

## Using Chinese Learning Materials with LingQ Application to Develop Reading Skills of Lower Secondary Students

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**Abstract**—Reading competence is widely recognized as a fundamental component of foreign language learning, as it strongly influences students' academic performance and long-term educational achievement. Within the context of Chinese as a Foreign Language (CFL) education in Thailand, many lower secondary school students experience difficulties in areas such as reading comprehension, vocabulary identification, and learning motivation. These challenges may hinder students' overall learning effectiveness and engagement in Chinese language learning. This study investigates the effectiveness of integrating picture-supported Chinese learning materials with the LingQ mobile application to improve reading skills and learning motivation among lower secondary students. A one-group pretest–posttest research design was adopted. The participants involved in this research were 23 Grade 7 students from a public secondary school located in Chiang Mai Province, Thailand. The instructional intervention was carried out over a period of four weeks. During this time, classroom activities were supported through the LingQ platform, where carefully selected picture-based Chinese reading materials were incorporated into the lessons to help improve students' reading skills. To evaluate the learning outcomes, data were collected using three different instruments: a Chinese reading proficiency test, a student attitude questionnaire, and classroom observation records. The analysis of the results indicated that students' Chinese reading abilities improved noticeably after the intervention. Taken together, the findings suggest that the integration of picture-supported Chinese learning materials with mobile language learning tools can effectively facilitate Chinese reading instruction. Such an approach not only helps stimulate students' interest in learning Chinese but also provides meaningful support for the sustainable development of foreign language education at the lower secondary level.

**Keywords**— Chinese as a foreign language; mobile-assisted language learning; picture-based learning materials; reading skills; secondary education

### I. INTRODUCTION

In recent years, foreign language education has become increasingly important in a globalized world, as language ability is closely related to the development of human capital. In Thailand, Chinese language education has grown quickly at the secondary school level, mainly because economic and cultural connections between Thailand and China have become stronger. Even so, many students at the lower secondary level still find it difficult to develop effective Chinese reading skills. Since reading is closely linked to overall language proficiency and academic success, these difficulties can have a noticeable impact on students' learning outcomes.

Reading Chinese is often difficult for many students. Learners must recognize characters, understand vocabulary, and interpret meaning simultaneously. For beginners in lower secondary school, these demands may increase learning difficulty and reduce motivation. Furthermore, teaching that relies mainly on textbooks and teacher explanations may not effectively address individual differences or promote active student participation. From the perspective of educational development, improving learning efficiency requires appropriate instructional design as well as the effective use of technology. Mobile-assisted language learning (MALL) has gradually become an important approach because it allows learners to study more flexibly and continue learning beyond the classroom environment. LingQ is one example of such a mobile learning application. Through this platform, learners can read authentic texts, check vocabulary explanations, and practice reading and listening independently. Although LingQ offers many useful features, its educational value depends greatly on how it is used in teaching and on the quality of the learning materials provided. In particular, picture-supported Chinese learning materials may be helpful for lower secondary students. By combining visual information with written text, these materials can provide additional support for comprehension and make reading tasks easier for learners to understand. Therefore, this study investigates whether integrating picture-based Chinese learning materials with the LingQ application can enhance students' reading skills and learning motivation in a real classroom context.

### II. LITERATURE REVIEW

In recent years, increasing academic attention has been directed toward the use of learning materials as instructional media in language education, particularly in relation to the development of children's language skills. Many related studies have reached a consensus that learning materials integrating visual images and textual information not only attract learners' attention and enhance reading motivation among lower secondary students, but also effectively promote vocabulary comprehension, contextual understanding, and language use in both speaking and writing.

For example, Natsajee (2018) conducted a study involving the integration of learning materials into instructional lesson plans and compared students' pretest and posttest performance. The findings revealed significant improvement in students' reading comprehension as well as increased classroom participation.

Research in this field usually follows a structured design. Most studies clearly define their objectives, describe the instructional procedures, and explain how data are collected and analyzed. Such designs help demonstrate both the scientific validity of the research and the effectiveness of instructional materials in language teaching. From a theoretical perspective, Piaget's theory of cognitive development (1971) suggests that students at the lower secondary level are generally in the concrete operational stage. At this stage, learners tend to respond better to learning materials that include clear and vivid visual elements. Using visual support can make complex linguistic ideas easier for students to comprehend. According to Vygotsky's (1978) theory of the Zone of Proximal Development (ZPD), learning becomes more effective when learners receive appropriate guidance. In this context, teachers and learning materials act as scaffolding that assists students in progressively improving their language proficiency. Such scaffolding becomes especially effective when learning materials combine visual support with Chinese texts that match students' language proficiency.

At the beginning of the lessons, teachers usually work together with students while reading the texts. Chinese picture books and short passages on LingQ are used to introduce new words and help students understand the content. After some practice, students become more comfortable with the materials and start using LingQ independently. They can check the pinyin and meaning of unfamiliar words, listen to the audio again, and save new vocabulary for further learning.

After a period of practice, these materials and the platform provide steady support for learning. In this way, students gradually move from teacher-led reading to more independent Chinese reading. They allow students to move step by step from reading with teacher assistance to reading Chinese more independently. This learning process can also be explained by Paivio's Dual Coding Theory (1986). According to this theory, learning

becomes more effective when visual and verbal information are combined, since the integration of these two forms of input encourages deeper cognitive processing and strengthens long-term memory.

A large number of empirical studies have also shown that instructional materials can play an important role in language learning. They help learners develop vocabulary recognition, reading comprehension, and writing skills, while also increasing learning motivation and classroom participation (Wang, 2015; Wu, 2020).

Huang Gaoling (2022), in the study Practice Study on Teaching English with Picture Books in English Enlightenment for Children Aged 5–6, found that picture-based learning materials were highly effective in early childhood English education.

From a theoretical standpoint, Piaget (1971) indicated that children aged 5–12 are in the concrete operational stage, making them particularly receptive to concrete, visually supported learning materials. Vygotsky (1978) further emphasized that instructional support within the ZPD enables learners to surpass their existing capabilities through guided assistance. Similarly, Paivio's Dual Coding Theory (1986) highlights that learning experiences integrating visual and textual information activate multiple cognitive pathways and strengthen long-term memory.

Yang, Wang, and Mei (2024) examined secondary school students' perceptions of mobile-assisted language learning and reported that interactive mobile learning technologies significantly enhanced students' learning motivation, engagement, and opportunities for out-of-class reading. Applications that provide vocabulary support and individualized learning functions were found to be particularly effective. Such studies typically employ systematic research procedures, including objective formulation, instructional design, data collection, and data analysis, to scientifically evaluate language learning outcomes.

These findings suggest that integrating the LingQ application into Chinese reading instruction for lower secondary students may effectively increase reading exposure and improve reading comprehension. This approach aligns well with adolescents' developmental needs for motivational support and flexible, learner-centered instructional activities.

Based on practical teaching experience, it has been observed that lower secondary students still encounter difficulties in Chinese learning, particularly in vocabulary memorization, character recognition, and sentence comprehension. Numerous studies indicate that learning materials can transform complex content into accessible and meaningful learning experiences by connecting instructional content with learners' real-life experiences, which is consistent with the cognitive development of adolescents.

Based on the reviewed domestic and international research, the use of learning materials has demonstrated effectiveness in language education from both theoretical and practical perspectives. Therefore, this study aims to apply these concepts within the context of lower secondary education in Chiang Mai Province, Thailand, to investigate instructional approaches for Chinese language teaching through learning materials and to evaluate the learning outcomes resulting from their practical implementation.

In conclusion, the use of picture-based learning materials in Chinese language instruction at the lower secondary level is strongly supported by theories in psychology and linguistics and has demonstrated positive outcomes in authentic classroom settings. This study seeks to further explore the application of this instructional approach in lower secondary Chinese language classrooms in Chiang Mai Province, Thailand.

### III. THEORETICAL BACKGROUND

**Chinese Reading Instruction as a Social Educational Issue:** Reading ability is a key indicator of educational quality and learning efficiency. In CFL contexts, students often struggle with character recognition and reading comprehension, which may lead to low academic confidence and reduced participation. Addressing these issues is not only a pedagogical concern but also a social issue related to educational development and equal learning opportunities.

**Picture-Based Learning Materials and Learning Efficiency:** Picture-based learning materials provide contextualized input that supports comprehension and memory. Previous studies have shown that visual-text integration can reduce cognitive load, enhance vocabulary acquisition, and increase learner motivation. Such materials are particularly effective for adolescent learners who benefit from concrete and engaging learning experiences.

**Mobile-Assisted Language Learning (MALL):** MALL emphasizes flexibility, learner autonomy, and continuous access to learning resources. LingQ enables learners to control their reading process by interacting with vocabulary and audio support. From a management and educational efficiency perspective, MALL tools can complement classroom instruction and extend learning beyond school hours.

#### Theoretical Framework

This study is grounded in several well-established learning theories that support the integration of picture-based learning materials and mobile-assisted language learning tools in foreign language education. First, Piaget's Cognitive Development Theory provides a developmental perspective on how learners process information. According to Piaget, lower secondary students are generally at the concrete operational stage, in which learning is more effective when abstract concepts are supported by concrete and visual representations. Picture-based Chinese learning materials offer visual cues that help students connect unfamiliar Chinese characters and vocabulary with meaningful contexts. This visual support reduces cognitive difficulty and facilitates comprehension, making picture-based materials particularly suitable for lower secondary learners. Second, Vygotsky's Sociocultural Theory, particularly the concept of the Zone of Proximal Development (ZPD), emphasizes the importance of scaffolding in learning. In this study, scaffolding is provided through both instructional materials and technological tools. Picture-based reading materials function as visual scaffolds that support comprehension, while the LingQ application offers additional support through vocabulary explanations, pinyin, and audio features. These tools enable learners to perform reading tasks that may be challenging independently, thereby promoting gradual development toward autonomous reading. Third, Dual Coding Theory, proposed by Paivio, explains learning as the result of processing information through both verbal and visual channels. When learners receive information in both textual and visual forms, the likelihood of effective information processing and long-term retention increases. The integration of images with Chinese reading texts in this study aligns with Dual Coding Theory by simultaneously activating verbal and visual cognitive systems. This dual processing supports vocabulary acquisition and reading comprehension, particularly for learners who are still developing foundational reading skills in a foreign language.

Finally, Brain-Based Learning theory emphasizes the role of emotional engagement, meaningful context, and multisensory input in effective learning. Picture-based learning materials, combined with interactive mobile applications, create a learning environment that is engaging and emotionally supportive. Features of the LingQ application, such as interactive vocabulary tools and audio input, allow learners to actively engage with reading materials in a low-anxiety environment. This approach aligns with Brain-Based Learning principles by promoting motivation, attention, and deeper cognitive processing. Together, these theoretical perspectives provide a strong foundation for the instructional design of this study. They support the use of picture-based Chinese learning materials and mobile-assisted language learning tools as effective means of enhancing reading skills, learner motivation, and learning autonomy among lower secondary students.

#### Research Gap and Summary

Based on the review of previous studies, it is evident that picture-based learning materials and mobile-assisted language learning (MALL) have been widely recognized as effective approaches in foreign language education. Numerous studies have reported positive effects of visual learning materials on vocabulary acquisition, reading comprehension, and learner motivation. Similarly, research on MALL has demonstrated that mobile applications can enhance learner autonomy, engagement, and access to language input beyond the classroom.

However, several research gaps remain. First, although picture-based learning materials have been extensively examined in early childhood and primary education contexts, relatively limited research has focused on their application at the lower secondary level, particularly in Chinese as a foreign language (CFL) learning environments. Second, while many studies have investigated mobile-assisted language learning tools, fewer studies have explored the integration of picture-based learning materials with specific mobile reading applications such as LingQ in formal classroom settings.

In addition, existing research has predominantly focused on learners in English language learning contexts, whereas empirical studies examining Chinese language learning through mobile applications in Southeast Asian contexts, especially in Thailand, remain scarce. Moreover, few studies have combined quantitative measures of reading performance with qualitative data on learner attitudes and classroom behaviors to provide a comprehensive understanding of instructional effectiveness.

Therefore, this study seeks to address these gaps by investigating the integration of picture-based Chinese learning materials with the LingQ application in a lower secondary school context in Thailand. By employing a mixed-method approach that examines reading performance, learner motivation, and classroom engagement, this study aims to contribute empirical evidence to the existing literature on technology-assisted Chinese language education and provide practical insights for instructional design at the lower secondary level.

#### IV. RESEARCH METHODOLOGY

##### Research Design

A quantitative-dominant mixed-method approach using a one-group pretest–posttest design was adopted.

##### Participants

The participants were 23 Grade 7 students from San Sai Wittayakhom School, Chiang Mai Province, Thailand. All participants were beginner-level Chinese learners enrolled in a basic Chinese course.

##### Instructional Procedure

The instructional intervention was conducted over a four-week period and consisted of eight instructional sessions, with one to two sessions per week. The instructional design integrated picture-based Chinese reading materials with the LingQ mobile application and was implemented during regular Chinese language classes.

Five picture-based Chinese reading materials were selected for the instructional activities. Each instructional session followed a structured three-stage procedure: pre-reading, guided reading, and post-reading.

During the pre-reading stage, picture-based materials were used to activate students' background knowledge and introduce key vocabulary related to the reading texts. Teachers guided students to observe the images and predict the content of the texts, facilitating initial comprehension and reducing potential reading difficulty. This stage aimed to prepare students for reading by providing visual context and supporting vocabulary recognition.

In the guided reading stage, students engaged in reading activities through the LingQ application. The teacher demonstrated how to use LingQ's features, such as clicking on unfamiliar words to access pinyin and vocabulary explanations, listening to audio support, and highlighting key expressions. Students read the texts individually or in small groups, with the teacher providing assistance when necessary. This stage emphasized reading comprehension, vocabulary learning, and reading fluency through repeated exposure to the texts.

During the post-reading stage, follow-up activities were conducted to reinforce comprehension and encourage reflection on the reading content. Students participated in activities such as answering comprehension questions, summarizing the main ideas of the texts, and reading selected passages aloud. These activities aimed to consolidate learning outcomes and enhance students' confidence in reading Chinese texts.

In addition to classroom instruction, students were encouraged to continue using the LingQ application outside of class to practice reading and listening independently. This extension of learning activities supported learner autonomy and increased students' exposure to Chinese language input beyond scheduled class hours.

##### Research Instruments

Three types of research instruments were employed in this study.

##### 1. Chinese Reading Skill Test

The Chinese Reading Skill Test was used to assess students' Chinese reading ability before and after the instructional intervention using picture-based learning materials and the LingQ application. The test consisted of 10 multiple-choice items designed to measure vocabulary recognition, reading comprehension, and reading fluency.

The test was developed by the researcher in accordance with the learning objectives of the basic Chinese language curriculum. The content framework was based on lower secondary Chinese textbooks and the reading materials used in the instructional activities of this study. To ensure content validity, the test items were reviewed by three experts in Chinese language teaching. The reliability of the test was calculated using the Kuder–Richardson Formula 20 (KR-20), yielding a reliability coefficient of approximately 0.85, which indicates a satisfactory level of reliability.



Figure 1. Screen displaying a reading text with vocabulary explanations in the LingQ application



Figure 2. Sample questions from the Chinese reading skill test



Figure 3. Sample questions from the Chinese reading skill test

## 2. Student Attitude and Motivation Questionnaire

A student attitude and motivation questionnaire was administered to investigate students' perceptions of learning Chinese through picture-based materials and the LingQ application. The questionnaire consisted of 20 items measured on a five-point Likert scale and was divided into three dimensions: (1) learning interest and motivation, (2) perceived ease of use and comprehension of the learning materials, and (3) overall attitudes toward learning Chinese through technology.

Content validity of the questionnaire was examined by three experts, and the reliability was assessed using Cronbach's alpha coefficient. The reliability analysis yielded a Cronbach's alpha value of 0.88, indicating a high level of internal consistency.

## 3. Classroom Observation Record

A classroom observation record was used to document students' learning behaviors during instructional activities, including attention, participation, and reading fluency. The observation checklist comprised 10 behavioral indicators assessed using a three-level rating scale (high, moderate, and low).

Classroom observations were conducted collaboratively by the researcher and the Chinese language teacher in each instructional session. This collaborative observation approach was adopted to enhance the accuracy, credibility, and reliability of the qualitative data collected.

All three research instruments were designed in alignment with the objectives of the study and aimed to comprehensively evaluate the development of students' Chinese reading skills and learning attitudes resulting from the integration of picture-based learning materials and the LingQ application, using both quantitative and qualitative approaches. All instruments were validated by experts and demonstrated acceptable reliability.

## E. Data Analysis

Quantitative data were analyzed using mean, standard deviation, and paired-sample t-tests. Qualitative data were analyzed through thematic content analysis.

## V. RESULTS

This section presents the results of the study based on quantitative and qualitative data collected through the Chinese reading skill test, the student attitude and motivation questionnaire, and classroom observations.

### A. Results of the Chinese Reading Skill Test

The results of the Chinese Reading Skill Test revealed an overall improvement in students' Chinese reading performance following the instructional intervention. Prior to the intervention, students demonstrated limited reading ability, particularly in vocabulary recognition and sentence-level comprehension, which are essential components of Chinese reading proficiency.

After four weeks of instruction using picture-based Chinese learning materials integrated with the LingQ application, students' post-test scores showed a noticeable increase compared to their pre-test performance. Improvements were observed across all assessed areas, including vocabulary recognition, reading comprehension, and reading fluency. These results indicate that the instructional approach was effective in supporting students' development of foundational Chinese reading skills.

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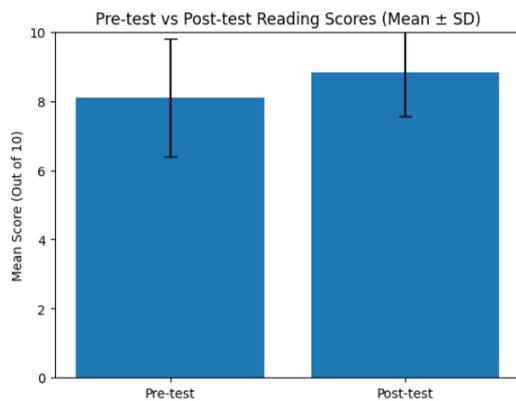


Figure 4. Pre-test vs Post-test Reading Scores of Students

Descriptive statistical analysis further indicated that most students achieved higher scores in the post-test, suggesting a general trend of reading improvement among participants rather than isolated individual gains. This overall pattern reflects positive learning outcomes associated with the use of visual learning materials and mobile-assisted reading support.

In addition to students' reading performance, the study also examined learners' attitudes and motivation toward the instructional approach.

### **B. Results of the Student Attitude and Motivation Questionnaire**

The results of the student attitude and motivation questionnaire demonstrated generally positive perceptions of learning Chinese through picture-based materials and the LingQ application. Overall, students reported increased interest and motivation toward Chinese reading activities following the instructional intervention.

Responses related to learning interest and motivation indicated that students found the picture-based materials engaging and enjoyable, which contributed to a more positive learning experience. Many students expressed that the integration of images with reading texts helped them better understand the content and maintain concentration during reading tasks.

In terms of perceived ease of use and comprehension, students reported that the LingQ application was user-friendly and supportive of their reading practice. Features such as vocabulary explanations, pinyin support, and audio playback were frequently identified as helpful tools for understanding unfamiliar words and improving reading confidence.

Regarding overall attitudes toward technology-assisted Chinese learning, the questionnaire results suggested that students held favorable views toward the use of mobile applications in language learning. The majority of participants indicated a willingness to continue using similar digital tools for future Chinese learning activities, both inside and outside the classroom.

To further understand students' learning behaviors during instructional activities, classroom observations were also conducted.

### **C. Results of Classroom Observations**

Classroom observation data provided additional qualitative evidence of changes in students' learning behaviors during the instructional period. Observations indicated that students demonstrated higher levels of attention and participation during picture-based reading activities compared to traditional textbook-based lessons.

Throughout the instructional sessions, students showed increased engagement in guided reading tasks and were more willing to read aloud and interact with the reading materials. Improvements in reading fluency and confidence were also noted, particularly during repeated reading activities supported by the LingQ application.

Furthermore, classroom observations revealed that students gradually became more independent in using learning tools, such as accessing vocabulary explanations and audio support without direct teacher assistance. This shift suggests that students developed greater autonomy in managing their own reading processes over the course of the intervention.

Overall, the results indicate positive changes in students' reading performance, learning attitudes, and classroom behaviors following the instructional intervention.

## **VI. DISCUSSION**

The findings suggest that integrating picture-based Chinese learning materials with the LingQ application effectively supported the development of Chinese reading skills among lower secondary students. The improvement in vocabulary recognition and reading comprehension aligns with Dual Coding Theory and supports the role of visual scaffolding in reducing cognitive load. Increased learner motivation and autonomy can be explained through sociocultural perspectives emphasizing scaffolding and learner support within the ZPD.

## **VII. CONCLUSION**

This study investigated the effectiveness of integrating picture-based Chinese learning materials with the LingQ mobile application in developing reading skills and learning motivation among lower secondary students. The findings indicate that the instructional approach significantly enhanced students' Chinese reading performance, particularly in vocabulary recognition and reading comprehension, while also fostering greater learning motivation and classroom engagement.

From an educational and social study perspective, the results suggest that the appropriate integration of visual learning materials and mobile-assisted language learning tools can improve learning efficiency within regular classroom settings. Picture-based materials functioned as effective instructional scaffolding, supporting learners' comprehension, whereas the LingQ application facilitated individualized and autonomous learning beyond traditional classroom instruction.

The findings of this study provide practical implications for educators, policymakers, and educational institutions seeking to enhance the quality of foreign language education through technology-supported instructional strategies. By incorporating picture-based learning materials and mobile applications into classroom teaching, schools may improve access to effective learning resources and promote sustainable educational development.

Data were collected using a Chinese Reading Skill Test, a student attitude and motivation questionnaire, and classroom observation records. The reading test demonstrated acceptable reliability ( $KR-20 = 0.85$ ), and the questionnaire showed high internal consistency (Cronbach's  $\alpha = 0.88$ ). Quantitative data were analyzed using descriptive statistics and paired-sample t-tests, while qualitative data were analyzed through thematic content analysis.

Despite the positive outcomes, this study has several limitations. The research was conducted with a relatively small sample and employed a one-group pretest–posttest design, which may limit the generalizability of the findings. Future research is encouraged to involve larger samples, comparative or control group designs, and longer intervention periods to further examine the long-term effects of picture-based mobile-assisted language learning on Chinese reading development.

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