

The power of brushstrokes: How Chinese calligraphy transforms learning – A systematic review



Ming Wei^a | Othman Bin Talib^a  | Chua Yan Piaw^a | Xiaoling Gui^b | Xiaoyang Pan^c | Qingyin Song^d

^aFaculty of Social Sciences & Liberal Arts, UCSI University, Kuala Lumpur, Malaysia.

^bFaculty of Clinical Medicine, Guizhou Medical University, Guiyang, Guizhou, China.

^cFaculty of Educational Studies, University Putra Malaysia, Serdang, Selangor, Malaysia.

^dFaculty of Art & Design, Guizhou Light Industry Vocational and Technical College, Guiyang, Guizhou, China.

Abstract Chinese calligraphy, a visual artistic, and stylised form of handwriting Chinese character, reflects China's history-cultural context. Several studies demonstrated that Chinese calligraphy could enhance learning experiences. However, scholars failed to detail how Chinese calligraphy improves learning. This study discusses the enhancement of Chinese calligraphy on learners' Chinese writing and reading abilities, handwriting skills, learning capacities, and personality traits. This study employed the databases of Scopus, WOS, ERIC, and APA PsycINFO to retrieve articles published up to May 2024. The included articles focused on examining how Chinese calligraphy facilitates learning. Ultimately, ten articles were included. The results indicate that Chinese calligraphy benefits many learners, including children, primary school students, college students, learners of Chinese as a foreign language or a second language, and adult learners. Chinese calligraphy reinforces the development of Chinese character handwriting skills, creativity, cognitive abilities, learning engagement, cultural heritage awareness, technology application, remote learning, learning-related psycho, and personality.

Keywords: visual art, education, learner, systematic analysis

1. Introduction

Chinese calligraphy has been a fundamental element of Chinese culture since ancient times. It is a visual art form and a unique Chinese cultural heritage (Zhou et al., 2013). Chinese calligraphy encompasses the techniques of handwriting characters, the aesthetics of character forms, the mastery of brushstrokes, and the expression of the writer's mindset and emotions (Li, 2011). As an art, Chinese calligraphy occupies a significant status in Chinese culture and is regarded as a vital pathway to cultivating personal virtues and nurturing individual character (Kao et al., 2021).

Learning is how individuals acquire knowledge, skills, attitudes, or values via experience, instruction, or research (Schneider, 2024). Modern educational theory stresses that learning is not simply the accumulation of knowledge, but a process of personal growth and development achieved through active participation and interaction (Paul, 2011). Factors like the learning environment, motivation, and teaching methods significantly influence learning outcomes (Kempen et al., 2024).

Recent studies have demonstrated that Chinese calligraphy promotes learning through multiple pathways. First, Chinese calligraphy training can improve students' attention and memory, thereby enhancing their performance in other academic subjects (Zhao, 2023). Second, as an art form, Chinese calligraphy can stimulate students' creativity and aesthetic sensibilities (He & Liu, 2024). Additionally, practicing Chinese calligraphy fosters students' perseverance and patience, increasing their motivation and resilience in learning (Zhang et al., 2022). Structured Chinese calligraphy training enables students to cultivate their handwriting skills and to appreciate the profound cultural heritage and spiritual essence embedded in the practice, which is crucial for nurturing their holistic competence (Meng et al., 2024). A systematic review can synthesise existing research on how Chinese calligraphy enhances learning, offering a comprehensive overview. Therefore, this review aims to assess the importance of Chinese calligraphy as a learning pathway for students based on existing literature and to explore how Chinese calligraphy improves learning. This study screened the literature from the past decade focusing solely on Chinese calligraphy promotes learning to achieve the following objectives and answer the following research questions (RQ):

RQ1: What types of learners benefit from Chinese calligraphy?

RQ2: How does Chinese calligraphy enhance various aspects of learning?

2. Background Literature



This Chinese calligraphy, an ancient art form originating in the first century, involves writing Chinese characters with a soft-bristle brush. The main styles of Chinese calligraphy include Standard Script, Running Script, Cursive Script, Clerical Script, and Seal Script (Nam, 2020). The development of Chinese characters is deeply rooted in cultural and historical contexts, serving as a medium to convey cultural and linguistic information. This influence extends beyond China, affecting neighboring regions such as Korea, Japan, and Vietnam (Chai & Ma, 2022). Unlike English words formed from 26 letters, Chinese characters are more complex, comprising various strokes and radicals, making their learning and cognition more challenging (Hsiaung et al., 2017). Chinese characters are a norm writing system and a visually intricate art form with significant aesthetic value, essential in preserving traditional Chinese culture (Brunelle & Kirby, 2016; Cao & Champadaeng, 2024).

Learning is a fundamental concept of science and psychology in education, representing the procedure by which individuals pursue knowledge, skills, attitudes, or values via experience, instruction, or research (Schneider, 2024). New educational theories highlight that learning combines the accumulation of knowledge with a process of personal growth and development achieved through active participation and interaction (Paavola & Hakkarainen, 2005). Scholars have indicated that causes like learning motivation, environment, and instructional methods significantly influence learning results (Safitri, 2023; Sherin, 2002). Moreover, a safe learning atmosphere and excellent education can greatly enhance students’ satisfaction and academic achievement (Kempen et al., 2024).

Newly, studies on how Chinese calligraphy and character handwriting stimulate learning have increased. Experts have shown that training in Chinese calligraphy can improve students' attention and memory, reinforcing their performance in other academic subjects (Zhang et al., 2022). Chinese calligraphy requires focus, precision, and repetitive practice, all engaging cognitive functions related to attention and memory (Li, 2010; Hsiao et al, 2023). The fine motor skills and mental concentration needed to produce detailed characters activate areas of the brain associated with learning and information retention (Willingham, 1998). As students practice calligraphy, these cognitive skills are strengthened, leading to improved tasks requiring sustained attention and memory, which are crucial in various academic subjects (Doug, 2019; Kao et al., 2021). The mindfulness and discipline developed through this practice may also foster better learning habits overall, contributing to enhanced academic performance across subjects (Hue, 2009).

Chinese calligraphy, an art form, rouses creativity and aesthetic skills while cultivating perseverance and patience, which boost motivation and resilience in learning (Meng et al., 2024). Chinese calligraphy furthermore performs a crucial position in written communication, reading, and academic success (Li et al., 2022). Nonetheless, the specific mechanisms and impacts of Chinese calligraphy on learning need to be understood, requiring additional empirical research to expose its educational value (Cai et al., 2023). Systematic reviews and in-depth exploration can facilitate wider recognition and apply the potential of Chinese calligraphy to increase learners’ competence and academic performance.

3. Materials and Methods

3.1. Database and search strategy

This systematic review followed PRISMA (2020) Checklist (Page et al., 2021). This title has been registered on the International Platform of Registered Systematic Review and Meta-analysis Protocols, and the registration number is INPLASY202490058. The review consisted of three steps: (1) literature search, including the selection of search terms, databases, and inclusion criteria; (2) title-based screening; and (3) abstract-based screening. The search was conducted in May 2024, adopting the databases Scopus, Web of Science (WOS), ERIC (Educational Resources Information Centre), and PsycINFO (EBSCO). Scopus and Web of Science (WOS) were chosen for their comprehensive coverage of peer-reviewed literature across multiple disciplines, ensuring access to high-quality, impactful studies. ERIC and PsycINFO were selected for their specialisation in educational and psychological research, which are crucial for exploring topics related to learning, memory, and student performance.

The search terms utilised (See Table 1) were (“Chinese calligraphy” OR “Chinese handwriting” OR “Chinese character writing” AND “learning” OR “students” OR “learners” OR “adolescents” OR “school” OR “education”). Search strategy (See Table 2) was conducted by title in each database, resulting in the number of 2390 articles included in total.

Table 1 Search string.

Search Builder	Search String
Chinese calligraphy	“Chinese calligraphy” OR “Chinese handwriting” OR “Chinese character writing”
Learning	“learning” OR “students” OR “learners” OR “adolescents” OR “school” OR “education”

3.2. Inclusion and exclusion criteria



All searches were progressed in May 2024. The inclusion criteria for the paper were: (1) publication date between 2014 and 2024; (2) inclusion of the keywords: Chinese calligraphy, Chinese character writing, learning, students, education; (3) written in English; (4) quantitative, qualitative, and mixed-methods studies to provide diverse perspectives on the research topic. The study period was set from 2014 to 2024. This interval was selected based on several factors. First, the abundance of online resources between the time allowed for a comprehensive review of the literature on Chinese calligraphy and its impact on learning. Second, focusing on the past decade confirmed access to the most recent literature and facilitated tracking advancements in the field. Finally, a shorter timeframe enabled a thorough review of relevant literature and afforded a deeper understanding of how Chinese calligraphy enhances learning.

Table 2 Search strategy.

Keywords	Search String 1 (Chinese Calligraphy)	Search String 2 (Learning)	Results
	"Chinese calligraphy" OR "Chinese handwriting" OR "Chinese character writing"	"students" OR "learners" OR "adolescents" OR "school" OR "education"	
Database	Strategy		Results
Scopus	(ALL ("Chinese calligraphy" OR "Chinese handwriting" OR "Chinese character writing") AND ALL ("students" OR "learners" OR "adolescents" OR "school" OR "education"))		2147
WOS	"Chinese calligraphy" OR "Chinese handwriting" OR "Chinese character writing" (All) and "students" OR "learners" OR "adolescents" OR "school" OR "education" (All)		144
ERIC	TX ("Chinese calligraphy" OR "Chinese handwriting" OR "Chinese character writing") AND TX ("students" OR "learners" OR "adolescents" OR "school" OR "education")		36
APA PsycINFO	TX ("Chinese calligraphy" OR "Chinese handwriting" OR "Chinese character writing") AND TX ("students" OR "learners" OR "adolescents" OR "school" OR "education")		63
Total			2390

Studies were included if they met the following criteria: they exclusively focused on participants of all ages engaged in Chinese calligraphy, including preschool children, school-age minors, college students, and adult learners; they involved worldwide Chinese calligraphy learners; they examined the academic impacts of Chinese calligraphy on students; they were published as journal articles in English; and they were published between January 1st, 2014, and May 1st, 2024.

Studies were excluded if they were published before January 1st, 2014; involved non-Chinese calligraphy; focused on non-Chinese calligraphic education (CCE); or had outcomes unrelated to the positive impact of CCE on students' learning.

3.3. Selection of articles and descriptive overview

The study began a comprehensive search for relevant literature using four prominent databases: Scopus, Web of Science (WOS), ERIC, and PsycINFO. This initial search resulted in the identification of 2390 potential articles. To streamline the review process, duplicate records were removed, and articles that were not journal articles or published within the specified timeframe were excluded. Subsequently, a thorough screening of titles, abstracts, and keywords was conducted, leading to the exclusion of an additional 1038 articles that did not meet the established eligibility criteria. In the final stage, a detailed full-text review was performed on the remaining articles, resulting in the exclusion of 46 articles that did not align with the study's inclusion criteria. Ultimately, 10 articles published between 2017 and 2023 were deemed suitable for inclusion in the qualitative synthesis. Figure 1 provides a visual representation of this three-stage study selection process, illustrating the identification, screening, and inclusion of relevant articles.

3.4. Quality assessment of included studies

The study assessed the quality of each study employing Crowe's Critical Appraisal Tool (CCAT). The CCAT applies to various research designs, including quantitative, qualitative, and mixed-methods research, and it demonstrated high reliability in this study (Crowe et al., 2011; 2012). The CCAT evaluation criteria, available online, consist of eight categories: preliminary, introduction, design, sampling, data collection, ethical issues, results, and discussion (See Table 3). Each category is scored on a 5-point scale, with a maximum total score of 40 points (See Table 4). Table 4 presents the characteristics of all 10 studies and their CCAT scores. The CCAT guidelines suggest that scores should be used as a reference for quality assessment and should be considered alongside the research questions for inclusion in the analysis.

3.5. Approach to analysis and synthesis

This review employs thematic analysis. Ten articles were imported into ATLAS.ti 24 for a literature review analysis, following the approach outlined by Zairul (2020). We adhered to the six-step framework proposed by Braun and Clarke (2006). These steps involve familiarization with the data, generating codes, identifying themes, reviewing themes, defining themes,



and explaining themes. Through this process, we identified five key themes: (1) the development of Chinese handwriting skills, (2) creativity and cognitive development, (3) learning engagement and cultural heritage, (4) technology and distance education, and (5) psychological and personality effects.

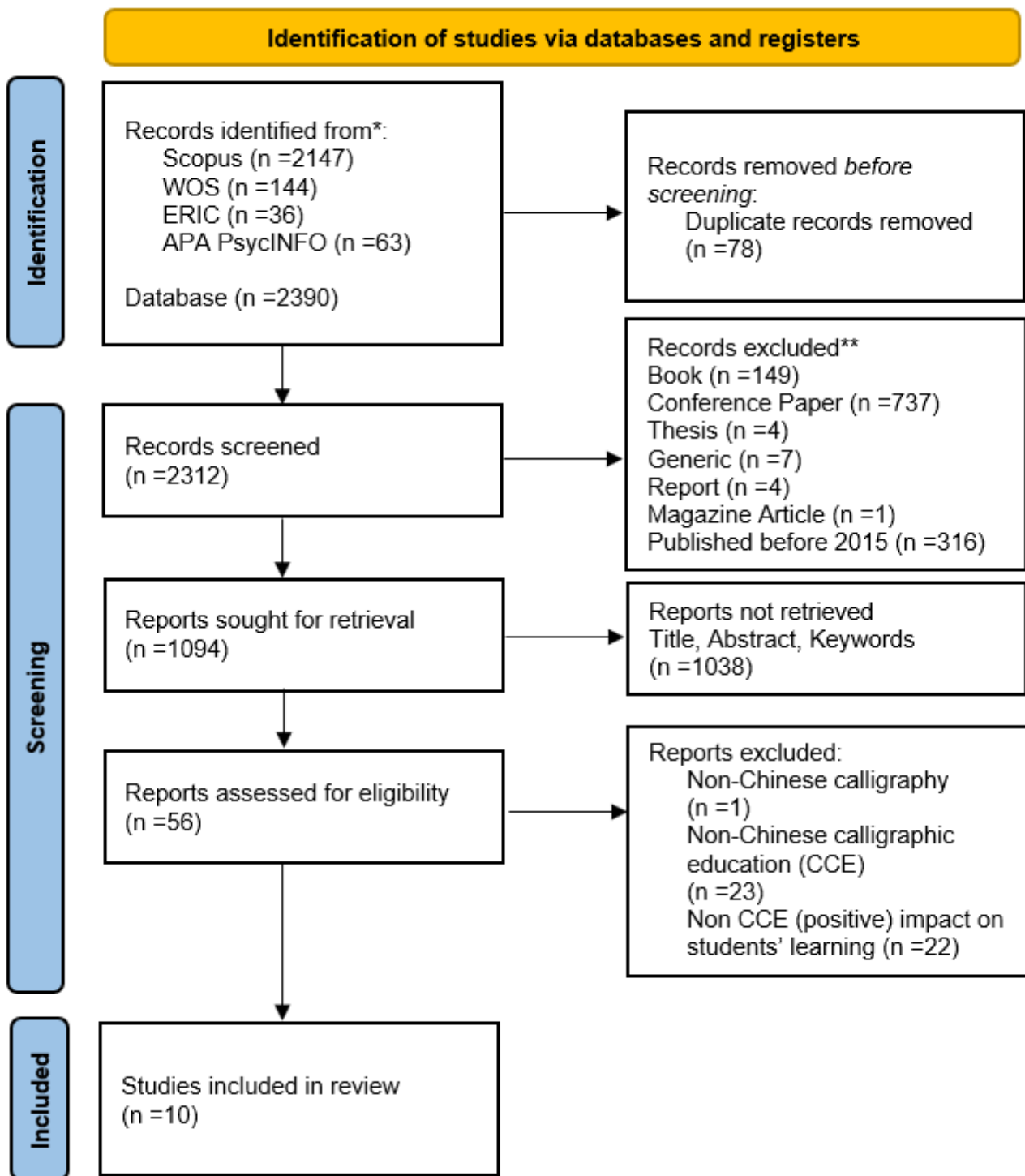


Figure 1 The PRISMA flow diagram of the research process.

To guarantee the quality and quantity of included and excluded articles, a structured strategy was adopted: In the beginning phase, the initial screening was handled by the first author. The corresponding author then reviewed the inclusion and exclusion criteria and performed a second screening. The other four authors audited consistency in the number and quality of included articles. The corresponding author assessed the ten included articles via the CCAT criteria in the ending phase. The other four authors proposed scoring opinions, discussed them with the first authors, and addressed them through negotiation with the corresponding author.

Table 3 The CCAT form. *Source* Crowe (2013)

Crowe Critical Appraisal Tool (CCAT): Version 1.4		
Category Item	Item Descriptors	Description Score (1–5)
	1. Preliminaries	
Title	1. Includes study aims and designs	Preliminaries (/5)
Abstract	1. Contains key information 2. Balanced and informative	
Text	1. Sufficient detail others could reproduce 2. Clear, concise writing/ table(s)/ diagram(s)/ figure(s)	
	2. Introduction	
Background	1. Summary of current knowledge 2. Specific problem(s) addressed and reason(s) for addressing	Introduction (/5)
Objective	1. Primary objective(s), hypothesis(es), aim(s) 2. Secondary question(s)	
	3. Design	
Research design	1. Research design(s) was chosen and why 2. Suitability of research design(s)	Design (/5)
Intervention, treatment, exposure	1. Intervention(s)/treatment(s)/exposure(s) chosen and why 2. Precise details of intervention(s)/treatment(s)/exposure(s) for each group 3. Intervention(s)/treatment(s)/exposure(s) valid and reliable	
Outcome, output, predictor, measure	1. Outcome(s)/output(s)/predictor(s)/measure(s) chosen and why 2. Clearly define outcome(s)/output(s)/predictor(s)/measure(s) 3. Outcome(s)/output(s)/predictor(s)/measure(s) valid and reliable	
Bias, etc.	1. Potential sources of bias, confounding variables, effect modifiers, interactions 2. Sequence generation, group allocation, group balance, and by whom 3. Equivalent treatment of participants/cases/groups	
	4. Sampling	
Sampling method	1. Sampling method(s) chosen and why 2. Suitability of sampling method	Sampling (/5)
Sampling size	1. Sampling size, how chosen, and why 2. Suitability of sample size	
Sampling protocol	1. Description and suitability of target/ actual/ sample population(s) 2. Inclusion and exclusion criteria for participants/ cases/ groups 3. Recruitment of participants/cases/groups	
	5. Data collection	
Collection method	1. Collection method(s) chosen and why 2. Suitability of collection method(s)	Data collection (/5)
Collection protocol	1. Include date(s), location(s), setting(s), personnel, materials, processes 2. Methods to ensure/enhance the quality of measurement/instrumentation 3. Manage non-participation, withdrawal, incomplete/lost data	
	6. Ethical matters	
Participant ethics	1. Informed consent, equity 2. Privacy, confidentiality/anonymity	Ethical matters (/5)
Researcher ethics	1. Ethical approval, funding, conflict(s) of interest 2. Subjectivities, relationship(s) with participants/cases	
	7. Results	



accuracy among Chinese language students. Three studies, including Cai et al. (2023) and Zhang et al. (2022), focused on the enhancement of creativity and cognitive capabilities through Chinese calligraphy practice. Research projects combined Chinese calligraphy with music to boost creative thinking in preschool children (Cai et al., 2023), while educational programs utilised fMRI techniques to reveal the cognitive benefits of Chinese handwriting (Zhang et al., 2022). Educational plans uniquely examined learning engagement and cultural heritage, showing that Chinese calligraphy projects can foster academic learning attitudes and cultural appreciation (Ching & New, 2019). Instruction practices studied the usage of VR technology in teaching Chinese calligraphy, finding that it positively influenced students' understanding and imagination, but did not significantly increase operational skills (Li et al., 2022). Finally, educational research demonstrated that Chinese calligraphy positively affects psychological and personality traits, enhancing cognitive function, emotional states, and personality maturity (Kao et al., 2021). This review emphasises the diverse educational benefits of Chinese calligraphy, including improvement in handwriting, creative expression, and psychological well-being. It also implies the requirement for further research on cultural engagement and technology integration.

Table 4 The quality assessment of included studies.

Critical appraisal of included studies										
Scores										
NO.	Category Items	1) Preliminaries	2) Introduction	3) Design	4) Sampling	5) Data Collection	6) Ethical matters (participant ethics and researcher ethics)	7) Results	8) Discussion	9) Aggregate Scores (/40)
1	Cai (2023) Mainland, China	5	5	4	4	4	5	5	4	36
2	Chai (2022) Mainland, China	5	5	4	5	5	5	4	5	38
3	Ching (2019) Hongkong, China	4	4	3	3	4	3	4	3	28
4	Deng (2022) Mainland, China	4	4	4	3	4	4	4	3	30
5	Hsiaung (2017) Taiwan, China	5	5	4	4	4	3	4	4	33
6	Kao (2021) Mainland, China	4	5	4	5	5	3	4	4	34
7	Li (2022) Mainland, China	5	5	5	4	4	3	5	4	35
8	Tse (2017) Hongkong, China	4	5	5	4	5	4	5	4	36
9	Tin (2018) Malaysia	5	5	5	4	4	3	4	5	35
10	Zhang (2022) Mainland, China	5	5	4	4	5	4	5	4	36



Table 5 The list of CCAT scores.

No.	Authors (years) Country	Title	Aim(s)	Participant Characteristics	Main Finding	CCAT Scores
1	Cai (2023) Mainland, China	The Role of the Art of Chinese Calligraphy and Music in Developing Creative Thinking Skills in Preschoolers Using Flipped Technology	To study the influence of teaching music and calligraphy practices using flipped classroom technology on the development of creative thinking in preschool children	120 children, ages 4–5, who attend three kindergartens in Yiyang City, People’s Republic of China.	The results showed that the use of musical-calligraphic practice provides higher creative thinking skills in the categories of “imagination” and “originality” while “fluency” and “flexibility” are like the use of a single musical practice.	36
2	Chai (2022) Mainland, China	Exploring Relationships Between L2 Chinese Character Writing and Reading Acquisition from Embodied Cognitive Perspectives: Evidence from HSK Big Data	To examine the role of Chinese handwriting in reading acquisition through big data from a national CSL proficiency test, Hanyu Shuiping Kaoshi (HSK)	74,362 CSL learners (Mean age = 23.3 years, range = 9.4-79.3 years; 36,528 males and 37,834 females).	The results indicated that the significant effect of CCWP and significant language distance × CCWP interaction effect on reading proficiency; however, cultural background × CCWP interaction effect was not significant.	38
3	Ching (2019) Hongkong, China	The Calligraphy Connections Project: Reviving Historical East Asian Texts	To recount and reflect upon the Calligraphy Connections Project, an initiative aimed at getting students to engage with historical East Asian texts through the creation of calligraphy artworks, which were subsequently exhibited to the public.	The 51 students who participated in the project from the two universities came from a total of 18 different departments/colleges. City University of Hong Kong (CityU) and Central South University (CSU) of Changsha, China.	The results indicated that the CCP was to inspire creative and academic learning attitudes and help them see how classical East Asian texts can be relevant and useful. Its research, and artwork creation, was as much about having students improve their knowledge of historical East Asian texts, as it was developing their practical information search and navigation abilities.	28
4	Deng (2022) Mainland, China	An examination of Chinese character writing errors: Developmental differences among Chinese as a foreign language learners	To investigate the handwriting errors by Chinese as a foreign language (CFL) learners from eight countries and three language families (Indo-European languages, Slavic languages, Romance languages), including wrongly written	The students were selected from eight countries whose L1 backgrounds are mainly Germanic (USA, UK, Germany, Sweden), Romance (Italy, France, Spain) and Slavic language(s) (Russia).	The results demonstrated that it is crucial for CFL learners to rapidly develop their awareness of orthography between the elementary and intermediate stages.	30

5	Hsiaung (2017) Taiwan, China	Effect of stroke-order learning and handwriting exercises on recognizing and writing Chinese characters by Chinese as foreign language learners	characters and misused characters. To investigate the effectiveness of stroke-order learning and writing exercises in promoting the ability of Chinese-as-a-foreign-language (CFL) learners to recognize and write Chinese characters by using a computer-based teaching system	The participants (n = 91, 48 males and 43 females) were students (ages ranging from 16 to 20 years) of the Chinese study program from NTNU. All the participants were native Portuguese or Spanish speakers who spoke English as a second language and had not reached the A1 level of the Common European Framework of Reference (CEFR) for the Chinese language.	The results indicated that CFL learners who practiced writing the characters had improved accuracy in their Chinese writing assignments and meaning assignments compared with students who did not practice writing, indicating that writing exercises helped students to memorize the orthography and output of Chinese characters. Writing exercises also helped improve memorization of the meaning of Chinese characters.	33
6	Kao (2021) Mainland, China	Calligraphy, Psychology and the Confucian Literati Personality	To provide empirical evidence showing strong association of CCH and personality traits and discuss the results in the contexts of calligraphy practice and Confucian literati personality, Confucianism and Chinese personalities as well as calligraphy writing and tool-using psychological theory.	The 553 students were randomly selected from a pool of over 850 students from three public middle schools and two universities in Beijing, ranging in age of 12–25 years, and the 654 members of Beijing Calligraphy Association were randomly selected from a full membership of 1,161, ages ranged between 35 and over 60 years.	The results established that Chinese brush handwriting has measurable behavioural, psychological and emotional effects and the CCH practitioners have enhanced brain functioning, improved cognitive abilities and intellectual skills, better emotional states and a more mature personality.	34
7	Li (2022) Mainland, China	Research Into improved Distance Learning Using VR Technology	To use the effectiveness of VR to teach Chinese books and paintings, analyse if VR can enable distance education, and explore the impacts of VR practical teaching.	The 160 teachers and students of this subject (not just limited to teachers and students of calligraphy)	The results of this study indicated that Chinese calligraphy studies in VR time and space affect students' understanding and imagination but not their operational abilities	35
8	Tse (2017) Hongkong, China	Development of Chinese handwriting skills among kindergarten children: Copying of the composition in Chinese characters and name writing	To examine the developmental progression of Chinese name writing among kindergarten children, then to evaluate children's ability to write Chinese characters at the K3 level, and to determine whether copying ability can	The 141 Chinese children (76 boys and 65 girls) from the first to third year of kindergarten education (K1 to K3) were recruited from a kindergarten in Hong Kong.	The results showed that the abilities of Chinese name writing were moderately to strongly related with the abilities in copying the composition of Chinese characters. It also showed that copying radicals significantly predicted Chinese name writing ability.	36

			predict name-writing skills among Chinese kindergarten children.			
9	Tin (2018) Malaysia	Integrating Animations in Chinese Character Writing Based on Cognitive Theory of Multimedia Learning to Promote Students' Writing Skills	To investigate the effect and students' perception on the implementation of animation in teaching and learning of Chinese character writing based on Cognitive Theory of Multimedia Learning (AniCC Online Learning) via Frog VLE platform.	The 33 Year-1 students	The results showed that the design of AniCC Online Learning via Frog VLE platform can improve writing performance as well as to help students in their writing skills.	35
10	Zhang (2022) Mainland, China	Brain Correlates of Chinese Handwriting and Their Relation to Reading Development in Children: An fMRI Study	To identify brain correlates of handwriting in Chinese children, and to determine how the neural circuitry of handwriting relates to reading development by using a series of brain-behaviour correlation analyses.	The 36 children (15 males and 21 females; age range = 9.15–11.11 years) were recruited from 5 elementary schools in Beijing, China, and all were native Chinese speakers.	The results revealed that the brain correlates of handwriting and their relation to reading development in Chinese children, offering new insight into the development of handwriting, and reading skills.	36

Table 6 Author vs theme.

	Theme1: Development of Chinese Handwriting Skills	Theme2: Creativity and Cognitive Development	Theme3: Learning Engagement and Cultural Heritage	Theme4: Technology and Distance Education	Theme5: Psychological and Personality Effects
(Deng & Hu, 2022)	/	-	-	-	-
(Ching & New, 2019)	-	-	/	-	-
(Hsiung et al., 2017)	/	-	-	-	-
(Cai et al., 2023)	-	/	-	-	-
(Zhang et al., 2022)	-	/	-	-	-
(Li et al., 2022)	-	-	-	/	-
(Tin et al., 2018)	/	-	-	-	-
(Tse et al., 2017)	/	-	-	-	-
(Kao et al., 2021)	-	-	-	-	/
(Chai & Ma, 2022)	/	-	-	-	-

Note: / Yes; - No

4.2. Qualitative reporting

Figure 2 outlines the potential cognitive, educational, and cultural advantages of incorporating Chinese calligraphy into educational programs. It highlights five key areas for further research such as (1) The development of fine motor skills and hand-eye coordination through stroke practice; (2) The enhancement of creativity and cognitive skills through studying various styles and problem-solving; (3) Increased student engagement with Chinese culture and heritage through a deeper



understanding of character meanings and history; (4) The exploration of technological applications for distance learning in calligraphy and (5) The investigation of potential psychological and personality benefits of calligraphy practice, such as stress reduction and improved focus. While further research is warranted, this model suggests that Chinese calligraphy can be a valuable tool for enhancing learning in various aspects.

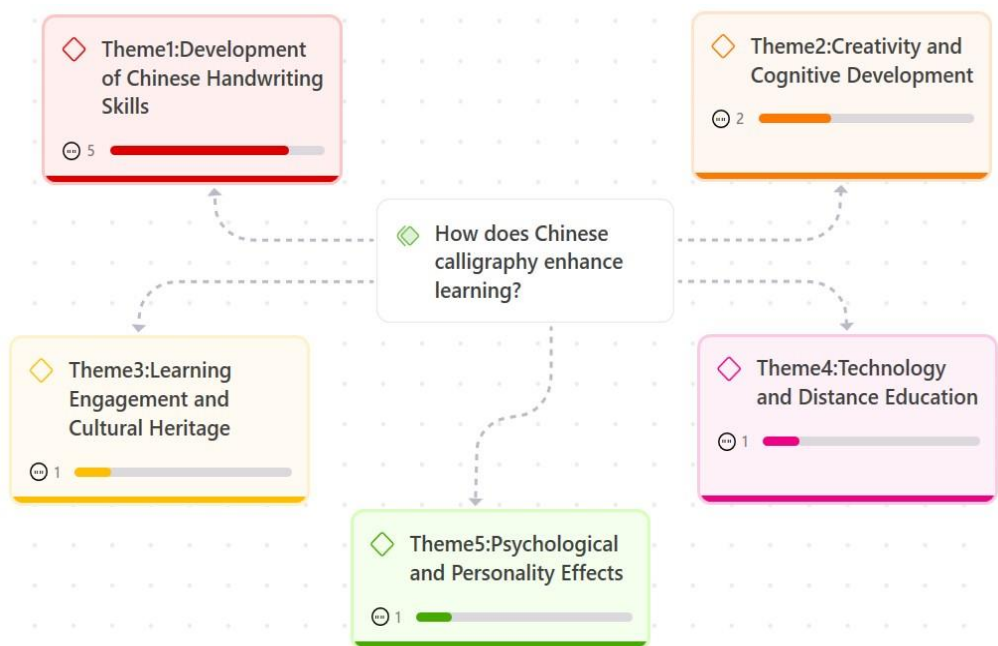


Figure 2 The themes to answer the research question.

Figure 3 presents how Chinese calligraphy can be integrated into the curriculum to improve cognitive skills and academic performance. The figure outlines several thematic areas: (1) refining fine motor skills and hand-eye coordination through repetitive stroke and character training; (2) stimulating creativity and cognition via exploring various styles and employing problem-solving strategies to obtain ideal forms; (3) cultivating student interest in Chinese culture and heritage by fostering a deeper understanding of character meanings and histories through Chinese calligraphy education; (4) investigating technological applications to enhance the effectiveness of teaching Chinese calligraphy via remote learning; and (5) researching underlying psychological and personality benefits of Chinese calligraphy training, involving reduced stress and improved focus. But further investigation is urgent, this frame recommends that Chinese calligraphy provides a multifaceted approach to improving educational effectiveness.

RQ1: What types of learners benefit from Chinese calligraphy?

Beyond its aesthetic value, Chinese calligraphy offers a valuable framework for discovering learning and development among diverse learner groups. This study, guided by thematic elements shown in Figure 3, explores potential research questions. For younger learners (Cai et al., 2023; Tse et al., 2017; Zhang et al., 2022), practicing Chinese calligraphy may increase fine motor skills and hand-eye coordination. Studies may discuss whether Chinese calligraphy advances improvements over other activities designed to develop motor skills. For adult learners (Chai & Ma, 2022; Deng & Hu, 2022; Hsiung et al., 2017; Kao et al., 2021), Chinese calligraphy practice may influence creativity, cognitive abilities, and cultural involvement. Research could compare the effects of Chinese calligraphy on these dimensions with other artistic activities among college students (Ching & New, 2019). Furthermore, the role of technology in education necessitates exploring its effectiveness in conducting Chinese calligraphy courses in remote learning settings (Li et al., 2022). Ultimately, the possible psychological and personality advantages of Chinese calligraphy practice warrant comprehensive study through diverse learner populations.

Figure 4 indicates that Chinese calligraphy benefits various learners, augmenting motor skill development in young children, improving cognitive abilities, creativity, and cultural engagement in adults, and supporting Chinese calligraphy education in remote settings by technology. Besides, the potential psychological and personality strengths underline its meaning for all learner groups in enhancing holistic happiness.



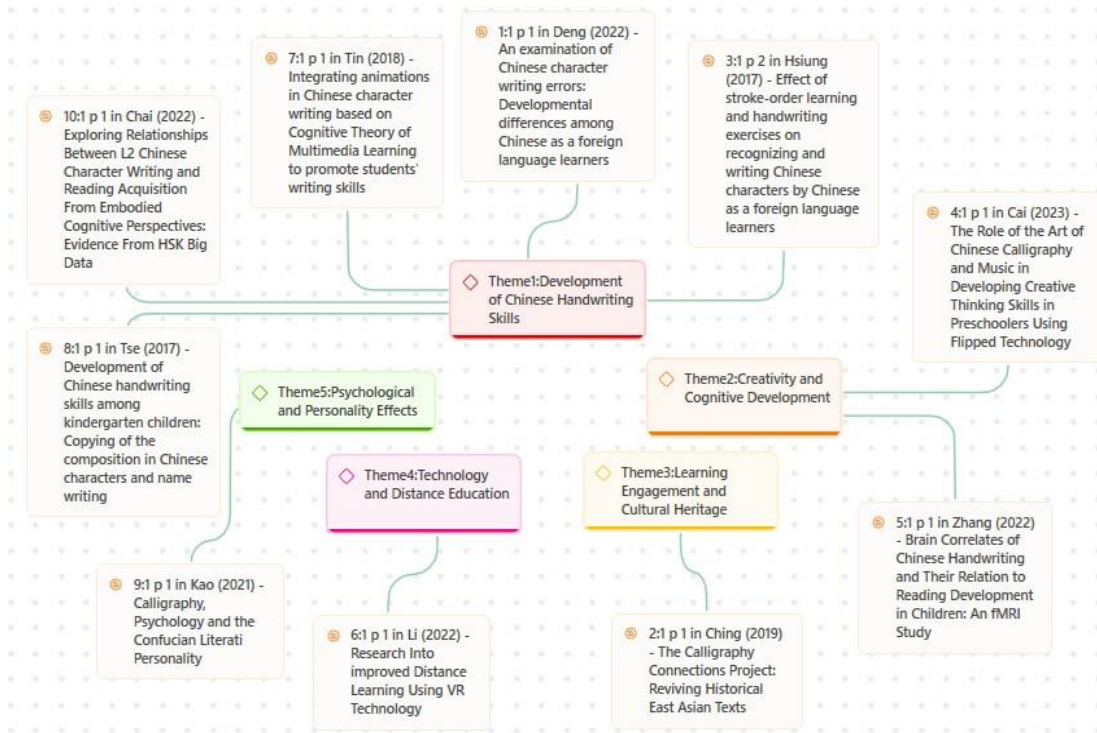


Figure 3 The themes vs studies.



Figure 4 The learners to answer RQ1.

4.3. RQ2: How does Chinese calligraphy enhance various aspects of learning?



Chinese calligraphy, deeply rooted in cultural heritage and artistic expression, proposes a unique perspective for discovering learning and individual growth. This research inquires how Chinese calligraphy practice can enhance the educational experience for different ages and backgrounds. Drawing on insights from the thematic categories in Figure 5, this report explores the numerous values of Chinese calligraphy for diverse learners. The series of themes are discussed below:

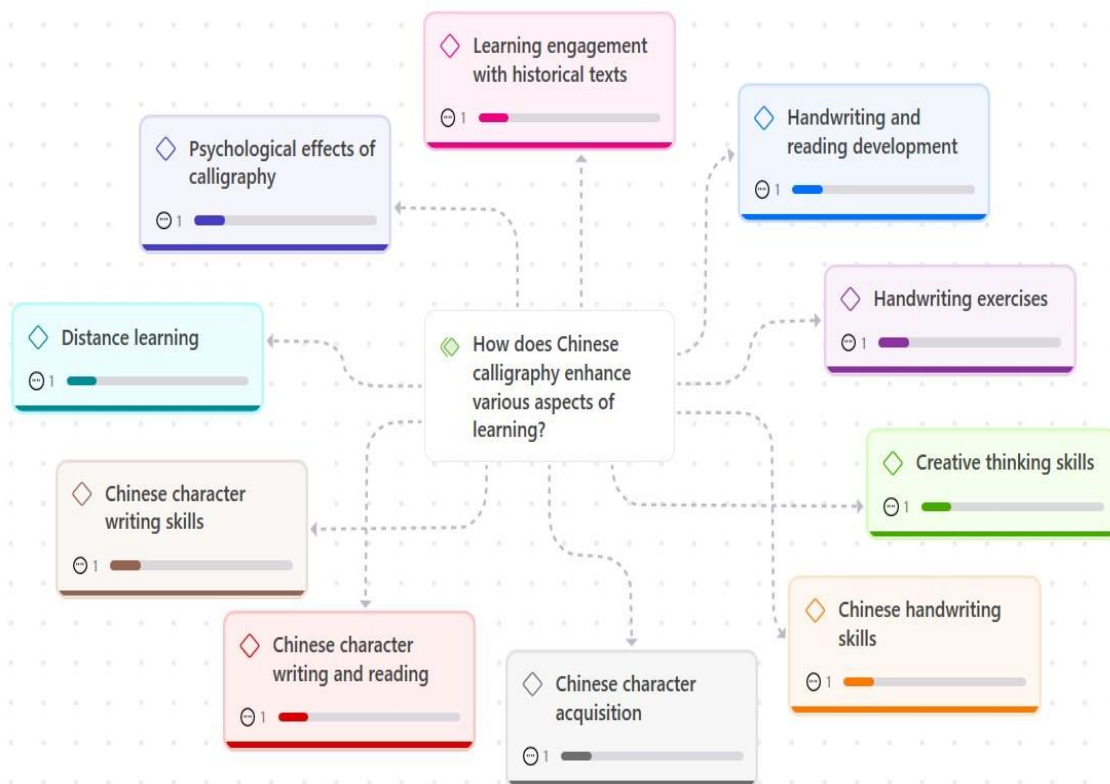


Figure 5 The aspects to answer RQ2.

4.3.1. Enhancing foundational skills in young learners

For young learners, particularly those in preschool and kindergarten (Tse et al., 2017), Chinese calligraphy practice is an effective method for cultivating essential skills. The repetitive actions involved in creating strokes and characters strengthen hands and finger muscles, enhance dexterity, and improve visual-motor coordination (Hsiung et al., 2017). These developed motor skills benefit diverse activities, involving writing, drawing, and playing musical instruments (Cai et al., 2023).

4.3.2. Fostering creativity, cognitive function, and cultural engagement

Chinese calligraphy extends beyond the memorisation of stroke orders and their practice. It is a creative activity that allows learners to explore various styles, techniques, and brush approaches to achieve specific forms (Kao et al., 2021). This process not only reinforces creative thinking and problem-solving skills but also heightens visual-spatial reasoning, a crucial cognitive ability (Li et al., 2022). Furthermore, Chinese calligraphy practice deepens the connection with Chinese culture and heritage. By searching the historical and conceptual legacies of the characters, learners gain a more profound understanding of the Chinese language and its history (Ching & New, 2019). This may stimulate student motivation and engagement across diverse groups, including young and adult learners of general calligraphy learners and Chinese as a Foreign Language (CFL) learners, as noted by Chai & Ma (2022) and Hsiung et al. (2017).

4.3.3. Technology and remote learning environments

The rapid expansion of online educational platforms presents significant opportunities for teaching Chinese calligraphy. Educators can leverage technology to deliver effective Chinese calligraphy instruction in virtual learning circumstances (Li et al., 2022). Engaging practices and e-learning materials greatly enhance the learning experience for students within diverse geographical locations, uniquely for CFL learners as illustrated.

4.3.4. Potential psychological and personality benefits

Studies suggest that calligraphy practice may provide psychological and personality benefits (Kao et al., 2021). The repetitive motions and focus required for calligraphy can induce a state of relaxation and mindfulness, potentially reducing



stress and anxiety. Additionally, calligraphy practice may cultivate traits like patience, perseverance, and discipline. These potential benefits can be relevant for all learner groups seeking to improve their emotional well-being.

5. Final Considerations

This systematic review, based on the thematic components shown in Figure 2, evaluates how Chinese calligraphy boosts educational outcomes among heterogeneous learner demographics. The results suggest that Chinese calligraphy offers a diverse pattern to learning and influences multiple areas of development.

5.1. Multifaceted benefits for diverse learners

For young learners, Chinese calligraphy practice helps cultivate foundational motor skills and hand-eye coordination. Then, Chinese calligraphy serves as a creative, cognitive, and cultural tool for learners of all ages. Chinese calligraphy involves repetitive skills and concentration, which can offer psychological and personality profits. This may help relieve stress and anxiety while nurturing virtues such as patience and perseverance.

5.2. Contributions and benefits of this study

The systematic review presents a new viewpoint on the effects of Chinese calligraphy on learners with varying learning styles. It builds on existing research on the advantages of art forms in education, specifically stressing the unique instance of Chinese calligraphy.

Based on evidence that Chinese calligraphy bargains numerous gains for children, this research extends its findings to cover creativity, cognitive function, cultural understanding, and potential psychological wellness across all age groups. This underscores the multifaceted role of Chinese calligraphy in education. By considering various learner groups—including children, adult learners, Chinese as a Foreign Language (CFL), and remote learners—this review broadens the scope of Chinese calligraphy's potential strengths and provides a comprehensive framework for its integration into diverse educational settings. In addition, this review identifies key directions for future research, underlining the necessity to inquire why Chinese calligraphy affects learning achievements among distinct learner types and to construct suitable pedagogical strategies for incorporating Chinese calligraphy into diverse educational atmospheres, including online platforms. Through setting a research agenda, this study encourages a deeper comprehension of the role of Chinese calligraphy in modern education.

The educational process involving Chinese calligraphy has substantial research implications. It enriches learning environments by cultivating key skills and essential knowledge in students, thereby creating a more diverse educational experience. The development of creativity, cognitive function, and cultural understanding through Chinese calligraphy means that it can improve learning outcomes across different academic disciplines. Research indicates that Chinese calligraphy benefits learners of all ages and backgrounds, making it applicable in varying educational contexts. Besides, the psychological and personality benefits of practicing Chinese calligraphy, such as fostering patience and reducing stress, strengthen its role in student well-being and its contribution to educational strategies.

In conclusion, this study significantly contributes to understanding the benefits of Chinese calligraphy as a teaching and learning tool in various contexts. It strengthens the multifunctional value of Chinese calligraphy for students and proposes a framework for future research to investigate its effectiveness in diverse educational environments.

5.3. Limitations of the study

Three aspects are reflected in the research limitation. The scope of benefit for Chinese calligraphic learners is limited and may be restricted to the Sinosphere. Additionally, the beneficiary population is incomplete, and it has almost no impact on non-Chinese learners. Finally, the research results may merely apply to the Chinese history-cultural context.

5.4. The need for further research

While this assessment highlights the strengths of Chinese calligraphy in enhancing education, further research is required to determine its precise impact on students. Future research should explore ways that Chinese calligraphy affects the learning achievements of various learner groups, including children, adults, and those involved in remote learning. In addition, developing effective guidelines for teaching Chinese calligraphy in specific learning environments, such as traditional classrooms and online platforms, is pivotal for maximising its outcomes for all learners.

Chinese calligraphy is increasingly integrated into educational contexts, with ongoing research targeted to optimise its application in instruction. Thus, Chinese calligraphy becomes the instrument to cultivate the educational process and foster skills, such as problem-solving and knowledge acquisition, which are essential in today's world.

Acknowledgment

The author is honoured to appreciate all the authors' contributions to the study.

Ethical Considerations

Not applicable.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

References

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Brunelle, M., & Kirby, J. (2016). Tone and phonation in Southeast Asian languages. *Language and Linguistics Compass, 10*(4), 191–207. <https://doi.org/10.1111/lnc3.12182>
- Cai, Q., Zhang, H., & Cai, L. (2023). The role of the art of Chinese calligraphy and music in developing creative thinking skills in preschoolers using flipped technology. *Journal of Psycholinguistic Research, 52*(6), 1973–1987. <https://doi.org/10.1007/s10936-023-09980-1>
- Cao, H., & Champadaeng, S. (2024). The art of Chinese calligraphy: Educational protection and literacy study of cultural heritage. *International Journal of Education and Literacy Studies, 12*(3), 160–171. <https://doi.org/10.7575/aiaac.ijels.v.12n.3p.160>
- Chai, X., & Ma, M. (2022). Exploring relationships between L2 Chinese character writing and reading acquisition from embodied cognitive perspectives: evidence from HSK big data. *Frontiers in Psychology, 12*, 779190. <https://doi.org/10.3389/fpsyg.2021.779190>
- Ching, S. H., & New, B. (2019). The calligraphy connections project: Reviving historical East Asian texts. *International Information & Library Review, 52*(2), 108–116. <https://doi.org/10.1080/10572317.2019.1658500>
- Crowe, M. C. (2021). *Crowe Critical Appraisal Tool (CCAT) User Guide Version 1.4*. <https://conchra.com.au/wp-content/uploads/2015/12/CCAT-user-guide-v1.4.pdf>
- Crowe, M., Sheppard, L., & Campbell, A. (2011). Comparison of the effects of using the Crowe Critical Appraisal Tool versus informal appraisal in assessing health research: a randomised trial. *JBI Evidence Implementation, 9*(4), 444–449. <https://doi.org/10.1111/j.1744-1609.2011.00237.x>
- Crowe, M., Sheppard, L., & Campbell, A. (2012). Reliability analysis for a proposed critical appraisal tool demonstrated value for diverse research designs. *Journal of Clinical Epidemiology, 65*(4), 375–383. <https://doi.org/10.1016/j.jclinepi.2011.08.006>
- Deng, S., & Hu, W. (2022). An examination of Chinese character writing errors: Developmental differences among Chinese as a foreign language learners. *Journal of Chinese Writing Systems, 6*(1), 39–51. <https://doi.org/10.1177/25138502211066611>
- Doug, R. (2019). Handwriting: Developing pupils' identity and cognitive skills. *International Journal of Education and Literacy Studies, 7*(2), 177–188. <http://dx.doi.org/10.7575/aiaac.ijels.v.7n.2p.177>
- Enfield, N. J. (2011). Dynamics of human diversity in mainland southeast asia: Introduction. In *Dynamics of human diversity: The case of mainland Southeast Asia* (pp. 1–8). Pacific Linguistics.
- He, G. R., & Liu, X. (2024). A study of enhancing the effectiveness on calligraphy teaching in international Chinese language education. *Journal of Roi Kaensarn Academi, 9*(6), 962–980.
- Hsiao, C. C., Lin, C. C., Cheng, C. G., Chang, Y. H., Lin, H. C., Wu, H. C., & Cheng, C. A. (2023). Self-reported beneficial effects of Chinese calligraphy handwriting training for individuals with mild cognitive impairment: An exploratory study. *International Journal of Environmental Research and Public Health, 20*(2), 1031. <https://doi.org/10.3390/ijerph20021031>
- Hsiung, H. Y., Chang, Y. L., Chen, H. C., & Sung, Y. T. (2017). Effect of stroke-order learning and handwriting exercises on recognizing and writing Chinese characters by Chinese as a foreign language learners. *Computers in Human Behaviour, 74*, 303–310. <https://doi.org/10.1016/j.chb.2017.04.022>
- Hue, M. T. (2009). Promotion of spiritual development: Exploration of the self and spiritualism through the practice of Chinese calligraphy. *Pastoral Care in Education, 27*(1), 63–76. <https://doi.org/10.1080/02643940902733886>
- Kao, H. S., Xu, M., & Kao, T. T. (2021). Calligraphy, psychology and the Confucian literati personality. *Psychology and Developing Societies, 33*(1), 54–72. <https://doi.org/10.1177/0971333621990449>
- Kempen, E., Labuschagne, M. J., & Jama, M. P. (2024). Elements of a safe learning environment: A student perspective. *African Journal of Health Professions Education, 16*(2), 58–62. <https://doi.org/10.7196/AJHPE.2024.v16i2.1222>
- Li, J. K. (2011). Calligraphy and modern Chinese writers. *Social Sciences in China, 32*(1), 110–126. <https://doi.org/10.1080/02529203.2011.548928>
- Li, P., Fang, Z., & Jiang, T. (2022). Research into improved distance learning using VR technology. In *Frontiers in Education* (p. 757874). Frontiers Media SA. <https://doi.org/10.3389/educ.2022.757874>
- Li, W. (2010). *Chinese Writing and Calligraphy*. University of Hawaii Press.
- Meng, F., Wang, H., & Zhang, L. (2024). The relationship between learning motivation and learning anxiety of college students. In *SHS Web of Conferences* (p. 02006). EDP Sciences. <https://doi.org/10.1051/shsconf/202419302006>
- Nam, E. Y. C. (2020). Expressive arts therapy with Chinese calligraphy elements as a working approach. *Creative Arts in Education and Therapy, 6*(2), 179–186. <https://doi.org/10.15212/CAET/2020/6/2>
- Paavola, S., & Hakkarainen, K. (2005). The knowledge creation metaphor—An emergent epistemological approach to learning. *Science & Education, 14*(6), 535–557. <https://doi.org/10.1007/s11191-004-5157-0>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The British Medical Journal, 372*, n71. <https://doi.org/10.1136/bmj.n71>
- Paul, B. (2011). *Theories in Adult Learning and Education*. Verlag Barbara Budrich. <https://doi.org/10.3224/86649362>



- Safitri, R., Hadi, S., & Widiasih, W. (2023). The effect of the problem based learning model on the students motivation and learning outcomes. *Journal Penelitian Pendidikan IPA*, 9(9), 7310–7316. <https://doi.org/10.29303/jppipa.v9i9.4772>
- Schneider, K. (2024). What is learning? *Psychology*, 15(5), 779–799. <https://doi.org/10.4236/psych.2024.155047>
- Sherin, M. G. (2002). When teaching becomes learning. *Cognition and Instruction*, 20(2), 119–150. https://doi.org/10.1207/S1532690XCI2002_1
- Tse, L. F., Siu, A. M., & Li-Tsang, C. W. (2017). Development of Chinese handwriting skills among kindergarten children: Copying of the composition in Chinese characters and name writing. *Journal of Occupational Therapy, Schools, & Early Intervention*, 10(1), 40–51. <http://dx.doi.org/10.1080/19411243.2016.1273159>
- Willingham, D. B. (1998). A neuropsychological theory of motor skill learning. *Psychological Review*, 105(3), 558. <https://doi.org/10.1037/0033-295X.105.3.558>
- Zairul, M. (2020). A thematic review on student-centred learning in the studio education. *Journal of Critical Reviews*, 7(2), 504–511. <http://dx.doi.org/10.31838/jcr.07.02.95>
- Zhang, J., Kang, L., Li, J., Li, Y., Bi, H., & Yang, Y. (2022). Brain correlates of Chinese handwriting and their relation to reading development in children: An fMRI study. *Brain Sciences*, 12(12), 1724. <https://doi.org/10.3390/brainsci12121724>
- Zhao, M. (2023). Calligraphy education: Its role and path in promoting the inheritance of traditional culture. *Frontiers in Educational Research*, 6(9), 48–53. <https://doi.org/10.25236/FER.2023.060909>
- Zhou, Q. B., Zhang, J., & Edelman, J. R. (2013). Rethinking traditional Chinese culture: A consumer-based model regarding the authenticity of Chinese calligraphic landscape. *Tourism Management*, 36, 99–112. <https://doi.org/10.1016/j.tourman.2012.11.008>

