emphasize that the questionnaire is anonymous and ask subjects to answer truthfully based on their real feelings about participating in the experiment, which will help the teacher to provide the necessary reference for improving the teaching program.

Qualitative data were obtained from a questionnaire with 5 scale. The questionnaire has a total of thirty questions and is divided into four sections, the first of which is instructional management. The second part was on teaching activities of Chinese character recognition, the third part was on teaching materials, and the fourth part was on assessment and evaluation. The questionnaire is edited using a modified version of the Google Forms questionnaire template, which is also posted to Google Classroom, and subjects are notified to fill out the survey when the post-test is completed. Each question corresponds to five different levels, ranging from strongly disagree to strongly agree. The corresponding score is from one to five, with a score of one for strongly disagree and five for strongly agree.

Table 3.6 All Variables of Scale Reliability

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
a1	12	1	5	3.58	1.311
a2	12	2	5	4.17	.937
a3	12	1	5	3.83	1.267
a4	12	1	4	3.50	.905
a5	12	1	5	3.50	1.243
a6	12	2	5	3.58	.996
a7	12	2	5	3.50	.905
a8	12	1	5	3.58	1.240
a9	12	2	5	3.67	.985
a10	12	1	5	3.67	1.155
a11	12	1	5	3.42	1.084
a12	12	2	5	3.58	.996
a13	12	1	5	3.25	1.288
a14	12	2	5	3.50	1.087
a15	12	1	5	3.25	1.288
a16	12	1	5	3.33	1.231
a17	12	1	5	3.25	1.138

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
a18	12	2	5	3.33	.888
a19	12	2	5	3.50	1.000
a20	12	1	5	3.33	1.155
a21	12	2	5	3.67	.888
a22	12	3	5	3.67	.778
a23	12	2	5	3.42	.996
a24	12	1	5	3.67	1.303
a25	12	2	5	3.42	1.084
a26	12	2	5	3.42	.996
a27	12	1	4	3.00	.953
a28	12	1	5	3.08	1.165
a29	12	1	4	3.00	.953
a30	12	1	5	2.58	1.311
mean	12	1.63	4.63	3.4417	.84281

This study investigated the internal consistency of The Chinese character-based learning with blended instructional strategy with thirty items on the Chinese character Recognition Ability Development Assessment Scale. The alpha coefficient of this scale was 0.98 in Table 3.6, showing a high internal consistency of the items on this scale. The range of mean values for each item was 2.58 to 4.17, and the mean value for the total scale was 3.44, SD value was 0.84281.

Content validity and construct validity were still assessed by three experts, the same experts who assessed the lesson plans and test papers, and the study used the Index of Objective Consistency (IOC) method for the items. A three-point rating scale, -1=incongruent, 0=problematic, 1=consistent, was provided to the experts. Mean scores were generated based on the results, with an overall content and construct validity of 0.90, indicating that the content of the questionnaire was appropriate for the subjects and that it measured their learning of Chinese character recognition.

3.4.6 Open-ended question

The questionnaire for this study was created by Google Forms and consisted of two parts, one with a five-point Likert scale and the other with open-ended questions. Since the questionnaire was anonymous, most of the subjects did not fill out

the open-ended questions carefully. If we had taken 5 minutes to clearly explain the requirements for filling out the form before the questionnaire was officially launched. This problem could have been avoided. I still decided to publish below what individual subjects filled out. Get more details from Table 3.7

Table 3.7 Google questionnaire in Open-ended questions

Table 3.7 Google questionnaire in Open-ended questions	
Questions	Answer Text
Q1. What aspects of this course did you find most useful or valuable?	1. Useful 2. I can remember the writing process enough and memorize the Chinese characters a little. 3. Helped me to remember more Chinese characters. 4. Outstanding/ excellent Chinese characters
Q2. How do you think this course could be improved?	1. Teach early 2. Uncertainty 3. Teach a little faster

3.5 Data Collection Procedures

1. The instruments for this study included a lesson plan, tests (pre-test and post-test using the same test paper), questionnaires and personal interviews, and validated the validity of the instruments. The lesson plan, test, and questionnaire were submitted to three experts to assess the validity of the content. Content validity was assessed by using the Index of Item-Objective Congruence (IOC) measure.

2. An experimental study was conducted from June to July 2022 in the 6th grade of elementary school at Tawat Sawetchat Bilingual School (โรงเรียนทวดเสวตฉัตร), Bangkok. This was a single group study. A pre-test of Chinese character recognition skills was first completed before the lesson plan was implemented. Then after completing the experimental lesson plan with 40 target Chinese characters, the subjects were given a post-test. This was followed by a questionnaire and open-ended question on the second day. The process of a number of time points was as follows: complete the IOC document score assessment by the end of the first week of June, then, begin pre-testing and complete the lesson plan for the lab intervention by July 15, and return questionnaires by July 20.

3. The lesson plan was implemented and the researcher recorded the observations into a notebook at any time during the implementation process. The pre-test and post-test were able to collect the test scores of the subjects quickly because of the use of the Google Forms application. Questionnaires and open-ended question were also collected through Google questionnaires.

3.6 Data Analysis

Data analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and review, and evaluate data. Analysis metrics include means, standard deviation, significance compare value, t-tests, the use of Cronbach's alpha (α) to determine the reliability of the questionnaire, and the content of the interviews will be analyzed for textual analysis. The data analysis tools for this study were Excel and SPSS, where expert ratings of the IOC were collected and summarized in excel. The scores of the pre-test and post-test questionnaires were similarly collected using excel and then imported into SPSS for analysis. The scores of the questionnaires were also processed in the same way as the previous ones.

CHAPTER 4

RESULTS

The three questions of this study were: 1) how to improve the subjects' Chinese character recognition ability. 2) The implementation of this lesson plan, to what extent the ability of the subjects has been improved, and 3) use blended learning strategies to enhance their interest in Chinese characters and thus active learning. The analysis of post-test scores conducted after the intervention treatment was able to know whether the subjects' accuracy of Chinese character recognition was improved. After the questionnaire scale the subjects', attitudes can be investigated. An anonymous question-and-answer interview was conducted to analyze the subjects' true feelings. All quantitative data is first collected and aggregated through excel. Then it was imported into SPSS to generate statistical charts and interpret the data. The advantage of using excel here is that the results of the excel statistical analysis can be compared with the results of the SPSS analysis if necessary. Reduce the experimental data error. The interview content here was set in Google Forms with the status of non-required items, which was expected to be ignored by the subjects, and surprisingly the text content was actually collected.

4.1 Part 1 Results of Research Objective 1

O1: To design lesson plan using Chinese character-based and blended learning approaches to help improve students' character recognition in Chinese.

To enhance the student's ability to recognize Chinese characters, a unique lesson plan centered on those characters was created and put into practice using a blended learning strategy. Based on field observations and summary notes, I recorded the lesson plans' implementation observations and summarized and categorized them according to their implementation order, as indicated in Table 4.1 below.

Table 4.1 Classification and discussion of observations and Discovery

Table 4.1. Classification and discussion of observations and Discovery		
Categories of Observation and Discovery	Phenomenon	Summarize
Effect of application software on subjects	Subjects accessed the learning content through Google Classroom, acting overwhelmed at first and gradually becoming comfortable with it.	The teacher guides the students on when to use their smartphones and when their attention needs to return to the classroom during the learning process.
The impact of the choice of teaching mode on the implementation of blended learning strategies	At the beginning of the class, the subject was made aware that the teacher planned to use twenty minutes to explain one Chinese character in a comprehensive manner. The subjects were clear about the purpose of the instruction.	In this study, the researcher used a design thinking model to approach the problems encountered from a macro perspective. However, the pedagogical approach did not follow the various existing pedagogical models, due to the flexibility and adaptability required for the implementation strategies considered in this study.
Necessary prior knowledge to ensure smooth implementation of teaching	Most of the subjects had a clear understanding of the concept of basic strokes in Chinese characters, including how the strokes are written and the order in which the different strokes are connected to each other.	The purpose of the online instructional materials used in the pre-study session was to help the subjects review the basic strokes of Chinese characters and the order in which the strokes are written. Before the official launch of the experimental study, it was necessary to understand the learners' mastery of Chinese strokes.
Heuristic question setting and feedback from subjects	Subjects responded enthusiastically to the teacher's questions and were actively engaged in the teaching activities based on the guided questions and the presentation of information images.	The teacher's questioning must be progressive. First have the subject observe some phenomenon in life, then have the subject distill the common elements. The teacher then asks the core question, if you were to create a Chinese character to express this meaning, how would you express it? Then show how the ancient Chinese created the character and how the character evolved.
The setting of interactive teaching sessions and subjects' willingness to participate	In the group drawing session, the willingness of all subjects to participate was very high. The participation of the subjects was also very high in the session of explaining and expressing the meaning of Chinese characters in pantomime.	Using multiple intelligence theory, the subjects were fully engaged in teaching activities. Every effort is made to achieve the goal that learners cannot forget the target Chinese character after learning it only once.
Classroom Learning Effectiveness Assessment	All subjects were attentive and eager to participate in the session of using Pinyin input method to enter the target Chinese characters. Some subjects used Chinese characters to communicate with the authors of this study outside of the classroom, through social networking software.	The only purpose is to make learners appreciate the practicality of mastering Chinese Character. It implies to learners that you can read Chinese characters and that you can write them for communication. It sets the stage for the learner to develop subsequent Chinese character writing skills.

If the results of this study need to be replicated in other related studies, please refer here. Further explanation of the impact of the application on the subjects is provided by the fact that the learning aids for this Chinese character recognition course were presented through Google Classroom. The subjects saw animated GIFs of the target Chinese character (showing the stroke order of the target Chinese Character)

during the pre-study phase, and also viewed the learning materials through the Google Slide shared browsing link posted by the teacher to Google Classroom.

As further explained regarding the impact of the choice of instructional mode on the implementation of blended learning strategies, learners can preview and review content related to the target Chinese character at their own pace, and can even apply the learned methods to other Chinese characters. This means that the learning process can be non-linear and the lesson plan revolves around a pre-determined target Chinese character. The first lesson is about one character, the second lesson is about another one, and so on. In general, the forty characters follow the same teaching steps. There is no correlation between each lesson, as each Chinese character is a separate entity. This is different from the normal sense of a lesson plan, where learners want to learn lesson 5 and must understand lessons 1 through 4. Ideally, the learning of Chinese characters can be done with good use of fragmented time and like Lego blocks, building out the combined characters from the solitary characters, then from character to words, from words to phrases, and from phrases to sentences. The key is accumulation and an enjoyable beginning stage, and the original purpose of this research study was based on the same purpose, that the learning of Chinese characters begins with a relaxed and enjoyable experience.

To sum up, Google Classroom was used to connect teacher-student interactions outside of the classroom in the Chinese character recognition course that was created for this study. The steps involved in carrying out the lesson plan were setting up Google Classroom, using it, and returning to the offline classroom to finish extended divergent learning of a target Chinese character and evaluate the results of the classroom learning activities. The results of the phenomena seen during the implementation process were recorded, organized, examined, and finally given by the writers of this study.

4.2 Part 2 Results of Research Objective 2

O2: To investigate the student's learning outcomes (Chinese character recognition ability) Through a teaching strategy utilizing a Chinese character-based and blended learning approach.

Chinese character recognition abilities were developed to a certain level in order to evaluate the individuals' learning outcomes. In this study, pre-and post-tests as well as a questionnaire were administered.

Table 4.2 shows the means scores on the pre-test and post-test

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre-test	30.67	12	6.880	1.986
	post-test	35.75	12	4.789	1.382

Table 4.2 shows the paired sample statistic, from which it can be seen that the mean score of the pre-test was 30.67 and the mean score of the post-test was 35.75. The mean score of the post-test was 5.08 points higher than the mean score of the pre-test. This indicates that after the experimental intervention, the students' scores improved substantially. To further compare whether the two scores reached the level of statistical difference, a paired samples t-test was also conducted, as shown in Table 4.3

Table 4.3 Paired sample correlations between pre-test and post-test

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	pre-test & post-test	12	.980	.000

from Table 4.3, the correlation between the pre-test and post-test scores in this single class is 0.98 with a probability P-value of 0.000, which is less than 0.05 at the significance level, thus rejecting the original hypothesis and indicating that they are significantly correlated and a paired-sample t-test applies.

Table 4.4 Paired samples test for pre-test and post-test

Paired Samples Test										
		Paired Differences								
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)	
					Lower	Upper				
Pair 1	pre-test-post-test	-5.083	2.392	.690	-6.603	-3.564	-7.363	11	.000	

As shown in Table 4.4, the t-value of the paired t-test between pretest and posttest scores was -7.363 with a probability p-value of 0.000, which is less than 0.05 at the significance level. therefore, the original hypothesis, that there is a significant difference between pretest and posttest scores.

Table 4.5 Mean scores and standard deviations of questionnaire surveys

Table 4.5. Mean scores and standard deviations of questionnaire surveys				
	Question	Mean	S.D.	Option
Part I Instruction Management				
1	I signed up for a Google email account.	3.58	1.311	Uncertain→ Agree
2	I have the Google Classroom application installed on my phone.	4.17	0.937	Agree
3	My phone can access the Internet without any problem.	3.83	1.267	Uncertain→ Agree
4	In the classroom, I could clearly see the teacher's slide show material through the TV.	3.50	0.905	Uncertain→ Agree
5	In the classroom, I can clearly see what the teacher is writing on the blackboard.	3.50	1.243	Uncertain→ Agree
6	I think the teacher set clear teaching questions that helped stimulate thinking.	3.58	0.996	Uncertain→ Agree
7	I can understand the purpose of teaching at each step.	3.50	0.905	Uncertain→ Agree
8	I think the length of time for teaching the first step is reasonable.	3.58	1.240	Uncertain→ Agree
9	I think the length of time for teaching the second step is reasonable.	3.67	0.985	Uncertain→ Agree
10	I think the length of time for teaching the third step is reasonable.	3.67	1.155	Uncertain→ Agree
11	I think the length of time for teaching the fourth step is reasonable.	3.42	1.084	Uncertain→ Agree
12	I think the length of time for teaching the fifty step is reasonable.	3.58	0.996	Uncertain→ Agree
Factor 1 Composite		3.63	1.09	Agree
Part II Activities in Chinese Character Recognition Instruction				
13	In the first step, I think it is a great teaching activity to translate the physical images you see into sketches.	3.25	1.288	Uncertain→ Agree
14	In the second step, I felt that looking at the history of the evolution of Chinese characters helped me to understand them.	3.50	1.087	Uncertain→ Agree
15	In the second step, I felt that learning and imitating different handwritten variants of Chinese characters helped me to feel the beauty of the art of line modeling.	3.25	1.288	Uncertain→ Agree
16	In the third step, I thought that creating sketches based on the Thai meaning of the combined characters and the imagery of the monogram would deepen my understanding and impression of the Undecomposable Modern Chinese Characters.	3.33	1.231	Uncertain→ Agree
17	In the fourth step, I believe that speculating on the basic strokes of Chinese Characters helps me develop my Chinese Characters writing skills.	3.25	1.138	Uncertain→ Agree

Table 4.5. Mean scores and standard deviations of questionnaire surveys

	Question	Mean	S.D.	Option
18	In the fifth step, the way of submitting assignments, I felt that using Chinese Pinyin Input Method could enhance my motivation to learn Chinese characters.	3.33	0.888	Uncertain→ Agree
	Factor 2 Composite	3.32	1.15	Uncertain→ Agree
Part III Instructional Materials				
19	I am proficient in operating a smart phone to open pre-reading materials for Chinese characters from Google Classroom.	3.50	1.000	Uncertain→ Agree
20	The GIF animations in the pre-study materials help me understand the order of the strokes of the Chinese characters.	3.33	1.155	Uncertain→ Agree
21	I feel that the slide content accurately represents the majority of the teaching content.	3.67	0.888	Uncertain→ Agree
22	I think the teacher's blackboard design accurately represents the vast majority of the teaching content.	3.67	0.778	Uncertain→ Agree
23	I prefer to draw on the Xiaomi LCD writing pad to express the meaning of Chinese characters as opposed to sketching them out on paper.	3.42	0.996	Uncertain→ Agree
24	I prefer drawing sketch notes on paper to express the meaning of Chinese characters as opposed to drawing sketches on the Xiaomi LCD writing Tablet.	3.67	1.303	Uncertain→ Agree
25	I think the way the GIF animation is explained helps to understand the meaning of the Chinese characters.	3.42	1.084	Uncertain→ Agree
26	Using my smartphone and learning Chinese characters has helped me a lot.	3.42	0.996	Uncertain→ Agree
	Factor 3 Composite	3.51	1.03	Agree
Part IV Assessment and Evaluation				
27	The Pre-Post Test are easy for me.	3.00	0.953	Uncertain
28	The Pre-Post Test are difficult for me.	3.08	1.165	Uncertain→ Agree
29	I think it is reasonable to use thirty minutes to complete the test.	3.00	0.953	Uncertain
30	I think the test takes fifteen minutes is enough.	2.58	1.311	Disagree
	Factor 4 Composite	2.92	1.10	Disagree
	Summary of the whole overview	3.35	1.09	Uncertain

From Table 4.5, we can conclude that the mean value of Instructional Management factor is 3.63 with a standard deviation of 1.09. The mean value of Instructional Interaction factor is 3.32 with a standard deviation of 1.15. The mean value of Instructional Materials factor is 3.51 with a standard deviation of 1.03. The mean value of Outcome assessment factor is 2.92 with a standard deviation of 1.10. The overall mean was 3.35 with a standard deviation of 1.09.

4.3 Part 3 Results of Research Objective 3

O3: To investigate students' opinions towards the Chinese Character-based Teaching with the use of the Blended-learning approach to improving students' character recognition in Chinese.

The results of the personal interview data analysis present the reasons why students are satisfied with blended learning. It was divided into two themes, the first

part showing which aspects subjects found most valuable during the Chinese character-based instructional model, using blended learning strategies, one aspect? or more than one? Or all of them? The second part was for the participants to provide ideas for improving the course.

From the answers to the questionnaire paragraph questions, I tried to categorize them for dimensional analysis. More detail as shown in Table 4.6

Table 4.6 Summary of personal interviews

Table 4.6 Summary of personal interviews		
Question	Answer	Explanation and Interpretation
Q1. What aspects of this course did you find most useful or valuable?	A1. Useful	I think the respondent did not look at the meaning of the question carefully. I felt that the course was appropriate, so I chose 'useful'. So at least I can assume that this subject found the course useful.
	A2. I can remember the writing process enough and memorize the Chinese characters a little.	This participant clearly indicated that the curriculum for developing Chinese character recognition skills based on the blended learning strategy helped him or her master the process of writing Chinese characters in stroke order and remember a portion of the target Chinese characters. It is worth noting that Chinese character writing ability was not the focus of this study, but we can reasonably speculate from the answers that the learning strategies designed in this study's curriculum were able to help learners transition from Chinese character recognition ability, to Chinese character writing ability, a trend that is evident.
	A3. Helped me to remember more Chinese characters.	Through this set of lessons, subjects reported that they remembered more Chinese characters. That is, the most basic character types and meanings, which are essential to master.
	A4. Outstanding/excellent	Again, the subjects did not read the requirements of the questions clearly, and the responses were abstract and general, but they were acknowledged and appreciated.
	A5. Chinese characters	Subjects clearly indicated that this course was most useful for learning Chinese character.
Q2. How do you think this course could be improved?	A1. Teach early	Subjects indicated that the intervention should have been conducted earlier, i.e., as described in the Introduction section of this study, when students in fourth grade and above, still rely on Hanyu Pinyin and have not developed Chinese character reading skills. It would favor great trouble for learning other subjects.
	A2. Uncertainty	The answer to this item is not informative.
	A3. Teach a little faster	The suggestion from the subjects was that the teaching time needed for each Chinese character could be shortened a little bit, and then the number of Chinese characters that could be learned per unit of time increased.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

The objectives of this study were 1) to investigate the development of an effective teaching method, i.e., through blended learning strategies, to improve Thai elementary school sixth graders' Chinese character recognition skills. 2) to investigate the extent to which both blended learning strategies can improve Thai elementary school sixth graders' Chinese character recognition skills. and 3) What are the students' perceptions of using blended learning strategies to improve their Chinese character recognition skills? Using a purposive sampling method, 12 students from a sixth grade Chinese-Thai bilingual class at Wat Sawetachat School (โรงเรียนวัดเสด็จ) were invited to participate in the experiment. There were three instruments, namely a lesson plan, pre-test and post-test papers, and a questionnaire (which included a five-level scale and a question-and-answer interview), in which the test was based on the selection of the correct meaning of the image based on the target Chinese character. At the end of the experiment, data were collected from the pre-test and post-test papers. The quantitative data were also analyzed using mean, mean difference, standard deviation, and t-test, and there were significant differences. Validity analysis was also conducted on the five-level scale questionnaire, and its validity was statistically supported.

This chapter summarizes and discusses the effects of this study on improving students' Chinese character recognition skills through blended learning strategies. It is divided into the following main sections: 1) Conclusion, 2) Discussion, 3) Limitation, 4) Impact of results and 5) Recommendations. Extensive information about each section is presented below.

5.1 Conclusion

This study reveals the mastery of Chinese character recognition skills through blended learning strategies among Thai students in a sixth-grade bilingual special class. The results of the Chinese character recognition test revealed that blended

learning strategies are an effective teaching method. Specifically, based on the analysis comparing the pre-test and post-test, it was found that the subjects' scores increased from 30.67 on the pre-test to 35.75 on the post-test. Secondly, the questionnaire results indicate that the lesson plan developed based on the blended learning strategy is effective in helping the subjects to enhance their Chinese character recognition skills. The alpha coefficient of this scale was 0.98, showing a high internal consistency of the items on this scale. The answers collected by the open-ended questions also showed effectiveness, and some subjects indicated that they should have learned earlier. The hypotheses presented at the beginning of this study are statistically valid. It is recommended to use it as early as possible, e.g., starting after the third grade.

5.2 Discussions

After 4 weeks of implementation of the intervention treatment experiment, the analysis of the results based on the three research instruments can be interpreted and concluded that the design of a unique Chinese character-based pedagogy, implemented through a blended learning approach, was effective in improving students' Chinese character recognition skills. The core reasons for the success of this study are the clear research ontology (developing students' Chinese character recognition skills), the specific measures were taken including the improvement of the traditional instructional materials and teaching methods to suit the Internet application environment, as well as the appropriate distribution of learner milestones inside and outside the classroom, and finally, the targeted assessment and evaluation. This can be discussed as follows.

5.2.1 Explicit identification of research ontology (development of Chinese character recognition skills)

The starting point of this study, where students did not know Chinese characters and had not developed Chinese reading skills. Thus, how many Chinese characters should a beginner learner master to be considered qualified? CPGS (Chinese

Proficiency Grading Standards) for International Chinese Language Education gave me the answer. Hence, I selected the first twenty Chinese characters and tested them on the subjects of this study. The subjects explicitly told the author of this study to label the Hanyu pinyin or to pronounce these Chinese characters, otherwise, the subjects could not know the meaning of these square Chinese characters. It can be determined that the subjects had the ability to transfer sound to meaning (S2M) and not the ability to transfer word form to meaning (F2M).

5.2.2 Modification of instructional materials and traditional teaching methods

During the intervention treatment phase, the unique lesson plans implemented through a blended learning approach were more likely to capture the subjects' attention and thus actively think about the teacher's questions. The lesson plans would set up questions that allowed students to design Chinese character that would convey specific meanings. The purpose was to fully stimulate students' creativity, and the child's drawing of information images on the Xiaomi LED Tablet confirmed that the purpose was achieved. The subject expresses the guessed or inferred meaning through drawing or action behavior. This is the same as Kim et al.'s (2021) findings that M Girls High School was significantly effective in developing creative thinking skills, but not in developing knowledge information processing skills, which is different from my findings.

Processing traditional learning materials into new materials adapted to Internet applications is necessary for the successful implementation of a blended learning approach. Sandanayake's (2019) study revolved around Open Educational Resources (OERs) and the learning materials they used included in-class materials, OER learning materials, audio/video clips, figures, tables, and graphics, and deliver courses in a blended mode with the help of the Moodle Learning Management System (LMS). The study materials used in my research include Chinese character pre-reading materials (stroke order), and Chinese character teaching materials (GIF Animation, Infographic), and with the aid of Google Classroom, blended learning is completed.

5.2.3 Appropriate distribution of online and offline learning objectives

Appropriately distributing the weight of online and offline learning content is also necessary to make the blended learning approach successful. The online learning materials in this study focused on pre-reading and review, and on students who missed the classroom lectures. The instructional activities in the offline classroom focused on the need for the instructor to guide the students (heuristic instruction). Unlike the study by Daspit & D'Souza (2012), converting a business course to an online course does not require students to return to a traditional classroom. And students need to be trained on how to use the wiki system properly. The mobile application used in this study, on the other hand, it was simple for the subjects to operate (as opposed to a complex mobile game application). The instructional materials used in the offline teaching activities were not only designed for use in the classroom only, they were also visible in the Chinese Character Recognition course of Google Classroom, by clicking on the web links of the materials. The benefit of this is that when students are unable to attend school for any reason, they can see the missed content on their smartphones. We can see that the blended learning approach is an extension and supplement to traditional teaching activities, which is consistent with the findings from Daspit & D'Souza's (2012) study. Future in-depth research could divide students into two groups and have one group of students use the online Chinese Character learning materials and they do not engage in offline instruction. The other group of students studied in an offline classroom, using Chinese Character materials for support and emphasizing the instructor's guidance role. Finally, compare the effects produced by the two learning styles.

5.2.4 Specialized testing and assessment

The test used in this study is the Form to Meaning (F2M), which is based on a study by Chan et al. (2020), a team of researchers who summarized six tests of Chinese character recognition ability and recommended that more international Chinese language educators promote this test (CCAA, Chinese character acquisition

assessment). The authors of this study initially planned to use the CCAA (Chinese character acquisition assessment) as a test. The authors of this study initially planned to use two of the CCAA tests, F2M and M2F, but finally canceled the M2F test due to time constraints. The similarity between the two studies is that 40 Chinese characters were selected. The difference is that the forty Chinese characters in this study were derived from high-frequency monograms. In contrast, the 40 Chinese characters in Chan et al. (2020) were selected from the 200 most frequent Chinese characters in the teaching programs of 21 kindergartens in Hong Kong. The participants in this study tried to get their teachers to give hints and ask them to pronounce the Chinese characters they did not know during the quiz. One student told the teacher that he was confident that he could get a perfect score on the test if the teacher pronounced all 40 characters. From the above observations, we can find that the subjects' ability to translate the pronunciation and meaning of Chinese characters predates the transformation of the character form and meaning. This finding echoes the inference in the findings of Chan et al. (2020).

Chinese is very difficult to learn, this is what I heard many students around me often say. What is the most difficult part? Most students almost always answer that Chinese characters are the hardest to learn. The Thai language has a very different symbol system than Chinese, so many learners take a back seat and focus only on learning Hanyu Pinyin, giving up on Chinese characters altogether. They even have the misconception that learning Chinese is the same as learning Hanyu Pinyin. How to do a good job of teaching Chinese characters is a big problem in front of every international Chinese educator. This study will start with Chinese characters, on the one hand, from the problems encountered in practical work, and on the other hand, based on the fact that Chinese is based in the forest of world linguistics and distinguished from pinyin languages, the most unique label is the beauty of the imagery of Chinese square characters.

The learning process of any language goes through language acquisition and pragmatics. The learners in this study need to use Chinese to learn multiple subjects,

which is the best evidence that they have to use it after learning, and if they cannot use it flexibly, it proves that they have not learned it well. In addition, it is not enough for learners to only have the ability to listen and speak Chinese. they must develop their Chinese reading and writing skills. This research can be used as a reference for the development of Chinese character recognition ability. In addition, the teaching materials used in this research are all from the open network world. Learners can organize materials for self-study according to the research ideas, which can also achieve the purpose of learning Chinese characters.

Let's return together to the opening hypothesis section of this study, around which the study was designed, implemented and evaluated. I organize it into tables 5.1 and discuss it as necessary.

Table 5.1 Discussion of research hypotheses (H1)

Table 5.1 Discussion of research hypotheses (H1)	
H1	Explanation
students' character recognition ability in Chinese after using Chinese character-based and blended learning is higher than before.	In addition to a unique lesson plan, test assessment methods, and questionnaires, this study has a focus on how to integrate fragmented online Chinese character learning materials and present them quickly to learners through a web application. The principle of organizing instructional materials is based on this hypothesis, namely, the unique properties of the Chinese characters themselves. The experimental results proved that this hypothesis is valid and holds true. In addition to the above findings, when I explained Chinese calligraphy (Chinese character writing) in the Chinese activity class after the experiment, the students did not appear to be overwhelmed, and notably, they began to try to guess the meaning of the Chinese characters. This incident supports the fact that the learners' Chinese character recognition skills have been strengthened, and the trend of further development is more obvious.

This study discusses the concept of blended learning, which is a learning style, a strategy for implementing learning activities that is in line with the trend of the digital age, where a new generation of learners is adept at using digital devices such as smartphones, computers, and televisions. Through a blended learning approach, educators can adapt learning activities from teacher-centered to learner-centered and design more engaging interactions. In this study, the main emphasis of the Chinese character-based pedagogy is to maximize the pictorial characteristics of Chinese

characters and to make clear to learners the logic of information transmission (imaginative and symbolic) from the perspective of Chinese character formation. This study is an attempt of the Chinese character-based pedagogy, and overall, it is feasible and acceptable to the learners.

5.3 Limitation

The constraints of this study, mainly include the study time and sample size, and the subjects' basic Chinese language level. The study was conducted within two months, and I think there are great challenges to the implementation of blended learning strategies. There were two main areas: the preparation time schedule for the production of instructional materials and the insufficient time for interval testing. There were only twelve study samples and they were a single group. Although the subjects were exposed to the Chinese language from the first grade, they lacked continuity of learning, lost motivation, passive learning, and many other factors, and did not achieve the desired learning effect. Thankfully, the Chinese Ministry of Education launched the International Chinese Language Education Chinese Language Proficiency Standards in 2021. It provides the main reference for teaching Chinese as a foreign language and learners.

The sample of this study is very small, but the potential target group is large, and it is suggested that future in-depth studies can expand the sample size and short-term research programs that can be able to cover the other thirteen schools in Bangkok once conditions are ripe. It is also hoped that other related researchers will be able to apply for the teaching program in this report to your own Chinese character teaching activities. The program can be refined and named in the future, but it is not the time to name it, at least not yet.

The issue arose during the questionnaire session because the study's author, who has low Thai language proficiency, failed to identify that I needed to enlist the help of a Thai language teacher at the right points in the research process and instead believed I could finish the study on my own. The sixth-grade participants all took part

in an educational study for the first time, and they all appeared daunted when completing the questionnaire. Although the smartphone's Google Translate app could translate texts from English into Thai automatically, there were still nuances in meaning that prevented me from determining if the subjects comprehended the questions' topic completely. These elements would have an impact on how the questionnaire collected data.

5.4 Impact of the results on the development of Chinese reading skills

This study develops a solution to the learning dilemma (Chinese dyslexia) caused by learners' belittling of Chinese characters and over-emphasis on Hanyu Pinyin, and proves effective through experimental arguments based on statistics. In the context of international Chinese language education, the learning of Chinese characters is a top priority. The successful implementation of blended learning strategies relies on the flexible use of information technology. How to develop a blended learning strategy suitable for learners based on the characteristics of Chinese characters? Educators need to continue to think about exploring and experimenting to prove it.

This study does not want to get caught up in the common debate about Chinese language teaching, i.e., whether to base teaching activities around phonics (conducted in Hanyu Pinyin) or around Chinese characters. This study hopes to draw the attention of Chinese language educators to how to effectively structure instructional approaches to help learners build confidence and overcome barriers to reading Chinese Characters. If the learner needs to improve their Chinese reading ability.

5.5 Recommendations

Forty Chinese characters were used in this study, and the reasons why these 40 characters were chosen were discussed earlier. The question I would like to point out in particular is how the teaching strategy needs to be adjusted when the number of target Chinese Characters measured is increased from 40 to 300 based on this study. How should the assessment of learning effectiveness be adjusted? How to design a

progressive, long-term implementable Chinese character learning program that allows students to accumulate Chinese characters without realizing it? In other words, i.e., to bring into play the active learning ability of the learners themselves.

About experimental interventions part. The main part of the experiment is divided into outside and inside the classroom. For the part outside the classroom, students need to complete the preparation independently, including pre-class preview and submission of homework. For the part in the classroom, students and teachers work together to complete, but the students are the protagonists, and the teacher only plays a guiding role. The learning objective is to recognize the meaning of forty Chinese characters. It is planned to explain ten Chinese characters per week, and it will take four weeks for the fully-established task. Considering that the temporary interspersed in-school activities in the middle of the week will affect the progress of the experiment, my suggestion is to control the learning activity time of each Chinese character between fifteen minutes and twenty minutes. With three hours a day in the classroom with the subjects, the teaching implementation plan has become relatively flexible, so the overall progress of the experiment will not be affected. For details of lesson plan, please refer to the appendix at the end of the article.

Regarding the technological innovation in teaching and learning, the implementation of blended learning strategies in this study relies on the popularity of smartphones and the development of Internet technology. We are in the process of a new round of technological change, and the means of teaching Chinese characters in Chinese as a foreign language cannot remain unchanged; how to rationalize and use information technology more effectively, instead of using technology for technology's sake. It is one of the basic principles that every one of us educational researchers need to pay attention to.

In the lesson plan of this study, the pinyin of the target Chinese character, i.e., the pronunciation rule, is marked in the last step of the classroom session. It is intended to illustrate the function of Hanyu Pinyin as an aid to correct pronunciation, which can be used to help learners quickly recall the pronunciation of the target Chinese

character as they learn the Chinese character in depth, and nothing more. Therefore, in the assessment session of the subsequent in-depth study, researchers can examine learners' labeling of Chinese characters with correct pinyin. According to the findings of Chan et al. (2020), in addition to the above-mentioned word forms (form to sound). We still examine learners, who write the correct Chinese characters based on the information images of the characters (meaning to form).

Seek to observe student responsiveness, e.g., each learner, setting their own learning task, or having the teacher assign a learning task. Did the student respond to the task? When did the response come? An experienced teacher might suggest using instant messaging software (Message, Line, WhatsApp). I would like to point out that the effect of such communication software applications is too fragmented, and I personally do not think it is good for observing and assessing learning effects.

Make the assessment and evaluation more relevant, by which I mean different students with different learning progressions, which in turn produce different results in Chinese character recognition. The assessment cycle can cover the entire range of elementary school levels. According to the standards set by the Ministry of Education in mainland China, the number of Chinese characters that need to be mastered in the lower elementary grades (first through third grade) and in the upper elementary grades (fourth through sixth grade) is then spread out over each school year, and each student's mastery progress can vary. Database technology, or traditional grade bag management, could be introduced to track and record the analysis of students' Chinese literacy development. The purpose of this, I believe, would be to greatly enhance learners' Chinese reading ability, but of course the above hypothesis would need to be justified by further experimental research.

In addition, it is important to emphasize that different countries have different policies on basic education, and I believe that the learning of a second foreign language is to help citizens better integrate into the international community, and as the saying goes, if you have one more language, you have one more pair of eyes to observe this beautiful and lovely world. It is also an important issue for every educator to

develop flexible teaching strategies for different school systems and different school hours. The school where this study was conducted is a Thai public school with a variety of teaching activities, which means that the conduct of a particular teaching research program will be forced to interrupt, which requires the researcher to prepare well in advance. The key attribute for the design, implementation and acceptance of teaching and learning research should be high adaptability and flexibility to respond to change. Face it and overcome it.

Due to the time constraints of the study, I omitted the post-implementation questionnaire of the lesson plan. This is considered a regret of this study, and beyond that, I think it is also a mistake, strictly speaking. The research will not stop, and this study will continue to iterate in the future. My research aims to make learning Chinese characters easier and easier by cherishing the time and effort invested by learners.

I hope to use this study as a starting point to develop a complete method for learning Chinese characters, where each character needs to be learned only once and then reviewed at intervals to overcome the forgetting properties of the brain. Arguing this hypothesis requires the design of an analytical postponement test (interval test) that incorporates the findings of the Ebbinghaus forgetting curve and looks for correlations through the experimental and control groups. I think this is a worthwhile direction to try in future follow-up studies.

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APPENDIX

Appendix A IOC of Lesson Plan

Evaluation Form

Lesson Plan:

Teaching 40 Undecomposable Chinese Characters by using Blended-Learning Approach through GIF Animation and Infographics.

Instructions:

1. This evaluation form is part of Research Paper, The Development of Chinese Character-Based Teaching Model Using a Blended-Learning Approach to Enhance Grade 6 Primary Students' Chinese Character Recognition Ability in a Thai Bilingual School. It is a five-rating scale.
2. Please rate (√) these following items and provide comments according to your opinions.

Rating scale:

- SRIPATUM UNIVERSITY
- 5 refers to Most relevant/connected/appropriate
 - 4 refers to Very relevant/connected/appropriate
 - 3 refers to Somewhat Relevant/connected/appropriate
 - 2 refers to Fairly relevant/connected/appropriate
 - 1 refers to Least relevant/connected/appropriate

Items	Issues	5	4	3	2	1
	Elements of lesson plan (Overall)					
1	1) The lesson plan covers all the elements needed for teaching.					
2	2) The sequence of the lesson plan is appropriate.					
3	3) The elements of the lesson plan are related.					
	Elements of lesson plan					
	1) GIF Animation and Infographics selection and Blended-Learning					

4	1.1) GIF Animation and Infographics of the lesson plan are appropriate and innovative.					
5	1.1.1) GIF Animation: Chinese Characters					
6	1.1.2) Infographics: The evolution of Chinese characters					
7	1.2) Blended Learning of the lesson plan are appropriate and innovative.					
8	1.2.1) Google Classroom: pre-view Chinese Character					
9	1.2.2) Google Form: Pre-Post Test					
10	1.2.3) Google Slide Show: Chinese Character					
2) Objectives						
11	2.1) The objectives are relevant to the research objectives					
12	2.2) The objectives are clear on what is intended to students' learning outcomes.					
13	2.3) The objectives are achievable.					
3) Content						
14	3.1 The content is relevant to the objectives and is achievable to the objectives set.					
4) Instrumental materials						
15	4.1) Instructional materials are clearly set and prepared.					
5) Time allotment						
16	5.1) Time allotment for each activity is appropriate.					
6) Activities						
17	6.1) The instructional procedure is appropriate.					
18	6.2.1) Activity 1: Develop Imagination based on real objects					
19	6.2.2) Activity 2: Copying and writing, engaging the senses					
20	6.2.3) Activity 3: Building Aesthetic Literacy					
21	6.2.4) Activity 4: Use body movements to express the meaning of words based on Thai prompts.					
22	6.2.5) Activity 5: Write out the basic strokes of Chinese characters					
23	6.2.6) Activity 6: Find the target character based on the Pinyin input method					
24	6.3) Activities are relevant to Chinese Character-based learning through Blended learning					
7) Evaluation and assessment						
25	7.1) Evaluation and assessment are appropriate.					

Additional Comments:

Appendix B IOC of Pre-Test and Post-Test

Evaluation Form

Chinese Character Cognitive Ability Test

Please rate these following items and provide comments according to your opinions.

-1 = Incongruent 0 = Questionable 1 = Congruent

Items	Questions	-1	0	1	Comments
1	Is the format of the test easy to follow?				
2	Is the test suitable for the students?				
3	Are the reading images appropriate?				
4	Are the questions and their choices appropriate?				
5	Does the test indicate students Chinese Character Cognitive ability?				
Passage 1 objective questions - Choose the meaning of Chinese characters					
6	Is item 1 appropriate for the students?				
7	Is item 2 appropriate for the students?				
8	Is item 3 appropriate for the students?				
9	Is item 4 appropriate for the students?				
10	Is item 5 appropriate for the students?				
11	Is item 6 appropriate for the students?				
12	Is item 7 appropriate for the students?				
13	Is item 8 appropriate for the students?				
14	Is item 9 appropriate for the students?				
15	Is item 10 appropriate for the students?				
16	Is item 11 appropriate for the students?				
17	Is item 12 appropriate for the students?				
18	Is item 13 appropriate for the students?				
19	Is item 14 appropriate for the students?				
20	Is item 15 appropriate for the students?				

Items	Questions	-1	0	1	Comments
21	Is item 16 appropriate for the students?				
22	Is item 17 appropriate for the students?				
23	Is item 18 appropriate for the students?				
24	Is item 19 appropriate for the students?				
25	Is item 20 appropriate for the students?				
26	Is item 21 appropriate for the students?				
27	Is item 22 appropriate for the students?				
28	Is item 23 appropriate for the students?				
29	Is item 24 appropriate for the students?				
30	Is item 25 appropriate for the students?				
31	Is item 26 appropriate for the students?				
32	Is item 27 appropriate for the students?				
33	Is item 28 appropriate for the students?				
34	Is item 29 appropriate for the students?				
35	Is item 30 appropriate for the students?				
36	Is item 31 appropriate for the students?				
37	Is item 32 appropriate for the students?				
38	Is item 33 appropriate for the students?				
39	Is item 34 appropriate for the students?				
40	Is item 35 appropriate for the students?				
41	Is item 36 appropriate for the students?				
42	Is item 37 appropriate for the students?				
43	Is item 38 appropriate for the students?				
44	Is item 39 appropriate for the students?				
45	Is item 40 appropriate for the students?				

Additional Comments:

.....
(.....)

Assessor



Appendix C IOC of Questionnaire

Validity Questionnaire Form
Blended Learning Strategies on Chinese Character Recognition Ability

Please rate these following items and provide comments according to your opinions.

-1 = Incongruent 0 = Questionable 1 = Congruent

Items	Questions	-1	0	1	Comments
1	Is the format of the questionnaire easy to follow?				
2	Is the questionnaire suitable for the students?				
3	Is the scale used for the questionnaire appropriate?				
4	Does the questionnaire indicate students' opinions of Chinese Character Recognition Instruction?				
Part I Instruction Management					
5	Is Statement 1.1 appropriate for the students?				
6	Is Statement 1.2 appropriate for the students?				
7	Is Statement 1.3 appropriate for the students?				
8	Is Statement 1.4 appropriate for the students?				
9	Is Statement 1.5 appropriate for the students?				
10	Is Statement 1.6 appropriate for the students?				
11	Is Statement 1.7 appropriate for the students?				
12	Is Statement 1.8 appropriate for the students?				
13	Is Statement 1.9 appropriate for the students?				
14	Is Statement 1.10 appropriate for the students?				
15	Is Statement 1.11 appropriate for the students?				
16	Is Statement 1.12 appropriate for the students?				
Part II Activities in Chinese Character Recognition Instruction					
17	Is Statement 2.1 appropriate for the students?				

18	Is Statement 2.2 appropriate for the students?				
19	Is Statement 2.3 appropriate for the students?				
20	Is Statement 2.4 appropriate for the students?				
21	Is Statement 2.5 appropriate for the students?				
22	Is Statement 2.6 appropriate for the students?				
Part III Instructional Materials					
23	Is Statement 3.1 appropriate for the students?				
24	Is Statement 3.2 appropriate for the students?				
25	Is Statement 3.3 appropriate for the students?				
26	Is Statement 3.4 appropriate for the students?				
27	Is Statement 3.5 appropriate for the students?				
28	Is Statement 3.6 appropriate for the students?				
29	Is Statement 3.7 appropriate for the students?				
30	Is Statement 3.8 appropriate for the students?				
Part IV Assessment and Evaluation					
31	Is Statement 4.1 appropriate for the students?				
32	Is Statement 4.2 appropriate for the students?				
33	Is Statement 4.3 appropriate for the students?				
34	Is Statement 4.4 appropriate for the students?				

Additional Comments:

.....
 (.....)



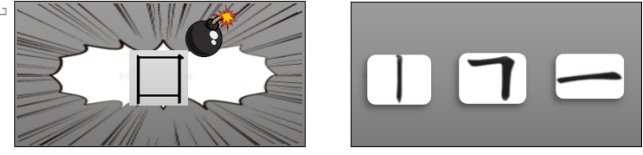
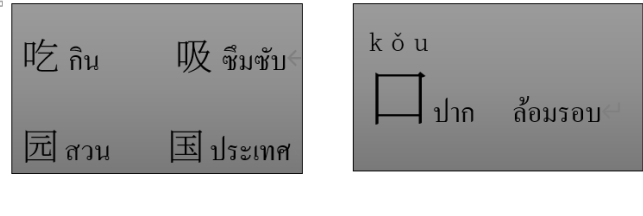
Assessor

Appendix D Lesson Plan

Objective ¹	Methods for organizing learning activities ¹	Applications/ Teaching Media ³	Equipment ³	Assessment Method ³
<ul style="list-style-type: none"> - Find the baseline about Chinese characters⁴ - Use of EdTech resources⁴ - No need to be in the classroom² 	Take the test before class (30 minutes) ^{4,2}	- Google Forms ^{4,2}	- Smart phone ⁴ -desktop computer ⁴ - Internet ⁴	pre-exam scores ^{4,2}
<ul style="list-style-type: none"> - Preview of Chinese characters to be learned⁴ - It is the Preview Part⁴ - Use of EdTech resources⁴ - No need to be in the classroom² 	<ul style="list-style-type: none"> - Teacher⁴ <ol style="list-style-type: none"> 1 Learning materials are provided for the monograms that need to be learned this week, including the basic stroke order of Chinese characters and animated GIF demonstrations.⁴ 2 The materials are provided with QR codes and posted to Google Classroom.⁴ - Student⁴ <ol style="list-style-type: none"> 1. Students need to pre-view Chinese characters in advance at home. Learning resources can be accessed using smart phones or computers.^{4,2} 	<ul style="list-style-type: none"> - Google Classroom⁴ - Google Slide⁴ - Web Browser (Chrome, Edge, Safari) ^{4,2} 	<ul style="list-style-type: none"> - Smart phone⁴ -desktop computer⁴ - Internet⁴ 	<ul style="list-style-type: none"> - For example, students need to know that [口] has three strokes.⁴ - Understanding the order of the [口] strokes⁴ - In this session, it is not necessary to deliberately ask students to remember the above. It is enough to have a basic impression.^{4,2}
Step one ⁴ <ul style="list-style-type: none"> - Learning the meaning of the Chinese character [口] (5 min)⁴ - This is the official learning session⁴ - Using EdTech Resources⁴ - Face to Face in the classroom² 	<ul style="list-style-type: none"> - Teacher⁴ <ol style="list-style-type: none"> 1. teach in the classroom using slides and blackboard.⁴ 2. Show pictures of mouths (including human mouths and animal mouths), bowl, and traffic intersections.⁴ 3. Also ask, "What are these? and What is the connection between them?"⁴ 4. If you were asked to create a Chinese character based on the picture provided earlier, what would you do?⁴ - Student⁴ <ol style="list-style-type: none"> 1. Expand your imagination and respond positively to the teacher.⁴ 2. Speak openly and write with your hands.⁴ 3. Draw what comes to mind on paper or tablet.^{4,2} 	- Google Slide or PowerPoint ^{4,2}	<ul style="list-style-type: none"> - Computer⁴ - TV ⁴ -Xiaomi LCD Writing Tablet⁴ 	<ul style="list-style-type: none"> - Stimulate children's imagination and encourage students to say or draw their answers on the Writing Tablet or Blackboard.^{4,2}
Step two ⁴ <ul style="list-style-type: none"> - Show the evolution of the Chinese character 	<ul style="list-style-type: none"> - Teacher⁴ <ol style="list-style-type: none"> 1. Show the evolution of the Chinese character [口]. Include the pictographic evolution process, and the calligraphic evolution process.⁴ 2. teacher will demonstrate the most representative fonts from ancient to modern times.⁴ 3. Give instructions to students to prepare pens and paper, or LCD handwriting board.⁴ 4. Demonstrate how to write standard Chinese characters and how to write irregular Chinese characters.⁴ - Student⁴ <ol style="list-style-type: none"> 1. In four groups of three students each, they will copy the evolution of Chinese characters.⁴ 2. Students need to appreciate where the beauty of Chinese characters comes from? How does the relationship of the plane structure come about?^{4,2} 	^{4,2}	-Xiaomi LCD Writing Tablet ^{4,2}	<ul style="list-style-type: none"> - Students are trained in spatial structure and modeling skills
<ul style="list-style-type: none"> - [口] (5 min)⁴ - This is the official learning session⁴ - Using EdTech Resources⁴ - Face to Face in the classroom² 	<ul style="list-style-type: none"> - Teacher⁴ <ol style="list-style-type: none"> 1. Show the combined Chinese characters that contain the Chinese character [口], using a google slideshow⁴ 2. There are four characters in total, and each character has a Thai meaning attached to it.⁴ 3. The teacher repeatedly emphasizes and points out the [口] in the combined characters.⁴ - Student⁴ <ol style="list-style-type: none"> 1. to understand the meaning of the Chinese character [口] and how it relates to the meaning of the composite character.⁴ 2. Need to use body movements to express the meaning of the combined characters.⁴ 3. to understand the unique logic of Chinese character formation.⁴ 4. Create sketches based on the Thai meaning of each amalgamated character, combined with the imagery of [口]. And show it to other students.^{4,2} 	- Google Slide or PowerPoint ^{4,2}	<ul style="list-style-type: none"> - Computer⁴ - TV⁴ 	<ul style="list-style-type: none"> - Guide students to observe, appreciate and understand how the original and derived meanings of literalism are reflected in Chinese characters.^{4,2}
Step three ⁴ <ul style="list-style-type: none"> - Demonstrate the ability to synthesize the Chinese character [口] (3 min)⁴ - This is the official learning session⁴ - Using EdTech Resources⁴ - Face to Face in the classroom² 	<ul style="list-style-type: none"> - Teacher⁴ <ol style="list-style-type: none"> 1. With the aid of a Google slide show, similar to a split-screen script, let students imagine the process of the Chinese character [口] being broken down by detonation.⁴ 	- Google Slide or PowerPoint ^{4,2}	<ul style="list-style-type: none"> - Computer⁴ - TV⁴ 	<ul style="list-style-type: none"> - Examine students' mastery of the basic strokes of Chinese characters⁴
Step four ⁴ <ul style="list-style-type: none"> - Deconstructing the Chinese character [口] (2 min)⁴ 	<ul style="list-style-type: none"> - Teacher⁴ <ol style="list-style-type: none"> 1. With the aid of a Google slide show, similar to a split-screen script, let students imagine the process of the Chinese character [口] being broken down by detonation.⁴ 	- Google Slide or PowerPoint ^{4,2}	<ul style="list-style-type: none"> - Computer⁴ - TV⁴ 	<ul style="list-style-type: none"> - Examine students' mastery of the basic strokes of Chinese characters⁴

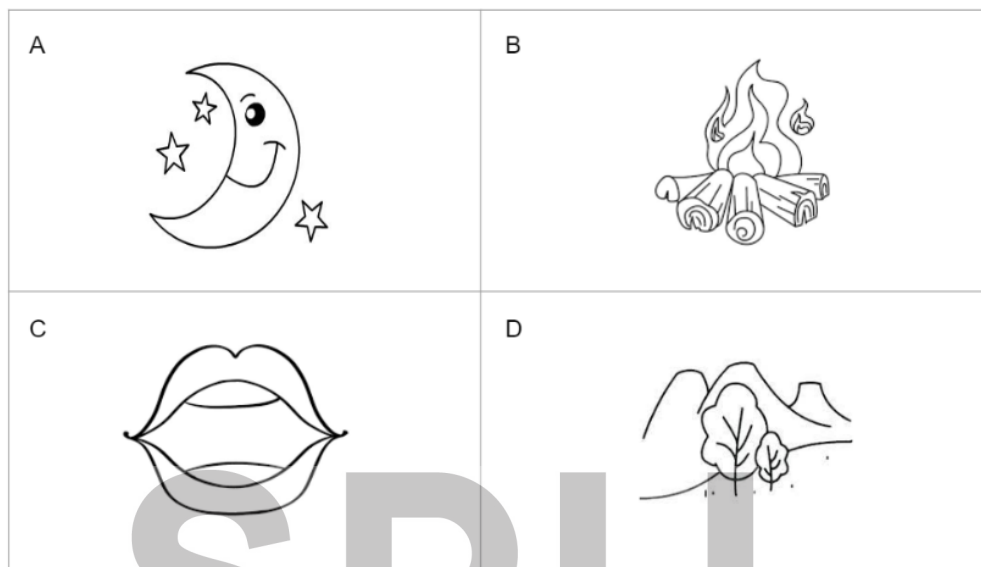
<ul style="list-style-type: none"> - This is the official learning session^๕ - Using EdTech Resources^๕ - Face to Face in the classroom^๕ 	<p>2. At the same time, the teacher asks, "What are the basic structures after decomposition?"^๕</p> <p>Student^๕</p> <ol style="list-style-type: none"> 1. You need to write [Mouth], the basic strokes after being broken down.^๕ 			<ul style="list-style-type: none"> - To achieve the purpose of review and consolidation^๕
<p>Step five^๕</p> <ul style="list-style-type: none"> - Summarize the Chinese character [口](3 min)^๕ - This is the official learning session^๕ - Using EdTech Resources^๕ - Face to Face in the classroom^๕ 	<p>Teacher^๕</p> <ol style="list-style-type: none"> 1. The pronunciation of the Chinese character [口] can only be written in this session, and no Chinese Pinyin can be used in each of the sessions above.^๕ 2. The teacher asks, how is this character pronounced?^๕ 3. The teacher asks, what does this character mean?^๕ 4. The teacher asks, how do you write this character?^๕ 5. Ask students to take out their smartphones, open Google Classroom, use Pinyin input method, and send the Chinese character [口] and Thai meaning.^๕ <p>Student^๕</p> <ol style="list-style-type: none"> 1. Answer the teacher's questions.^๕ 2. Send the Chinese character [口] to google classroom.^๕ 3. Check the Chinese-Thai dictionary or Google Translator, and post the Thai meaning and derivation of [口] to google classroom.^๕ 	<ul style="list-style-type: none"> - Google Classroom^๕ - Gboard^๕ 	<ul style="list-style-type: none"> - Smart Phone^๕ 	<ul style="list-style-type: none"> - Students are required to submit learning outcomes to Google Classroom.^๕

Teaching material reference

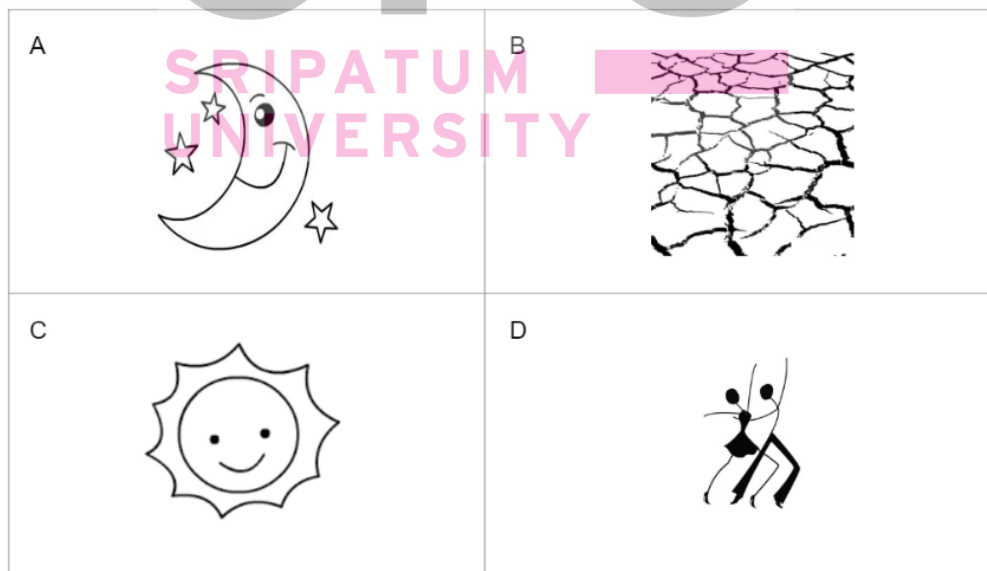
Ref ^๕	Demo (Material diagram of PPT Content) ^๕	Ask a question ^๕
1 ^๕		<p>Guess what's meaning of this character?^๕</p> <p>Tips: ^๕</p> <ol style="list-style-type: none"> 1. Whether in the classroom or at home, teachers or students can be question initiators.^๕
2 ^๕		<p>What do you associate with it? Yes, that's right, our mouths.^๕</p> <p>Tips: ^๕</p> <ol style="list-style-type: none"> 1. it can also be the mouth of the animal.^๕ 2. It can also be the interface of the apparatus.^๕ <p>How have Chinese characters evolved across the millennia to the present day?^๕</p> <p>Tips: ^๕</p> <ol style="list-style-type: none"> 1. First abstract the form.^๕ 2. then line up.^๕
3 ^๕		<p>Imagine exploding the Chinese character, which parts will be divided into?^๕</p> <p>Tips:^๕</p> <ol style="list-style-type: none"> 1. Imagine the parts scattered all over the place. ^๕
4 ^๕		<p>What are the common characteristics? ^๕</p> <p>Tips: ^๕</p> <ol style="list-style-type: none"> 1. Imagine your mouth. ^๕ 2. Imagine the feeling of being surrounded by invisible forces.^๕ <p>When you see this <u>hanzi</u> next time, what do you associate with it?^๕</p> <p>Tip:^๕</p> <ol style="list-style-type: none"> 1. Thai language aids in establishing a connection to memory with the student's native language.^๕

Appendix E Pre-Test and Post-Test

【口】是什么意思? *



【人】是什么意思? *



SCAN GET 40 Questions

Appendix F Questionnaire

1-Strongly Disagree 2-Disagree 3-Uncertain 4-Agree 5-Strongly Agree

Questions		1	2	3	4	5
Part I Instruction Management						
1	I signed up for a Google email account.					
2	I have the Google Classroom application installed on my phone.					
3	My phone can access the Internet without any problem.					
4	In the classroom, I could clearly see the teacher's slide show material through the TV.					
5	In the classroom, I can clearly see what the teacher is writing on the blackboard.					
6	I think the teacher set clear teaching questions that helped stimulate thinking.					
7	I can understand the purpose of teaching at each step.					
8	I think the length of time for teaching the first step is reasonable.					
9	I think the length of time for teaching the second step is reasonable.					
10	I think the length of time for teaching the third step is reasonable.					
11	I think the length of time for teaching the fourth step is reasonable.					
12	I think the length of time for teaching the fifty step is reasonable.					
Part II Activities in Chinese Character Recognition Instruction						
13	In the first step, I think it is a great teaching activity to translate the physical images you see into sketches.					
14	In the second step, I felt that looking at the history of the evolution of Chinese characters helped me to understand them.					
15	In the second step, I felt that learning and imitating different handwritten variants of Chinese characters helped me to feel the beauty of the art of line modeling.					

16	In the third step, I thought that creating sketches based on the Thai meaning of the combined characters and the imagery of the monogram would deepen my understanding and impression of the Undecomposable Modern Chinese Characters.					
17	In the fourth step, I believe that speculating on the basic strokes of Chinese Characters helps me develop my Chinese Characters writing skills.					
18	In the fifth step, the way of submitting assignments, I felt that using Chinese Hanyu Pinyin Input Method could enhance my motivation to learn Chinese characters.					
Part III Instructional Materials						
19	I am proficient in operating a smart phone to open pre-reading materials for Chinese characters from Google Classroom.					
20	The GIF animations in the pre-study materials help me understand the order of the strokes of the Chinese characters.					
21	I feel that the slide content accurately represents the majority of the teaching content.					
22	I think the teacher's blackboard design accurately represents the vast majority of the teaching content.					
23	I prefer to draw on the Xiaomi LCD writing pad to express the meaning of Chinese characters as opposed to sketching them out on paper.					
24	I prefer drawing sketch notes on paper to express the meaning of Chinese characters as opposed to drawing sketches on the Xiaomi LCD writing Tablet.					
25	I think the way the GIF animation is explained helps to understand the meaning of the Chinese characters.					
26	Using my smartphone and learning Chinese characters has helped me a lot.					
Part IV Assessment and Evaluation						
27	The Pre&Post Test are easy for me.					
28	The Pre&Post Test are difficult for me.					

29	I think it is reasonable to use thirty minutes to complete the test.					
30	I think the test takes fifteen minutes is enough.					

Additional Comments:

.....

(.....)

Assessor

SPU

SRIPATUM
UNIVERSITY



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Research

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