Transforming Hanzi Pedagogy in the Digital Age

Theory, Research, and Practice

电写时代的汉字教学

理论与实践

Edited by Chengzhi Chu,
Matthew D. Coss, and Phyllis N. Zhang

ROUTLEDGE

Transforming Hanzi Pedagogy in the Digital Age
Theory, Research, and Practice

Transforming Hanzi Pedagogy in the Digital Age 电写时代的汉字教学 brings together expert researchers and practitioners to offer a coherent theoretical, empirical, pedagogical, and experiential justification for a shift in pedagogical focus from hand-writing to e-writing in L2 Chinese pedagogy.

This volume argues for a pedagogy based on the 21st century communicative needs of L2 Chinese users, grounded in empirical research as well as practical and lived experiences. The authors propose an "e-writing as primary" (电写为主，手写为辅) framework for L2 Chinese instruction in the 21st century, a transformational proposal which will fundamentally shift the pedagogical focus of L2 Chinese instruction globally towards more learner-centered, research-informed practice. This volume includes three theoretical foundation chapters, four empirical studies, three descriptions of program-level implementation, and ten expert L2 Chinese user vignettes, which, taken together, offer a thorough introduction to e-writing for the future of L2 Chinese teaching and learning.

This book will be informative for Chinese language instructors, researchers, program directors, materials developers, and advanced graduate students in both CFL and CSL contexts worldwide.

Chengzhi Chu (储诚志) is Associate Professor of Chinese and Senior Program Advisor in the Chinese Program at the University of California, Davis, where he also serves on the Graduate Faculty of Linguistics and Second Language Acquisition. He has published widely in Chinese linguistics (grammar, lexicon, writing system, and dialect), cognitive semantics, corpus linguistics, Chinese L2 pedagogy, application of technology in Chinese teaching, and intercultural communication.

Matthew D. Coss (高正远) is a PhD candidate in Second Language Studies at Michigan State University. His research focuses on the multiple existing and potential interfaces between additional language learning research and practice, with particular focus on (task-based) language teaching and assessment, language program design and evaluation, and language teacher education.

Phyllis N. Zhang (张霓) is Professor of Chinese at The George Washington University in Washington, D.C. With a background in applied linguistics and language education, Dr. Zhang has authored a series of proficiency-oriented Chinese language textbooks. Her research centers around L2 language proficiency development and assessment, pedagogical grammar, and the integration of technology to enhance language instruction.

Just as digital communication has become indispensable in our daily lives, so too has technology-based communication become a central skill area for learners of Chinese as an additional language. This volume, which skillfully presents theoretical rationales, empirical research, and practical experience on e-writing-based L2 Chinese pedagogy, is a long-awaited and highly innovative contribution to our field."

Xiliang Cui (崔希亮), *Professor of Chinese Linguistics, Beijing Language and Culture University; Past President of Beijing Language and Culture University*

"I have paid close attention to the emergence and evolution of digital writing in L2 Chinese teaching and learning over the last decade. This innovative volume demarcates the arrival of a new era of e-writing for L2 Chinese pedagogy. Further, it has brought together a dedicated group of scholars and pedagogues to offer expert insight into the future of L2 Chinese teaching and learning."

Chang-Mo Hsu (許長謨), *Professor Emeritus of Chinese, National Cheng Kung University; Past President, Association of Teaching Chinese as a Second Language of Taiwan*

"This volume presents an exceptional level of originality, fundamentally reshaping the research terrain of Hanzi and Chinese language instruction for the digital age. Undoubtedly, it constitutes a pivotal achievement for the e-writing movement, laying a solid and field-specific theoretical foundation for the global Teaching Chinese to Speakers of Other Languages community."

Quan Li (李泉), *Professor of International Chinese Education, Renmin University*

"The book provides a long-awaited yet revolutionary approach to the learning and teaching of Chinese characters both in terms of theory and practice, and is a must for Chinese language teaching professionals, students, and learners of Chinese."

George X. Zhang (张新生), *Professor of Chinese and Senior Advisor to the President and Provost, Richmond American University London*

"The focus on handwriting has stalled the practice of Chinese language teaching, and it is time to move forward as the studies and reflections in this volume argue. As both a scholar of L2 writing and an L2 Chinese learner, I am excited to see this proposal put forth, and hopeful that it will help current and future Chinese language learners achieve Chinese proficiency with much less struggle (time wasted) than I and so many others have experienced."

Charlene Polio, *Professor of Second Language Studies and TESOL, Michigan State University*

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Contents

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Matthew (Matt) D. Coss (高正远) is a PhD candidate in Second Language Studies at Michigan State University. His research focuses on the multiple existing and potential interfaces between additional language learning research and practice, with particular focus on (task-based) language teaching and assessment, language program design and evaluation, and language teacher education.

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Foreword[1]
序（作者原文）

Quan Li（李泉）

Renmin University of China

Since the beginning of the 21st century, we have witnessed a rapid and practically uninterrupted evolution across all technological domains, including the increasing "intelligence" of computers and smartphones. In essence, this digital era has brought about a profound and irreversible transformation that has reshaped our global landscape and revolutionized our methods of communication. Likewise, Chinese-language (Hanzi-based) communication has experienced an irreversible metamorphosis, now predominantly relying on Pinyin-based input on increasingly smart devices for all manner of digital interactions. Nonetheless, over the past two decades, the teaching of Chinese characters (Hanzi) across the field of Teaching Chinese to Speakers of Other Languages (TCSOL) has, for the most part, clung to traditional paradigms, blissfully oblivious to the widespread and rapid changes in technology and tech-enhanced communication spanning the educational landscape. The potential for typing (打字), or e-writing (电写), as a viable alternative for teaching and learning Hanzi has largely been disregarded in both pedagogy and research circles. Instead, a fervent adherence, bordering on fixation, to pen-and-paper Hanzi hand-writing persists as the prevailing approach to TCSOL globally.

Encouragingly, in recent years, some colleagues in the United States have taken a decisive stance, leading the charge in advocating for a modernized approach to Chinese character instruction for the digital age, the editors and contributors to this volume especially. I am fortunate to have had the privilege of attending both online and offline presentations by (volume co-editor) Professor Chengzhi Chu, where he proposed a novel pedagogy for Hanzi in what he called "the digital writing era." It was through his talks, in fact, that I first encountered the notion of a "digital writing era." On December 8, 2022, during an online lecture as part of the Global Chinese Language Teaching series hosted by East China Normal University, Professor Chu further elaborated on the transformations in Chinese writing leading up to the present (digital writing) era. He identified and elaborated on three major periods in Hanzi writing tools' development, evolving from knife carving to brush and pen writing, culminating in digital writing on electronic screens. Professor Chu's talk also highlighted changes in Chinese written communication styles, arguing that the cultivation of Hanzi abilities for the digital writing era should shift from hand-writing Hanzi stroke by stroke to prioritizing e-writing via an emphasis on character recognition and differentiation. Professor Chu proposed a

new approach for Hanzi instruction in the digital age: e-writing as primary, hand-writing as secondary (电写为主、笔写为辅). He underscored the importance of prioritizing extensive e-writing while reserving hand-writing for select instances, advocating for an early start with e-writing followed by gradual incorporation of hand-writing ("电写一切、笔写一些，早早电写、逐步笔写"). Professor Chu's lecture greatly enriched my understanding and left me excited about this new pedagogical framework for Hanzi instruction in the digital age. Beyond its innovativeness, the cutting-edge and forward-looking principles of this framework possess the potential to propel TCSOL to unprecedented heights.

What's even more exciting is the comprehensive scope of this edited volume, titled *Transforming Hanzi Pedagogy in the Digital Age: Theory, Research, and Practice*, which has transcended conventional confines to redefine the landscape of Hanzi pedagogy and research. Through a multi-faceted approach, it delves into the "e-writing as primary, hand-writing as secondary" (henceforth e-writing) framework for Hanzi pedagogy, offering theoretical, empirical, and pedagogical insights to fortify this innovative approach within the TCSOL field. This volume presents an exceptional level of originality, fundamentally reshaping the research terrain of Hanzi and Chinese language instruction for the digital age. Undoubtedly, it constitutes a pivotal achievement for the e-writing movement, laying a solid and field-specific theoretical foundation for the global TCSOL community. Its most significant contribution lies in its multifaceted and consistent demonstration, encompassing both empirical investigations and programmatic pedagogical experiments, that e-writing has a multitude of advantages over hand-writing for L2 Chinese learners. This robustly supports and further develops the proposed e-writing framework outlined in the volume.

The volume's second major contribution relates to Hanzi's morphographic nature, which has historically necessitated the rote memorization of the written form, pronunciation, and meanings of each character, given that strokes and stroke order have little (systematic) bearing on character recognition, pronunciation, and comprehension. E-writing ameliorates this by linking sound with form and meaning, affording stronger connections among these three aspects of characters and words, which in turn facilitates literacy and proficiency development. Conversely, hand-writing involves a fragmented, stroke-by-stroke assembly of Hanzi, resulting in heightened memory demands, while e-writing encompasses a cohesive encoding, storage, and retrieval of sound, form, and meaning, leading to amplified learning benefits and efficiency. Thus, e-writing harmonizes more seamlessly with the inherent mechanics of Chinese characters, organically fusing form, sound, and meaning in the Hanzi learning process.

The third major contribution of this volume involves a reexamining of fundamental terms and concepts, particularly "writing." Additionally, the volume provides a precise operationalization for the supplemental roles of hand-writing: "learning-based," "communication-based," and "experiential-based." Further, a convergence of various studies within the volume suggests that e-writing is likely to invigorate learners' interest and motivation, bolster their sense of achievement and self-directed learning, and yield heightened efficiency in vocabulary acquisition and

enhanced writing skills compared to traditional hand-writing pedagogies, among many other benefits.

Hanzi are a fundamental factor influencing L2 Chinese learners' confidence, progress, efficiency, and proficiency development. Success or failure of learning Chinese is heavily contingent upon the success or failure of mastering Hanzi, making advancements in Hanzi instruction synonymous with advancements in Chinese language teaching as a whole. There is ample reason to believe that the concept of the "digital writing era" and its related research foci will not only usher Hanzi teaching and learning research into a new era, but also infuse the TCSOL field with vitality, akin to how Reform and Opening-up brought prosperity and development to China. Therefore, I extend my congratulations and gratitude to the editors and authors of this book for contributing a highly innovative, substantial, and practically valuable book focused on the central issues shaping the TCSOL landscape. I look forward to witnessing more significant contributions from the authors, editors, and other colleagues in the field as we collectively navigate L2 Chinese pedagogy in the digital writing era. In closing, I am grateful to the editors and contributors of this volume for giving me the honor of contributing this foreword.

Quan Li
August 8, 2023
Beijing

Note

1 Translated by Matthew D. Coss, August 17, 2023.

序（作者原文）

21世纪以来，科学技术日新月异，电脑手机越加智能化。信息化时代的今天，全世界都已“换笔”，且不可逆转。电脑手机输入拼音提取字词，积字词成句成篇，业已成为中文语文生活的常态，且同样不可逆转。然而，近20年间，国际中文教育中的汉字教学，总体上仍“与世隔绝”，固守在传统的汉字教学“桃花源”中，而不问“今是何世”，仿佛信息化时代“与我无关”。“打字”教学和研究始终未提到学科建设的日程，更未被视为前沿性、关键性课题。“汉字膜拜”“笔写迷恋”依旧是汉字教学的主流观念和形态。

令人欣喜的是，近年来，美国一些同行旗帜鲜明地呼吁和引领汉字教学进入“电写时代”，本书编者和作者就是其中的代表。幸运的是，我线下线上几次听过储诚志教授电写时代汉字教学理论与实践问题的演讲，“电写时代”的概念也是从他那里听到的。2022年12月8日，他在华东师范大学主办的“全球汉语教学系列讲座”线上演讲中，进一步阐释了电写时代汉字教学的变革：从书写工具的变革，将汉字书写分为“刀版刻铸、帛纸笔写、屏幕电写”三个时代；从中文书面交际方式的变革，提出汉字电写时代的到来；从汉字实用能力的变革，提出电写时代汉字能力培养应从“一笔一划”书写字形，转变为认字、电写和辨字能力；从与笔写对比中，提出电写时代汉字教学的理念：电写为主、笔写为辅，电写一切、笔写一些，早早电写、逐步笔写。诚志教授的演讲让我获益良多，更让我兴奋地感到信息化时代“电写为主，笔写为辅”汉字教学理论框架已然初步形成，不仅具有革新性，更因其适应当代语文生活方式的变革和二语教学智能化发展的需要，而具有前沿性、导向性和引领性。

更令人欣喜的是，《电写时代的L2汉字教学：理论与实践》这部专辑，整体上突破了传统意义上汉字教学研究范畴和语境，多角度研究、实证和丰富了“电写为主，笔写为辅”汉字教学理论框架，因而更具导向性和引领性。该专辑具有高度的原创性，整体上开拓了电写时代汉字和中文教学研究的新局面，堪称“电写为主，笔写为辅”汉字教学理论的旗帜性成果，体现了国际中文教育界基于汉语汉字特点的理论自信。其最大贡献在于，从理论研究和教学实验研究多角度证明“电写”汉字及中文教学的效益和质量远优于“笔写”，这就从根本上支撑起了“电写为主，笔写为辅”汉字教学理论框架。其学理贡献在于，汉字是语素文字，一个汉字的字形、字音、字义基本上都要“死记硬背”，笔画笔顺与识认字形字义没有关系。电写由音寻形识义，能够将字词的“形音义”紧密联系起来，更有助于字词的掌握；笔写碎片化的组装增加记忆负担，电写“音形义”整体编码、记忆和提取，

学习效益大、效率高。这表明，电写更适合汉字“集形音义于一身”的内在机理。其多元贡献在于，重新探讨了“写”等基本术语和概念的内涵；诠释了“学习式、沟通式、体验式”三种笔写辅助方式；相关研究显示，电写有助于强化学习者的学习兴趣和动机，有助于增强学习者中文学习的成就感和自主学习能力；电写比笔写词汇学习效率更高、写作能力更强，等等。

汉字是影响学习者中文学习信心、进程、效率和水平的关键因素，中文学习的成败很大程度上取决于汉字学习的成败，汉字教学的突破就是中文教学的突破。有充分理由相信，“电写时代”这一概念及相关研究成果，不仅将汉字教学研究带入一个崭新界面，更将为国际中文教育带来勃勃生机！如同“改革开放”为中国带来的繁荣和发展一样。在此，祝贺和感谢本书编者和作者在影响国际中文教育全局的核心问题上，贡献一部创新性强、含金量高、应用价值大的研究成果。期待本书作者编者和国际中文教育界更多的同人，在电写时代汉字及中文教学研究中做出更多更大的贡献。感谢编者和作者给我“写序”这份殊荣。

李泉

2023–08–08于北京

Introduction
导言

Matthew D. Coss (高正远), Chengzhi Chu (储诚志), and Phyllis N. Zhang (张霓)

Impetus for This Volume

The invention of the calligraphy brush (毛笔) presented the first major revolution in the mass production of Chinese writing during the Warring States Period (475 BC–221 BC) in China. This invention caused permanent and fundamental shifts in the quantity and level of access to written material, not to mention vastly reducing the time required to produce texts, and even caused a major shift in the writing system used by literate members of Chinese society, bringing about Clerical Script (隶书), Standard Script (楷书), and Cursive Scripts (行书 and 草书). Similarly, in the middle of the 20th century, the popularization of ink pens led to the gradual decline of the ubiquity of the brush as the primary writing instrument in China. This trend has repeated itself multiple times over the millennia that the Chinese writing system, Hanzi (汉字/漢字), has existed, with major shifts in the system repeatedly following technological advances throughout history—the calligraphy brush supplanted the carving knife just as silk and paper replaced bamboo or wood strips and metal vessels, stone tablets, and animal bones before them. As technology has advanced, Chinese literacy practices—the ways Hanzi texts are produced and consumed for a variety of communicative purposes—have changed as well.

In this volume, we present a theoretically grounded, empirically supported, pedagogically viable response to what we propose constitutes the second major revolution in the technology for written production of Chinese: the computer. That is, just as the calligraphy brush fundamentally changed communication via Hanzi centuries ago, so too have the computer and other digital technologies changed the ways that Hanzi are produced and consumed in the digital age, for native users and additional language learners of Chinese alike. In particular, this volume focuses on additional language (L2) learners of Chinese, particularly those learning in so-called foreign language (CFL[1]) contexts where regular access to Chinese is relegated primarily to the language classroom (and also to family homes and communities, for some heritage learners). Given the severely limited time that 'foreign' language learners at any age have to develop L2 Chinese proficiency, pedagogical approaches that maximize learning outcomes, minimize the learning burden, and also ensure high relevance to learners' current and future communicative needs and interests are critical. As this volume will demonstrate, digital tools like computers,

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tablets, and smartphones present unprecedented possibilities for efficient, effective, and maximally relevant teaching and learning of L2 Chinese in the digital age.

To make the case that the 21st century demands a revolutionary pedagogical approach in response to the computer-driven second technological revolution in Hanzi text production, this volume brings together internationally renowned teachers, program directors, and scholars of L2 Chinese acquisition, pedagogy, assessment, and program design. Their contributions collectively offer a vision for L2 Chinese in the 21st century based on years of engagement in theory-building, empirical research, pedagogical innovation, and language program development and evaluation. Together, the contributors in this volume propose that hand-writing based Hanzi teaching and learning should be replaced with the e-writing based (电写为主) approach. Fundamentally distinct from the historical (and in many places enduring) approach to L2 Chinese teaching and learning which prioritizes the production of large quantities of Hanzi by pen(cil) and paper from memory by hand, the e-writing approach prioritizes the development of literacy and communication skills via technology-enhanced textual production, primarily keyboard-based typing (but including technologies like speech-to-text tools, etc.). The e-writing approach foregrounds L2 Chinese users' ability to access and engage with texts, communicate interpersonally in digital media, and produce digital and multimedia texts in a variety of genres (i.e., the interpretive, interpersonal, and presentational modes of communication respectively) while simultaneously prioritizing the development of oral-aural communication skills. Unlike the status quo approach in most present-day L2 Chinese pedagogy (hand-writing primary), digital communication in the e-writing approach has the added benefit of being mutually constitutive of and mutually reinforcing with oral-aural skills (see, e.g., Z. Zhang and P. Zhang, this volume). This volume also anticipates and addresses common concerns and misunderstandings about a 电写为主 (e-writing based) pedagogy, demonstrating (1) that this approach does not require or even allow lowering standards for academic rigor, (2) that e-writing is more effective for long-term Hanzi retention than hand-writing, (3) that e-writing affords preservation of and engagement in and with Chinese cultural experiences and bodies of knowledge, and (4) that learning Chinese as an additional language without hand-writing Hanzi is not only possible, but that it is ideal for L2 learning contexts (for details, see Chu; Coss, Ch. 2, this volume).

As scholars, language program coordinators, and experienced language teachers ourselves, we the co-editors firmly believe it is our collective job across the L2 Chinese professional field to engage scientifically, objectively, and deeply with the potential affordances of this technological revolution in order to understand the extent to which these affordances can be harnessed in our language programs in the digital age. Therefore, we implore you, the reader, to engage with this volume with an open mind, understanding that our goal is to preserve and more effectively promote the cultural richness of the Chinese writing system in the 21st century, carrying forward the millennia-old tradition of learning and using Hanzi in a way that is as relevant and efficient for time-limited L2 learning contexts as possible. We present this approach on the basis of theory, research, practice, and L2 learner

experiences, in the hopes that the content of this volume will bring about much-needed changes and discussions in the field of L2 Chinese pedagogy worldwide.

Structure of the Volume

This volume is divided into four sections: Theory, Research, Practice, and Reflective Essays. Taken together, these sections provide a theoretically grounded, empirically supported rationale, experience-informed pedagogical possibilities, and expert L2 Chinese learners' perspectives to pave the way for the e-writing based (电写为主) approach to L2 Chinese pedagogy. The content of each section and chapter is summarized briefly here.

In the **first chapter** of **Section I (Theory)**, Chengzhi Chu (储诚志) offers an overview of the implications of the revolutionary shift in communication via Hanzi brought about by digital technology, providing a detailed rationale for why a 电写为主 (e-writing based) pedagogy is imperative for L2 Chinese instruction. Based on the proposal of the Benefit Optimization Principle for Second Language Education (外语教学的效益最优化原则), this chapter argues that an e-writing based approach is not only wholly justified, but also urgently necessary to maintain the relevance and efficacy of Chinese language programs moving forward. The chapter goes on to introduce a framework for understanding the primary and secondary functions of Hanzi for L2 Chinese differentiating 'Cultural Hanzi' (文化汉字) from 'Instrumental Hanzi' (工具汉字), the two related but different properties of all Chinese characters, clarifying widely held misconceptions which regularly motivate inefficient and ineffective pedagogical approaches, and demonstrating the capacity of an e-writing based approach to facilitate (not reduce) L2 Chinese learners' opportunities to develop understanding and appreciation of Chinese culture. The chapter further identifies three essential digital-age Hanzi skills: character recognition (and text reading), digital inputting, and character differentiation (and text proofreading), and suggests a framework which differentiates 'practical writing (实用性书写)' from 'experiential writing (体验性书写)', crucial for implementing the e-writing based (电写为主) approach in practice, particularly in university contexts.

In **Chapter 2**, Matthew D. Coss (高正远) offers a detailed clarification of commonly confused and sometimes misleading concepts relating to the development of L2 Chinese literacy and proficiency, with particular reference to CFL contexts. The chapter then presents common arguments in favor of and against a hand-writing as primary approach with reference to multiple pedagogical proposals from relevant literature. The chapter then presents a clarified framework and rationale for e-writing (电写为主), emphasizing this approach's many affordances relative to the status quo hand-writing based approach for the development of L2 Chinese literacy in the 21st century language classroom. In complementary fashion to Chapter 1, this chapter responds to issues and non-issues relating to the 电写为主 approach, clarifying misconceptions and highlighting areas in need of further theory-building, empirical investigation, and pedagogical experimentation in a variety of educational contexts.

In **Chapter 3**, Zheng-sheng Zhang (张正生) argues that adopting an e-writing based approach to L2 Chinese education is not only inevitable, but also highly desirable. Zhang enumerates the many benefits of prioritizing typing over hand-writing in L2 Chinese education: typing is easier and therefore more cost-effective in terms of time invested and outcomes gained for students; the process of pinyin-based typing directly connects sound, meaning, and form, integrating multiple aspects of Chinese language learning and supporting pronunciation development (another challenging area for L2 learners); typing affords the potential to develop meta-linguistic awareness of homophones, character components, and word segmentation; and typing reduces learning anxiety and increases motivation. Taking these factors into account, Zhang sees the shift from hand-writing to typing as a 'game changer' for L2 Chinese education.

Together, the chapters by Chu, Coss, and Z. Zhang offer an in-depth summary of the theoretical considerations underpinning this volume's argument for a shift to the 电写为主 approach to L2 Chinese pedagogical and program design.

In **Section II (Research)**, empirical support for the e-writing based approach is provided in three quantitative studies and one synthesis chapter. This section begins with **Chapter 4**, in which Phyllis N. Zhang (张霓) reports results from a quasi-experimental analysis comparing novice-level L2 Chinese learning with and without audio-enhancement in a typing-based pedagogical context, building on evidence published in Zhang (2021). Three modes of Hanzi learning are compared: a balanced hand-writing plus typing approach (手写键打平衡), a typing-primary approach without enhanced-audio input (无听打强化的键打模式), and a typing-based approach augmented by weekly typing with audio-input, the latter two both in a pedagogical setting where hand-writing was not required (听打强化的键打模式). Results show a clear advantage for audio-enhanced typing-based Hanzi learning on measures of writing fluency, writing complexity, and lexical recognition and recall over the other two groups. Unlike most studies of L2 Hanzi learning, both P. Zhang (this volume) and Zhang (2021) offer empirical support for the Hanzi learning and literacy development potential afforded by an e-writing approach in the classroom learning context rather than laboratory-based studies.

In **Chapter 5**, Xiwen Lu (陆熙雯) and colleagues present the first set of empirical studies to compare word-level (rather than the commonly studied individual character-level) vocabulary learning gains for L2 Chinese learners assigned to hand-writing and non-hand-writing experimental conditions. The first experiment was conducted in intermediate-level classes at a university in the United States. This was followed by three replications of the same experiment with learners at different universities under slightly different experimental conditions (changing the proportion of hand-writing and recognition activities during the groups' learning phases). Results from all four experiments demonstrate that learners in the hand-writing condition were always significantly outperformed by those in the non-hand-writing condition on measures of word recognition and recall. This study provides clear counterevidence to the common assertion that hand-writing is optimal, or required, to learn and remember L2 Chinese vocabulary.

In **Chapter 6**, Jun Da (笪骏) and colleagues explore the learning potential of an under-researched tool in L2 Chinese pedagogy: speech-to-text technology. This chapter reports results from a pilot study conducted in novice- and intermediate-level CFL courses at three U.S. universities. Their pedagogical experiment and results demonstrate speech-to-text technology's growing potential as both a pedagogical and self-guided learning tool, showing that despite flaws in the current version of the technology, learners found it highly engaging and beneficial.

In **Chapter 7**, Luyao Zhang (张鹭遥) and colleagues review 25 empirical studies published between 2010 and 2021 on the effects of pinyin-based typing (currently the dominant form of Hanzi e-writing) on learning Chinese in both CFL and CSL contexts. Key findings from the 25 studies suggest that typing has wide-ranging benefits for L2 Chinese learning: it supports Hanzi learning by enhancing connections between pronunciation, written word forms, and word meanings; it promotes metacognition during the text composition process and improves overall writing performance; it boosts students' autonomy and confidence in Chinese learning. Unsurprisingly, L2 Chinese learners are generally in favor of typing over hand-writing in L2 Chinese learning, especially in a CFL environment.

As converging evidence with the empirical findings presented in the previous section, **Section III (Practice)** presents examples of contexts in which a 电写为主/e-writing based approach has been successfully implemented not just in single pedagogical activities or courses, but in entire L2 Chinese programs, ranging from novice- to advanced-level proficiency for both heritage and non-heritage learners. In **Chapter 8**, Qian Wang (王蒨) and Hsiang-ning Wang (王祥寧) detail the University of British Columbia's experience shifting to a 电写为主 approach over the last decade—no small feat given that UBC is the largest L2 Chinese program in North America. In their chapter, they discuss the rationale for this shift and share evidence of the approach's success and results for both heritage and non-heritage learners of Chinese, providing a wealth of examples which serve as actionable information for programs seeking to shift towards an e-writing based approach. In **Chapter 9**, Xiaoyan Hu (胡小燕) and **Wenchao** He (何文潮) describe the critical need for a 电写为主 approach to enable L2 Chinese learners to reach professional levels of proficiency (i.e., sufficient ability to use Chinese in various work roles). Rich with examples from the University of Rhode Island's Chinese program, this chapter explains and exemplifies the affordances of a curriculum developed around the concept of 电写为主，手写为辅 (e-writing primary, hand-writing secondary), summarizing the wealth of experience gained by this field-leading program during more than a decade of research and innovation. Finally, in **Chapter 10**, Matt Coss (高正远) presents a rationale and a framework for the circularization of Hanzi—that is, a systematic approach to teaching and learning Hanzi beyond hand-written rote memorization across the Chinese learning trajectory of all learners. This proposal offers a culturally rich, pedagogically rigorous, and high-impact student-centered instructional approach to systematically incorporating Hanzi instruction into a 电写为主 approach.

The final section of the book, **Section IV**, features a series of nine short reflective essays (笔谈) written by individuals from three generations of Chinese learners

who, in addition to decades of learning and using Chinese, are at various stages of their careers as scholars, researchers, and teachers of Chinese as an additional language. They have established U.S.-based and China-based study abroad programs, built language learning companies, published academic books and journal articles, directed national organizations and initiatives, led local, national, and global professional development, and, of course, continue to use Chinese in their professional and personal lives. In alphabetical order, they are Dr. Michael E. Everson (University of Iowa), Kevin Fedewa (Michigan State University), Vashti Wai Yu Lee (Michigan State University), Olle Linge (Hacking Chinese), Dr. Victor H. Mair (University of Pennsylvania), Dr. David Moser (Beijing Capital Normal University), John Pasden (Mandarin Companion and AllSet Learning), Dr. Eric Pelzl (The Hong Kong Polytechnic University), and Dr. Frederick Poole (Michigan State University). Their contributions offer nine converging perspectives supporting 电写为主 approaches to L2 Chinese pedagogy based on very different lived experiences learning and professionally teaching, researching, and using Chinese. These first-person perspectives complement the empirical and pedagogical evidence in Sections II and III and demonstrate the widespread agreement among many expert L2 learners and teachers that the e-writing based approach is the ideal path forward for the field.

Notes on Terminology in This Volume

On 'Hanzi' and 'Writing'

There are two terms that require the reader's attention prior to engaging with the content of this book. As we describe later, this volume focuses on L2 users' ability to communicate using L2 Chinese in written modalities, rather than their ability to produce individual characters via any particular modality. As such, we prioritize use of the word **Hanzi** (the Hanyu Pinyin for 汉字/漢字 without tone marks) to concisely convey 'the Chinese writing system'. We feel this term accomplishes this goal better than the more wordy 'Chinese characters' or the isolated 'characters'. We restrict our use of '(Chinese) characters' to refer specifically to learners' ability to recognize and or produce individual characters in isolation, as is common in lab-based research reported elsewhere, rather than in textual communicative contexts.

Second, we wish to clarify our use of **writing**, as this is a polysemous term with which scholars and practitioners are often talking (or writing, as it were) past each other. In one sense, writing can refer to the product or result of the process of writing. In a second sense, writing, as in 'speaking, listening, reading, and writing', refers to a language user's ability to produce some amount of text (i.e., 交际写作). In its third sense, writing can specifically mean one's ability to produce symbols in a given language (e.g., letters, Chinese characters), often from memory and often by hand (i.e., 文字书写). As the burden of producing symbols for written communication by hand versus via typing is not substantially different for literate and technologically competent language users of most languages (English, Spanish, Russian, Arabic, Korean, etc.), the distinction between producing symbols and

texts is often not made when discussing written production in most languages. However, given the imprecision of discussion often resulting from writing's multiple possible meanings (see Coss, Chapter 2, this volume), in this volume we use 'writing' to mean the ability to compose *and* the activity of composing text (in L2 Chinese) **for a communicative purpose**, and only specify the medium of writing when relevant. When contributing authors describe specific approaches used in research and pedagogy, they follow the taxonomy proposed in the following section, and when appropriate employ specific sub-term(s) to specify research tasks and pedagogical procedures for their own research and pedagogical contexts.

A Proposed Taxonomy of Analog and Digital Chinese Writing

The L2 Chinese field (and Computer-Assisted Language Learning, CALL, more broadly) has used a wide variety of terms to succinctly communicate the concept of 'producing text using digital tools in an additional language', including 'typing', 'keyboarding', 'digital composition', and many others. The terminological diversity, which includes both different ways of describing the same concept and various minor (and sometimes major) distinctions between conceptually overlapping but importantly distinct ideas, is further muddled when terms are proposed in both Chinese and English, which often results in semi-equivalents rather than exact matches. The current state of affairs, in which it is often unclear whether by 'writing' we mean '(memorized, isolated) handwritten production of graphemes' or 'fluent, coherent (modality-neutral, but appropriate for communicative functional needs and contexts) textual production and communication' has impeded progress in the field and must be rectified. To this end, we offer a brief summary of the most common terms in the literature in both English and Chinese followed by a taxonomy in which we clarify the definitions and relationships between these terms. It is our hope that the taxonomy will serve as a foundation for terminological precision in future discussions, particularly of L2 Chinese writing.

English terms to describe writing and composition, specifically when contrasting hand-written and non-hand-written modalities, include typing, texting, keyboarding, e-writing, digital writing, digital composition, hand-writing, and writing by hand, among others. Chinese terms include 打字、电打、电写、电子输入、电书、键打、键写、语音输入、语音转文字、触屏、指写、手写、默写 and 笔写, among others. When describing a pedagogical approach, 电写为主 and 手写 or 笔写为主 are the most common Chinese terms. There is somewhat less consensus in English, with common terms including hand-writing-centric, hand-writing-primary, e-writing primary, computer-based, typing-supported, electronic-writing, and Computer Chinese all being used in the literature. We propose the following taxonomy of terms (Figure 0.1) in which we define each term and organize their relationship hierarchically, to serve as a standard for the field moving forward.

First, we divide Chinese written production, which includes both the production of Hanzi as well as the production of text for communication, into two modalities: **电写**[2] **(e-writing)** and **手写 (hand-writing**[3]**)**. The key distinction between these two modalities is the basic unit with which graphemes (specifically, Chinese

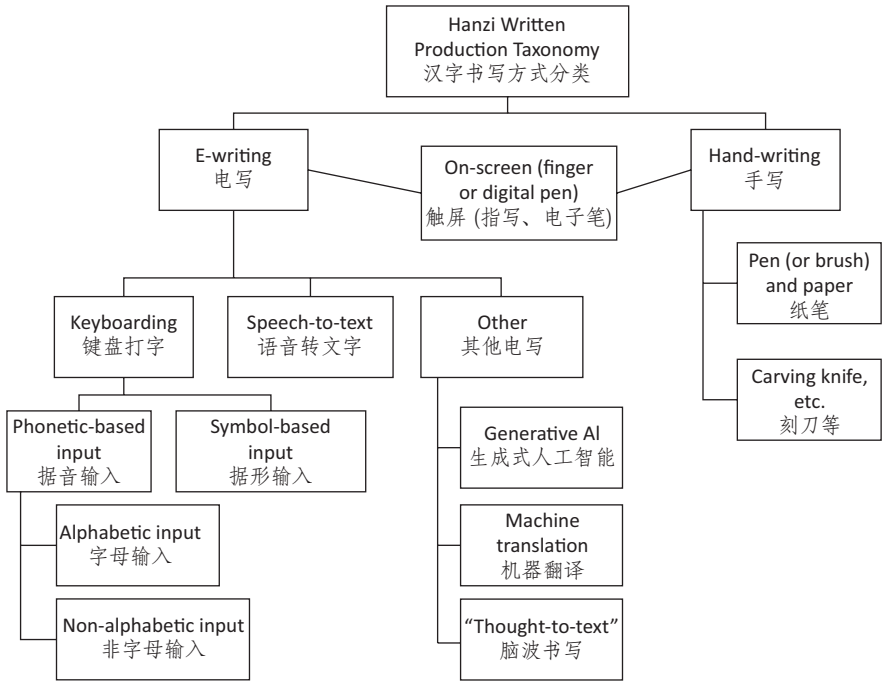

Figure 0.1 A Taxonomy of L2 Chinese Written Production

characters) are produced in each. In e-writing/电写, characters are produced fully formed, usually using a phonetic input system (see detailed explanation later). In hand-writing/手写, characters are formed stroke by stroke (line by line), usually with the expectation that a particular directional and sequential pattern (stroke order/笔顺) is followed. E-writing allows Chinese to be produced at the lexical (word) level, as composers can phonetically type out and select from multi-syllable words (e.g., typing 'baozi' to produce the word 包子), while hand-writing requires sub-lexical production of Chinese, as strokes are written one at a time to form components and characters. E-writing also requires knowledge of the pronunciation of characters and words for textual production to be possible, while hand-writing does not. It is important to note that the distinction between hand-writing and e-writing made in this taxonomy is not one based solely on tool or modality (i.e., analog versus digital). This relatively narrow definition differs from what is perhaps a more intuitive distinction between hand-writing and e-writing (i.e., all text produced electronically is e-writing, while hand-writing is limited to text produced by non-digital tools like pen and paper). However, given the processing differences involved in e-writing and hand-writing Chinese (see Zhang, 2021, p. 4 for a detailed overview), we have settled on this distinction of **modalities which necessitate sound (pronunciation) knowledge vs. modalities which do not**. Additionally, e-writing generally provides writers with some amount of immediate feedback, while hand-writing does not. That is, if one intends to type the word 'eat' in Mandarin,

typing 'che' instead of 'chi' would provide immediate feedback, since 吃 would not be listed as an option to choose based on the input 'che'. In this sense, our definition is nuanced in that it recognizes shared features beyond a binary, with input options like screen-based character writing (i.e., with an e-pen or a fingertip) sharing both features of hand-writing (i.e., sub-lexical stroke-by-stroke character production) and e-writing (i.e., immediate feedback, with algorithm-based character options presented based on the input). This is reflected in the earlier figure, with on-screen input being connected to both hand-writing and e-writing as superordinate categories.

The umbrella category e-writing includes **keyboarding/键盘打字** (synonymous with 键写/键打), **speech-to-text/语音转文字** (or语音输入), and other technologies at varying stages of developmental maturity, including generative AI, machine translation, and thought-to-speech technology under development (see, e.g., Herff et al., 2019). Keyboarding subsumes the use of both physical keyboards and keyboards displayed on a digital screen (e.g., on a tablet or cell phone). Within keyboarding, input systems are divided first based on whether sound-based or symbol-based building blocks are used to type. **Symbol-based inputs**, **据形输入**, include 五笔, 仓颉, and other more recent (e.g., 和码系统) keyboard-based typing techniques that rely on users' knowledge of the strokes which make up a character, rather than the character's pronunciation, to type it. **Phonetic input systems**, or 据音输入, use Latin letters or non-Latin symbols, each of which corresponds to a sound in spoken (in this case Mandarin) Chinese. When written in a syllable group (e.g., when one types 'b a o' to form the Chinese syllable bao), these letters are converted into a range of Chinese character options which can be selected on a digital screen. Within this category, we further differentiate between **alphabetic-based input/字母输入** and **non-alphabetic input/非字母输入**. The former subsumes all digital keyboard-based inputs using letters (e.g., Hanyu Pinyin); the latter includes non-letter-based input systems like the *bopomofo/Zhuyin Fuhao* system commonly used to type non-simplified (or 'traditional') Chinese characters.[4] Hand-writing refers exclusively to writing in which Chinese characters are produced stroke by stroke, character by character. This includes writing done using pen(cil) and paper, digital pens or fingers on touchscreens, and older technologies like calligraphy brushes and carving knives. Hand-writing is usually operationally equivalent to **writing from memory/默写**, though this is not exclusively the case, as some tasks (both pedagogical and for real-world communication) allow for the use of resources like dictionaries or copying characters by hand.

The Road Ahead for E-Writing Based Pedagogy

This volume is the first book that introduces and argues in favor of the 电写为主 approach to L2 Chinese pedagogy. Though we are confident in the theory, research, and pedagogical practices we present here, we will be the first to affirm that the work is just beginning. Curricular design and implementation, teaching materials development, and the viability, effectiveness, as well as stakeholder experiences with the 电写为主 approach have just started to be explored empirically, and each of these areas merits significant further exploration. Research into learning outcomes, especially research embedded in language courses and programs (e.g., P. Zhang, Wang & Wang, Hu & He, and Coss Ch. 10, this volume) rather than

lab-based studies of decontextualized character learning, is one critical area for continued work. We are aware of a number of empirical projects currently underway in programs at every stage of transition towards the 电写为主 approach, from non-adopters still mandating large amounts of hand-writing to programs that have entirely shifted to 电写 (e-writing). Rigorous research and reporting from these and other initiatives will shed further light on both the affordances and full development and implementation of the 电写为主 approach, which in turn will push the field to refine the approach further.

As language programs make transitions like those described in P. Zhang (2021, p. 9, and P. Zhang this volume), Hu and He (this volume), and Wang and Wang (this volume), the experiences of the various stakeholders, from teachers to learners to teaching assistants and study abroad partner programs, must also be explored. Indeed, all aspects of both the outcomes and experiences surrounding the implementation of the 电写为主 approach will be fertile areas for research and pedagogical experimentation going forward. An additional critical area for immediate work is the development of curricula, materials, and assessments to support transitions towards and full adoption of the 电写为主 approach. Textbooks, digital tools like websites and mobile apps, and instructor guides to use these new resources are all fundamental to facilitating the pedagogical shift we believe the field desperately needs. The development and adoption of these new materials will also require widespread teacher professional development. Both of these initiatives, materials development (and implementation) and teacher professional development, are areas which would benefit from substantial additional research.

A third area that requires careful attention and collaboration as the 电写为主 approach takes hold across the L2 Chinese field is program articulation, which should be explored in at least three different senses. As individual teachers engage with the ideas in this volume and subsequent publications, the need will undoubtedly arise for colleagues working in the same program to discuss the potential merits as well as the practical, logistical realities of shifting their pedagogical approach(es). Though individual adopters of innovative approaches are often sufficient to spark changes in their educational contexts, sustained change requires collaboration and consensus-building (Carless, 2013). As such, colleagues within programs will need to document their experiments, share their struggles and their successes, and collaborate to develop an articulated curriculum from lower- to upper-level Chinese courses. Similarly, pedagogical approaches and minimal achievement thresholds must be established and communicated so that students can continue their learning trajectories as they transition from one educational level to another (e.g., high school to college). As Zhao and colleagues (2023) have argued, consensus must be reached between high school and university Chinese programs, particularly for critical elements of the transition from high school to college like placement tests. By establishing requirements for written Chinese communicative ability (both for e-writing and, optionally, hand-writing), which may differ for different learner populations (i.e., immersion program students, heritage learners, additional language

learners in non-immersion programs), the field will decrease the likelihood that students quit learning Chinese as they transition from one level of school to the next (Diao & Liu, 2021; Zhao et al., 2023). Finally, consensus will need to be reached internationally in study abroad partnerships between Chinese language programs and in-country study abroad programs. If a student's home Chinese program uses a 电写为主 approach, but the study abroad program(s) with whom they partner use a 手写为主 approach, disparities in student abilities relative to differing program expectations may pose challenges for placing, teaching, and assessing students. Without consensus between partner programs and tools to smoothly transition students between programs, student learning and affect is likely to be negatively impacted in transition to and from study abroad much in the same way that it is impacted when students are placed into low levels in college after many years of language study prior to college (see, e.g., Diao & Liu, 2021). All three of these articulation consensus areas will involve the continued clarification and refining of standards, assessments, and policies at local (i.e., school/program, for placement) and inter/national levels. For example, the ACTFL proficiency standards do not specify writing modality, while the newly published Chinese Proficiency Grading Standards for International Chinese Language Education《国际中文教育中文水平等级标准》from Mainland China (Chinese Ministry of Education, 2021) are ambiguous and inconsistent in their requirements of grapheme and text production ability by modality. Additionally, high stakes language assessments in contexts like the United States have yet to reach a consensus, with the Advanced Placement (AP) Chinese test having transitioned to exclusively e-writing in 2008, the International Baccalaureate (IB) Chinese test still requiring hand-writing exclusively, and ACTFL's Writing Proficiency Test (WPT) offering test versions in both modalities. Collaboration within and between language programs, assessment entities, and scholars is critical in order to maximize learner retention and achievement field-wide.

Computers and other digital technologies are the new normal of the digital age, a reality made particularly salient by the rapid educational transitions our world experienced as a result of the global pandemic beginning in 2020. As technology continues to advance and the ways we communicate continue to change throughout the 21st century, we L2 Chinese professionals must continuously interrogate how these technologies can be integrated to develop and refine academically rigorous, communication-oriented, technology-enhanced L2 Chinese programs. Again, we stress that the work is just beginning in the areas described earlier (and likely others) for ongoing collaboration, research, and communication as the 电写为主 approach and its impacts are explored and reported across the field. To this end, we hope that you, the reader, whether you are a Chinese language teacher (first or additional language), a program director, a materials or test developer, a researcher, or any number of the possible permutations and combinations of these roles, will engage thoroughly and critically with our work, and that together the discussions started by this volume will push our field forward into a prosperous digital age of Chinese language teaching and learning.

Notes

1 We have elected to use the abbreviation 'CFL' to succinctly express the idea of contexts in which Chinese is a non-primary language of communication, as distinct from 'CSL' contexts in which Chinese is the primary language of communication and/or a lingua franca and learners have regular opportunities for exposure to and use of Chinese beyond classrooms. When appropriate, we use 'L2 Chinese' (or 'Chinese as an additional language') to collectively refer to non-L1 teaching, learning, and use of Chinese by both heritage and non-heritage learners. We recognize that this classification system is imperfect and oversimplifies the complex, dynamic linguistic realities of communities, locations, and individuals, but for the sake of brevity and to make clear differentiations where we believe appropriate, this term will have to suffice.
2 电写 was chosen over 电打 and 打字 to emphasize 'writing' (meaning composition, communication via textual media), over 电书 to avoid confusion with e-books (电子书), and over 电子输入 for concision.
3 手写 was selected over 笔写 both for direct correspondence with the English equivalent hand-writing as well as this term's ability to include non-pen/brush-based tools, including fingers, carving knives, etc. Throughout this volume, we use 'hand-writing' to indicate the ability to produce graphemes by hand (the process) and 'hand-writing' only to mean the graphemes/text produced by hand (the product) respectively.
4 This also includes typing *gana*/假名 to compose text in Japanese *kanji*.

References

Carless, D. (2013). Innovation in language teaching and learning. *The Encyclopedia of Applied Linguistics*, 1–4.

Chinese Ministry of Education. (2021). 国际中文教育中文水平等级标准 [*Chinese proficiency grading standards for international Chinese language education*]. Beijing Language and Culture University Press (北京语言大学出版社).

Diao, W., & Liu, H. Y. (2021). Starting college, quitting foreign language: The case of learners of Chinese language during secondary-postsecondary transition. *Journal of Language, Identity & Education*, *20*(2), 75–89.

Herff, C., Diener, L., Angrick, M., Mugler, E., Tate, M. C., Goldrick, M. A., . . . Schultz, T. (2019). Generating natural, intelligible speech from brain activity in motor, premotor, and inferior frontal cortices. *Frontiers in Neuroscience*, *13*, 1267.

Zhang, P. N. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. *Journal of Technology & Chinese Language Teaching*, *12*(2), 1–28.

Zhao, R., Coss, M. D., Ruan, H., Li, B., & Ma, J. (2023). Examining secondary-postsecondary articulation of Chinese language programs: A survey of US college placement procedures. *Foreign Language Annals*, *56*(3), 690–719.

Introduction

Carless, D. (2013). Innovation in language teaching and learning. The Encyclopedia of Applied Linguistics, 1–4.

Chinese Ministry of Education. (2021). [Chinese proficiency grading standards for international Chinese language education]. Beijing Language and Culture University Press ().

Diao, W., & Liu, H. Y. (2021). Starting college, quitting foreign language: The case of learners of Chinese language during secondary-postsecondary transition. Journal of Language, Identity & Education, 20(2), 75–89.

Herff, C., Diener, L., Angrick, M., Mugler, E., Tate, M. C., Goldrick, M. A., … Schultz, T. (2019). Generating natural, intelligible speech from brain activity in motor, premotor, and inferior frontal cortices. Frontiers in Neuroscience, 13, 1267.

Zhang, P. N. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology & Chinese Language Teaching, 12(2), 1–28.

Zhao, R., Coss, M. D., Ruan, H., Li, B., & Ma, J. (2023). Examining secondary-postsecondary articulation of Chinese language programs: A survey of US college placement procedures. Foreign Language Annals, 56(3), 690–719.

The Evolution of Hanzi Proficiency and the E-Writing Transformation of L2 Chinese Teaching in the Digital Age

Allen, J. R. (2008). Why learning to write Chinese is a waste of time: A modest proposal. Foreign Language Annals, 41(2), 237–251.

Bellassen, J., & Zhang, P. (2009). [A key to Chinese speech and writing]. Sinolingua.

Brown, H. D. (2014). Principles of language learning and teaching: A course in second language acquisition. Pearson.

Chu, C. (2000). Graph, sound, and meaning: A review of China's traditional theories on the relationship between Chinese script and the language. [American—Chinese Society and Culture], 3(2), 62–70.

Chu, C. (2006). A reflection on traditional approaches to Chinese character teaching and learning. In T. Yao, C. Chu, Y. Wang, H. Xu, & J. Hayden (Eds.), [Studies on Chinese instructional materials and pedagogy] (pp. 240–257). Beijing Language and Culture University Press.

Cook, V. (2016). Second language learning and language teaching. Routledge.

Cui, Y. (2019). : [Selected works of renowned Chinese language educators: Volume of Cui Yonghua]. Beijing Language and Culture University Press.

DeFrancis, J. (1986). The Chinese language: Fact and fantasy. University of Hawaii Press.

Feng, Y., & Yang, Q. (2013). [Principles of implementing computerized Hanzi input in Chinese language teaching in North American Universities]. [Chinese Language Globalization Studies], (1), 33–40.

He, W., Jiao, D., Shao, Q., & Livaccari, C. M. (2008). Chinese for tomorrow: A new five-skilled approach. Cheng & Tsui.

Hu, B. (2020). Teaching Chinese characters: What we know and what we can do. In C. Shei, M. M. Zikpi, & D. Chao (Eds.), The Routledge handbook of Chinese language teaching (pp. 225–237). Routledge.

Jiang, X. (2017). [Hanzi instruction in the age of the keyboard]. [Journal of International Chinese Teaching], 2, 4–10.

Krashen, S. (1994). The pleasure hypothesis. Georgetown University Round Table on Languages and Linguistics, 299–302.

Kupfer, P. [] (1993). [Some new ideas on Hanzi teaching]. In [Proceedings of the 4th international conference on teaching Chinese as a second language]. Beijing Language Institute Press.

Li, Q. (2006). [A comprehensive view of Hanzi research and teaching]. In [Chinese studies and applications]. China Social Sciences Press.

Li, Q. (2012). [Teaching strategies for the difficulty of learning Hanzi]. [Chinese Language Learning].
Li, Q. (2013). “” [Reflections on the issue of “difficulty in learning Hanzi”]. [Chinese Language Globalization Studies], 2013(1).
Lü, B. (1999). [Selected papers on Hanzi and Hanzi teaching]. Peking University Press.
Lü, S. (1987). [Recent works in linguistics]. Shanghai Education Publishing House.
Lü, S. (1990). — [Inextricable tangle: Hanzi and confusion in Chinese text]. [Reading], (11), 71–74.
Lu, X., Ostrow, K. S., & Heffernan, N. T. (2019). Save your strokes: Chinese handwriting practice makes for ineffective use of instructional time in second language classrooms. AERA Open, 5(4), 2332858419890326.
Lyu, B., Lai, C., Lin, C. H., & Gong, Y. (2021). Comparison studies of typing and handwriting in Chinese language learning: A synthetic review. International Journal of Educational Research, 106.
Mair, V. (2010). Character amnesia. Language Log. Retrieved August 2022, from https://languagelog.ldc.upenn.edu/nll/?p=2473
Masini, F. (2019). Chinese language and Christianity. In The Routledge handbook of Chinese applied linguistics. Routledge. Retrieved December 2022, from www.routledgehandbooks.com/doi/10.4324/9781315625157-4
Moser, D. (1991). Why Chinese is so damn hard. Sino-Platonic Papers, 27, 59–70.
Packard, J. L. (1990). Effects of time lag in the introduction of characters in the Chinese language curriculum. The Modern Language Journal, 74(2), 167–175.
Ricci, M., & Trigault, N. (1953). China in the 16th century: The journals of Matthew Ricci, 1583–1610. Random House.
Shen, H., Cai, Z., & Wang, P. (2009). [Learning 100 Chinese radicals]. Peking University Press.
Shi, Z. (2005). [A new bridge for learning Hanzi]. Beijing Book Co. Inc.
Sun, D. (2006). [Research on teaching Hanzi to foreigners]. Commercial Press.
Taylor, I., & Taylor, M. (2014). Writing and literacy in Chinese, Korean and Japanese. John Benjamins Publishing Company.
Wan, Y. (2014). : () [Hanzi: Cognition] (Bilingual ed.). Commercial Press.
Wan, Y. (2015). “”—· [How to break the bottleneck in Hanzi teaching: A discussion based on “Hanzi: Cognition”]. [Teaching Chinese in the World], 29(1), 130–142.
Xie, T. (1999). Using computers in Chinese language teaching. In Mapping the course of the Chinese language field. Chinese Language Teachers Association Monograph Series (Vol. 3, pp. 103–119). https://home.csulb.edu/~txie/papers/Using_computers.htm.
Xing, G. (1992). “”— [Hanzi does not have “special functions”—Reading the transcript of the TV series “the miraculous Hanzi”]. [Language Construction], (3), 2–3.
Xu, P., & Jen, T. (2005). Penless Chinese language learning: A computer-assisted approach. Journal of the Chinese Language Teachers Association, 40(2), 25–42.
Xu, S., & Gao, X. (1987). [Computers may overcome the difficulty of writing and searching for Hanzi]. [Chinese Learning], (6).
Ye, L. (2013). Shall we delay teaching characters in teaching Chinese as a foreign language? Foreign Language Annals, 46(4), 610–627.
Yin, J. J. H. (2006). Fundamentals of Chinese characters. Yale University Press.
Zhang, P. N. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology & Chinese Language Teaching, 12(2).
Zhang, Z.-S. (2009). Myth, reality and character instruction in the 21st century. Journal of the Chinese Language Teachers Association, 44(1), 69–89.
Zhou, J. (1998). “” [Analysis and countermeasures of the “difficulty in learning Hanzi”]. [Chinese Character Culture], 1998(2), 57–60.
Zhou, J. (2007). [Theories and methods of Hanzi teaching]. Beijing Book Co. Inc.

The E-Writing Approach to L2 Chinese Instruction: Clarifying Fundamental Principles and Core Concepts

Allen, J. R. (2008). Why learning to write Chinese is a waste of time: A modest proposal. Foreign Language Annals, 41(2), 237–251.

Bi, Y., Hai, Z., & Zhang, Y. (2009). Reading does not depend on writing, even in Chinese. Neuropsychologia, 47, 1193–1199.

Bourgerie, D. S., Cox, T. L., & Riep, S. L. (2023). Does text entry method make a difference on Chinese writing test scores? Chinese as a Second Language, 57(3), 270–297.

Byrnes, H. (2019). Affirming the context of instructed SLA: The potential of curricular thinking. Language Teaching Research, 23(4), 514–532.

Cao, F., Vu, M., Chan, L., Ho, D., Lawrence, J. M., Harris, L. N., … Perfetti, C. A. (2013). Writing affects the brain network of reading in Chinese: A functional magnetic resonance imaging study. Human Brain Mapping, 34(7), 1670–1684.

Coss, M. D. (forthcoming). Are we testing what we think we are? A multi-site investigation of typed and handwritten L2 Chinese writing assessments. Language Learning & Technology.

Cui, Y. (2008). [Comparing how Chinese characters are learned in child L1 and L2 contexts]. [Language Teaching and Linguistic Studies], 2, 17–23.

DeKeyser, R. (2020). Skill acquisition theory. In B. VanPatten, G. D. Keating, & S. Wulff (Eds.), Theories in second language acquisition (pp. 83–104). Routledge.

Dew, J. (1994). Language is primary, script is secondary: The importance of gaining a strong foundation in the language before devoting major efforts to character recognition. [Proceedings from the Conference on Cognition, Learning and Teaching of Chinese Characters]. www.fb06.uni-mainz.de/chinesisch/Dateien/hanzirenzhi_papers_dew.htm

Everson, M. E. (1988). Speed and comprehension in reading Chinese: Romanization vs. characters revisited. Journal of the Chinese Language Teachers Association, 23(2), 1–15.

Everson, M. E. (1998). Word recognition among learners of Chinese as a foreign language: Investigating the relationship between naming and knowing. Modern Language Journal, 82, 194–204.

Everson, M. E. (2011). Best practices in teaching logographic and Non-Roman writing systems to L2 learners. Annual Review of Applied Linguistics, 31, 249–274.

Everson, M. E. (2016). CFL teacher preparation and development. In J. Ruan, J. Zhang, & C. B. Leung (Eds.), Chinese language education in the United States (pp. 231–244). Springer International Publishing.

Fedewa, K., Polio, C., & Coss, M. D. (2022). Researching Chinese reading and writing: Past, present, and future. Online Colloquium. ACTFL Convention.

Feng, Y., & Yang, Q. (2013). [Principles of implementing computerized Chinese character input in Chinese language teaching in North American Universities]. [Chinese Language Globalization Studies], (1), 33–40.

Guan, C. Q., Liu, Y., Chan, D. H. L., Ye, F., & Perfetti, C. A. (2011). Writing strengthens orthography and alphabetic coding strengthens phonology in learning to read Chinese. Journal of Educational Psychology, 103, 509–522.

Guan, C. Q., Perfetti, C. A., & Meng, W. (2015). Writing quality predicts Chinese learning. Reading and Writing, 28, 763–795.

Jiang, X. (2005). [Hanzi instruction for Western learners: Separating reading and writing, prioritizing recognition over writing]. In J. Zhao (Ed.), ()— [Exploration of Chinese language teaching to foreigners—A collection of papers from the symposium on Chinese as a foreign language]. Commercial Press.

Jiang, X. (2017). [Chinese character instruction in the age of the keyboard]. [Journal of International Chinese Teaching], 2, 4–10.

Jiang, X., & Zheng, Y. (2015). [A survey study of Chinese language learners' attitudes toward handwriting and keyboarding of Chinese characters in China]. [Research on Chinese Applied Linguistics], (1), 53–77.

Ke, C., & Shen, H. (2003). [Looking backward and forward: A review of Chinese character instruction research in the United States]. [Language Teaching & Research], 3.

Kirschner, P., & Hendrick, C. (2020). How learning happens: Seminal works in educational psychology and what they mean in practice. Routledge.

Knell, E., & West, H. (2015). Writing practice and Chinese character recognition in early Chinese immersion students. Journal of the Chinese Language Teachers Association, 50(3), 45–61.
Knell, E., & West, H.-I. (2017). To delay or not to delay: The timing of Chinese character instruction for secondary learners. Foreign Language Annals, 50, 519–532.
Kraft, M. A. (2020). Interpreting effect sizes of education interventions. Educational Researcher, 49(4), 241–253.
Liao, J. (2023). What skills are being assessed? Evaluating L2 Chinese essays written by hand and on a computer keyboard. Assessing Writing, 57, 100765.
Lightbown, P. M. (2008). Transfer appropriate processing as a model for classroom second language acquisition. In Z. Han (Ed.), Understanding second language process (pp. 27–44). Multilingual Matters.
Long, M. (2015). Second language acquisition and task-based language teaching. John Wiley & Sons.
Lyu, B., Lai, C., Lin, C. H., & Gong, Y. (2021). Comparison studies of typing and handwriting in Chinese language learning: A synthetic review. International Journal of Educational Research, 106.
McGinnis, S. (1999). Student goals and approaches. In M. Chu (Ed.), Mapping the course of the Chinese language field (pp. 151–188). The Chinese Language Teachers Association.
Moore, S. J., Walton, A. R., & Lambert, R. D. (1992). Introducing Chinese into high schools: The dodge initiative. National Foreign Language Center.
Moser, D. (1991). Why Chinese is so damn hard. Sino-Platonic Papers, 27, 59–70.
Packard, J. L. (1990). Effects of time lag in the introduction of characters in the Chinese language curriculum. The Modern Language Journal, 74(2), 167–175.
Plonsky, L., & Oswald, F. L. (2014). How big is “big”? Interpreting effect sizes in L2 research. Language Learning, 64(4), 878–912.
Ross, C. (2012, November). Visual glueing: The relevance of stroke order for CFL learners. Presentation at the Annual Meeting of CLTA.
Smith, C. V., & Cardaciotto, L. (2011). Is active learning like broccoli? Student perceptions of active learning in large lecture classes. Journal of the Scholarship of Teaching and Learning, 11(1), 53–61.
Spada, N. (2007). Communicative language teaching: Current status and future prospects. In J. Cummins & C. Davison (Eds.), International handbook of English language teaching (Vol. 15, pp. 27–44). Springer.
Sun, J., Pae, H. K., & Ai, H. (2021). The recognition of coordinative compound words by learners of Chinese as a foreign language: A mixed methods study. Foreign Language Annals, 54(4), 923–951.
Tan, L. H., Spinks, J. A., Eden, G. F., Perfetti, C. A., & Siok, W. T. (2005). Reading depends on writing, in Chinese. Proceedings of the National Academy of Sciences of the United States of America, 102(24), 8781–8785.
Tan, L. H., Xu, M., Chang, C. Q., & Siok, W. T. (2013). China’s language input system in the digital age affects children’s reading development. Proceedings of the National Academy of Sciences of the United States of America, 110(3), 1119–1123.
Tse, S. K., Marton, F., Ki, W. W., & Loh, E. K. Y. (2007). An integrative perceptual approach for teaching Chinese characters. Instructional Science, 35, 375–406.
Walker, G. (1984). “Literacy” and “reading” in a Chinese language program. Journal of the Chinese Language Teachers Association, 19, 67–84.
Wang, S. H. C. (1998). A study on the learning and teaching of Hanzi-Chinese characters. Working Papers in Educational Linguistics, 14(1), 69–101.
Xu, P., & Jen, T. (2005). Penless Chinese language learning: A computer-assisted approach. Journal of the Chinese Language Teachers Association, 40(2), 25–42.
Xu, Z., Liu, D., & Joshi, R. (2020). The influence of sensory-motor components of handwriting on Chinese character learning in second-and fourth-grade Chinese children. Journal of Educational Psychology, 112(7), 1353.
Ye, L. (2013). Shall we delay teaching characters in teaching Chinese as a foreign language? Foreign Language Annals, 46(4), 610–627.
Zhang, P. N. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology & Chinese Language Teaching,

12(2), 1–28.
Zhao, R., Coss, M. D., Ruan, H., Li, B., & Ma, J. (2023). Examining secondary—Postsecondary articulation of Chinese language programs: A survey of US college placement procedures. Foreign Language Annals, 56(3), 690–719.

Typing Characters, Priority-Setting, and Skill Integrability: L2 Chinese in the Digital Age

DeFrancis, J. (1984a). Phonetic versus semantic predictability in Chinese characters. Journal of the Chinese Language Teachers Association, 19(1), 1–21.
DeFrancis, J. (1984b). The Chinese language: Fact and fantasy. University of Hawaii Press.
DeFrancis, J. (1989). Visible speech. University of Hawaii Press.
Fallows, D. (2011). Dreaming in Chinese: Mandarin lessons in life, love, and language. Bloomsbury Publishing.
He, W., Jiao, D., Shao, Q., & Livaccari, C. M. (2008). Chinese for tomorrow: A new five-skilled approach. Cheng & Tsui.
Hvelplund, K. T. (2011). Allocation of cognitive resources in translation: An eye-tracking and key-logging study [PhD thesis]. Copenhagen Business School (CBS).
Jen, T., & Xu, P. (2000). Penless Chinese character reproduction. Sino-Platonic Papers. 102. University of Pennsylvania.
Jianshu survey on input methods. (2019). www.jianshu.com/p/446e06d058c2
Lu, B. F., & Xie, T. W. (2004). The economic principles in teaching Chinese as a foreign language. In Hanyu Xuexi. Yanbian University Press.
Lu, X., & Révész, A. (2021). Revising in a non-alphabetic language: The multi-dimensional and dynamic nature of online revisions in Chinese as a second language. System, 100, 102544.
Moser, D. (1991). Why Chinese is so damn hard TM, from Schriftfestschrift: Essays on writing and language in honor of John DeFrancis on his eightieth birthday. Sino-Platonic Papers No. 27. University of Pennsylvania.
Schatz, L. (2011). Letter to the editor. Journal of Chinese Language Teachers' Association, 46(3), 131–134.
Sohu survey on voice input. (2021). www.sohu.com/a/470935906_783965
Wieger, L. (1965). Chinese characters: Their origins, etymology, history, classification and signification. Dover Publications.
Xie, T. W. (1999). Using computers in Chinese language teaching. In Mapping the course of the Chinese language field. Chinese Teachers Association Monograph Series (Vol. 2, pp. 103–119). The Chinese Language Teachers Association.
Zhang, Z. S. (2002). "Writing" characters using the computer. Proceedings of the Third International Conference on Chinese Pedagogy.
Zhang, Z. S. (2009). Myth, reality and character instruction in the 21st century. Journal of Chinese Language Teachers' Association, 44(1), 69–89.
Zhang, Z. S. (2018). [Myths about hanzi and hanzi instruction]. [Journal of International Chinese Education, Beijing Language University], 4, 13–29.

The Typing-Based Approach to L2 Chinese Beginner Instruction: A Study of Hanzi Instructional Design and Learning Outcomes

Baddeley, A. D. (2003). Working memory and language: An overview. Journal of Communication Disorders, 36(3), 189–208. https://doi.org/10.1016/S0021-9924(03)00019-4
Baddeley, A. D., Gathercole, S. E., & Papagno, C. (1998). The phonological loop as a language learning device. The Psychological Review, 105, 158–173. http://dx.doi.org/10.1037/0033–295X.105.1.158

Craik, F. I. M., & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. Journal of Experimental Psychology: General, 104, 268–294. http://dx.doi.org/10.1037/0096-3445.104.3.268

Ellis, N. (1996). Sequencing in SLA: Phonological memory, chunking, and points of order. Studies in Second Language Acquisition, 18(1), 91–126. http://dx.doi.org/10.1017/S0272263100014698

Ellis, N. (2012). Formulaic language and second language acquisition: Zipf and the phrasal Teddy Bear. Annual Review of Applied Linguistics, 32, 17–44. http://dx.doi.org/10.1017/S0267190512000025

Evans, N. W., Hartshorn, K. J., Cox, T. L., & Martin de Jel, T. (2014). Measuring written linguistic accuracy with weighted clause ratios: A question of validity. Journal of Second Language Writing, 24, 33–50. www.sciencedirect.com

Everson, M. E. (1998). Word recognition among learners of Chinese as a foreign language: Investigating the relationship between naming and knowing. The Modern Language Journal, 82(2), 194–204. http://dx.doi.org/10.1111/j.1540-4781.1998.tb01192.x

Feng, Y., & Yang, Q. Y. (2013). [The implementation principles of computer input of Chinese characters in Chinese language teaching in North American Universities]. [Chinese Language Globalization Studies], 1, 33–40.

Guan, C., Liu, Y., Chan, D., Ye, F., & Perfetti, C. (2011). Writing strengthens orthography and alphabetic coding strengthens phonology in learning to read Chinese. Journal of Educational Psychology, 103, 509–522. http://dx.doi.org/10.1037/a0023730

He, W., Jiao, D., Shao, Q., & Livaccari, C. (2008). Preface for teachers. In Chinese for tomorrow: A new five-skilled approach, textbook (Vol. 1, pp. xvii–xxxv). Cheng & Tsui Company.

Jiang, N., Hou, F., & Jiang, X. (2020). Analytic versus holistic recognition of Chinese words among L2 learners. Modern Language Journal, 104(3), 1–14. http://dx.doi.org/10.1111/modl.12662

Jiang, X. (2007). “” [An experimental study on the effect of the method of “Teaching the learner to recognize characters more than writing”]. [Chinese Teaching in the World], 2, 91–97.

Jiang, X. (2017). [Teaching Chinese characters in the keyboard age]. [Journal of International Chinese Teaching and Research], 2017(2), 4–10.

Jin, H. G. (2007). [Syntactic maturity in second language writings: A case of Chinese as a foreign language (CFL)]. Journal of the Chinese Language Teachers Association, 42(1), 27–55.

Jin, H. G. (2017). [Research in Chinese character processing and its pedagogical implications in CSL reading]. [Journal of International Chinese Teaching and Research], 2, 10–16.

Karpicke, J. D., & Roediger, III, H. L. (2007). Repeated retrieval during learning is the key to long-term retention. Journal of Memory and Language, 57, 151–162. www.sciencedirect.com

Ke, C. (1996). An empirical study on the relationship between Chinese character recognition and production. Modern Language Journal, 80(3), 340–349. http://dx.doi.org/10.1111/j.1540-4781.1996.tb01615.x

Krashen, S. (2021). The case for pinyin: A suggestion. Chinese Language Teaching Methodology and Technology, 4(2). https://engagedscholarship.csuohio.edu/cltmt/vol4/iss2/2

Li, Q. (2020). [A study on teaching Chinese as a second language in the new era: Orientation and problem]. [Language Teaching and Research] 2020(1), 1–10.

Lu, X., Ostrow, K. S., & Heffernan, N. T. (2019). Save your strokes: Chinese handwriting practice makes for ineffective use of instructional time in second-language classrooms. AERA Open. https://doi.org/10.1177/2332858419890326

Lyu, B., Lai, C., Lin, C.-H., & Gong, Y. (2021). Comparison studies of typing and handwriting in Chinese language learning: A synthetic review. International Journal of Educational Research, 106 (2), 101740. https://doi.org/10.1016/j.ijer.2021.101740

Polio, C. (1997). Measures of linguistic accuracy in second language writing research. Language Learning, 47(1), 101–143.

Polio, C., & Shea, M. (2014). An investigation into current measures of linguistic accuracy in second language research. Journal of Second Language Writing, 26, 10–27. https://doi.org/10.1016/j.jslw.2014.09.003

Shen, H., & Jiang, X. (2013). Character reading fluency, word segmentation accuracy, and reading comprehension in L2 Chinese. Reading in a Foreign Language, 25(1), 1–25. http://hdl.handle.net/10125/66679

Storch, N. (2009). The impact of studying in a second language (L2) medium university on the development of L2 writing. Journal of Second Language Writing, 18, 103–118.
Xie, T. (2005). Error analysis of Chinese input in Chinese learning. In P. Xu and T. Jen (Eds.), Chinese character teaching and computer technology (pp. 1–8).
Xu, P., & Jen, T. (2004). Penless Chinese language learning: A computer-assisted approach. Journal of Chinese Language Teachers Association, 40(2), 25–42.
Xu, Y., Chang, L.-Y., Zhang, J., & Perfetti, C. (2013). Reading, writing, and animation in character learning in Chinese as a foreign language. Foreign Language Annals, 46(3), 423–444. http://dx.doi.org/10.1111/flan.12040
Ye, L. (2013). Shall we delay teaching characters in teaching Chinese as a foreign language? Foreign Language Annals, 46(4), 610–627.
Yin, J. (2006). : [Proceed separately and strike together: A new approach to the teaching Chinese as a foreign language in the United States]. [Chinese Teaching in the World], 1, 116–121.
Yuan, F. Y. (2009). Measuring learner language in L2 Chinese in fluency, accuracy, and complexity. Journal of the Chinese Language Teachers Association, 44(3), 109–130.
Zhang, P. N. (2015a). Ni Wo Ta/Developing Chinese fluency: An introductory course—Textbook (Vols. 1 & 2). Cengage Learning.
Zhang, P. N. (2015b). Ni Wo Ta/Developing Chinese fluency: An introductory course—Literacy workbook (Vols. 1 & 2). Cengage Learning.
Zhang, P. N. (2018). — [New era and new goals: Reflections on the college-level L2 Chinese instruction in the U.S.]. [Journal of International Chinese Teaching and Research], 2018(2), 15–21.
Zhang, P. N. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology and Chinese Language Teaching, 2021(2), 1–28.
Zhang, T., & Ke, C. (2018). Research on L2 Chinese character acquisition. In C. Ke (Ed.), The Routledge handbook of Chinese second language acquisition. Routledge.
Zhang, Z.-S. (2009). Myth, reality, and character instruction in the 21st century. Journal of the Chinese Language Teachers Association, 44(1), 69–89.

Save Your Strokes: Further Studies on the Efficiency of Learning Chinese Words Without Hand-Writing

Allen, J. R. (2008). Why learning to write Chinese is a waste of time: A modest proposal. Foreign Language Annals, 41(2), 237–251. https://doi.org/10.1111/j.1944-9720.2008.tb03291.x
Berninger, V. W., Abbott, R. D., Abbott, S. P., Graham, S., & Richards, T. (2002). Writing and reading: Connections between language by hand and language by eye. Journal of Learning Disabilities, 35(1), 39–56. https://doi.org/10.1177/002221940203500104
Bi, Y., Han, Z., & Zhang, Y. (2009). Reading does not depend on writing, even in Chinese. Neuropsychologia, 47(4), 1193–1199. https://doi.org/10.1016/j.neuropsychologia.2008.11.006
Brown, J. (2020). Perseverance. In E. M. Sanchez (Ed.), Merriam-webster. Merriam-Webster. www.merriam-webster.com/dictionary/word
Dimitrov, D. M., & Rumrill, P. D. (2003). Pretest-posttest designs and measurement of change. Work, 20, 159–165. Retrieved January 15, 2020, from https://content.iospress.com/articles/work/wor00285
Everson, M. E. (2009). Literacy development in Chinese as a foreign language. In M. E. Everson & Y. Xiao (Eds.), Teaching Chinese as foreign language: Theories and applications (pp. 97–113). Cheng & Tsui.
Garnett, K. (2011). Fluency in learning to read: Conceptions, misconceptions, learning disabilities, and instructional moves. In J. R. Birsh (Ed.), Multisensory teaching of basic language skills (pp. 293–320). Brookes Publishing.
Grabe, W. (1991). Current developments in second language reading research. TESOL Quarterly, 25(3), 375–406. https://doi.org/10.2307/3586977

Guan, C. Q., Liu, Y., Chan, D. H. L., Ye, F., & Perfetti, C. A. (2011). Writing strengthens orthography and alphabeticcoding strengthens phonology in learning to read Chinese. Journal of Educational Psychology, 103, 509–552. https://doi.org/10.1037/a0023730

Hanban. (2010). [The graded Chinese syllables, characters and words for the application of teaching Chinese to the speakers of other languages]. Beijing Language and Culture University Press.

Hayes, L., & Flanigan, K. (2014). Developing word recognition. The Guilford Press.

Heffernan, N. T., & Heffernan, C. L. (2014). The ASSISTments ecosystem: Building a platform that brings scientists and teachers together for minimally invasive research on human learning and teaching. International Journal of Artificial Intelligence in Education, 24(4), 470–497. https://doi.org/10.1007/s40593-014-0024-x

Hsiung, H., Chang, Y., Chen, H., & Sung, Y. (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 Behavior, 74, 303–310. https://doi.org/10.1016/j.chb.2017.04.022

HSK Department. (1992). [The handbook of outline of the graded vocabulary for HSK]. Beijing Language Institute Press.

Jiang, X. (2007). “” [An experimental study on the effect of the method of “Teaching the learner to recognize characters more than writing”]. [Chinese Teaching in the World], 2, 91–97.

Jiang, X. (2017). [Teaching Chinese in the keyboard age]. [Journal of International Chinese Teaching], 2, 4–10.

Ke, C. (1998). Effects of strategies on the learning of Chinese characters among foreign language students. Journal of the Chinese Language Teachers Association, 33(2), 93–112. https://doi.org/10.1111/j.1944-9720.1998.tb01335.x

Kilpatrick, D. A. (2020). How the phonology of speech is foundational for instant word recognition. Perspectives on Language and Literacy, 46(3), 11–15. www.literacyhow.org/wp-content/uploads/2020/09/The-Phonology-of-Speech-in-WR-Kilpatrick.pdf

Koda, K. (1996). L2 Word recognition research: A critical review. The Modern Language Journal, 80(4), 450–460. www.jstor.org/stable/329725

Li, T., & McBride-Chang, C. (2014). How character reading can be different from word reading in Chinese and why it matters for Chinese reading development. In X. Chen, Q. Wang, & Y. Luo (Eds.), Reading development and difficulties in monolingual and bilingual Chinese children. Literacy Studies, 8. Springer. https://doi.org/10.1007/978-94-007-7380-6_3

Li, X., Bicknell, K., Liu, P., Wei, W., & Rayner, K. (2014). Reading is fundamentally similar across disparate writing systems: A systematic characterization of how words and characters influence eye movements in Chinese reading. Journal of Experimental Psychology: General, 143(2), 895–913. https://doi.org/10.1037/a0033580

Lu, X., Ostrow, K. S., & Heffernan, N. T. (2019). Save your strokes: Chinese handwriting practice makes for ineffective use of instructional time in second language classrooms. AERA Open. https://doi.org/10.1177/2332858419890326

Lyu, B., Lai, C., Lin, C.-H., & Gong, Y. (2021). Comparison studies of typing and handwriting in Chinese language learning: A synthetic review. International Journal of Educational Research, 106. www.sciencedirect.com/science/article/pii/S0883035521000100

Osborne, C., Zhang, Q., & Zhang, G. X. (2020). Which is more effective in introducing Chinese characters? An investigative study of four methods used to teach CFL beginners. The Language Learning Journal, 48(4), 385–401. https://doi.org/10.1080/09571736.2017.1393838

Packard, J. L., Chen, X., Li, W., Wu, X., Gaffney, J. S., Li, H., & Anderson, R. C. (2006). Explicit instruction in orthographic structure and word morphology helps Chinese children learn to write characters. Reading and Writing, 19(5), 457–487. https://doi.org/10.1007/s11145-006-9003-4

Pan, D. J., Yang, X., Lui, K. F. H., Lo, J. C. M., McBride, C., & Ho, C. S. H. (2021). Character and word reading in Chinese: Why and how they should be considered uniquely vis-a-vis literacy development. Contemporary Educational Psychology, 65, 101961. https://doi.org/10.1016/j.cedpsych.2021.101961

Saragi, T., Nation, I. S. P., & Meister, G. F. (1978). Vocabulary learning and reading. System, 6, 72–78. https://doi.org/10.1016/0346-251X(78)90027-1

Shen, H. H. (2005). An investigation of Chinese-character learning strategies among non-native speakers of Chinese. System, 33(1), 49–68. https://doi.org/10.1016/j.system.2004.11.001

Su, X. (2001). [Quantitative studies of the dictionary of modern Chinese]. [Chinese Teaching in the World], 58(4), 39–47.
Tan, L. H., & Perfetti, C. A. (1999). Phonological activation in visual identification of Chinese two—Character words. Journal of Experimental Psychology: Learning, Memory, and Cognition, 25(2), 382–393. https://doi.org/10.1037/0278-7393.25.2.382
Tan, L. H., Spinks, J. A., Eden, G. F., Perfetti, C. A., & Siok, W. T. (2005). Reading depends on writing, in Chinese. Proceedings of the National Academy of Sciences of the United States of America, 102(24), 8781–8785. http://doi.org/10.1073/pnas.0503523102
Tan, L. H., Xu, M., Chang, C. Q., & Siok, W. T. (2013). China's language input system in the digital age affects children's reading development. Proceedings of the National Academy of Sciences of the United States of America, 110(3), 1119–1123. https://doi.org/10.1073/pnas.1213586110
Uchihara, T., Webb, S., & Yanagisawa, A. (2019). The effects of repetition on incidental vocabulary learning: A meta-analysis of correlational studies. Language Learning, 69, 559–599. https://doi.org/10.1111/lang.12343
Webb, S. (2007). The effects of repetition on vocabulary knowledge. Applied Linguistics, 28, 46–65. https://doi.org/10.1093/applin/aml048
Xu, Y., Chang, L., Zhang, J., & Perfetti, C. (2013). Reading, writing, and animation in character learning in Chinese as a foreign language. Foreign Language Annals, 46(3), 423–444. https://doi.org/10.1111/flan.12040
Yang, X., Pan, D. J., Lo, C. M., & McBride, C. (2022). Same or different: Chinese character reading and word reading of young readers with development. Reading and Writing. https://doi.org/10.1007/s11145-022-10255-9
Yue, Y. (2017). Teaching Chinese in K—12 schools in the United States: What are the challenges? Foreign Language Annals, 50(3), 601–620. https://doi.org/10.1111/flan.12277
Zhang, P. N. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology and Chinese Language Teaching, 12(2), 1–28. www.tclt.us/journal/2021v12n2/zhangn.pdf
Zhao, R., Fan, R., Liu, M., Wang, X., & Yang, J. (2017). Rethinking the function of brain regions for reading Chinese characters in a meta-analysis of fMRI studies. Journal of Neurolinguistics, 44, 120–133. https://doi.org/10.1016/j.jneuroling.2017.04.001
Zhu, Y., Shum, S. M., Tse, S. B., & Liu, J. J. (2016). Word-processor or pencil-and-paper? A comparison of students' writing in Chinese as a foreign language. Computer Assisted Language Learning, 29(3), 596–617. https://doi.org/10.1080/09588221.2014.1000932

Voice-Writing Hanzi Using Speech-to-Text Technology for L2 Chinese Learning and Instruction: An Exploratory Study

Allen, J. R. (2008). Why learning to write Chinese is a waste of time: A modest proposal. Foreign Language Annuals, 41(2), 237–251. https://doi.org/10.1111/j.1944-9720.2008.tb03291.x
Chen, D. (2005). Empowering Chinese language via technology. Global Chinese Journal on Computers in Education, 3, 159–182.
Da, J. (2014). Using mobile speech technology to enhance CFL learners' speaking skills. Workshop given at the 2014 Annual Meeting and Exposition of the American Council on the Teaching of Foreign Languages.
Da, J. (2015). [The application of speech recognition technology in Chinese language learning: What can be learned from a Pinyin lab session]. Journal of Technology and Chinese Language Teaching, 6(1), 16–24.
Da, J., & Zheng, Y. (2018). Technology and the teaching and learning of Chinese as a foreign language. In C. Ke. (Ed.), The Routledge handbook of Chinese second language acquisition (pp. 432–447). Routledge.
Duperval, L. (2020, April 21). Voice dictation for writers: The ultimate guide to speed up your writing in 2020. https://medium.com/@lduperval/voice-dictation-for-writers-the-ultimate-guide-to-speed-up-your-writing-in-2020–4944c0138120

Eskenazi, M. (1999). Using automatic speech processing for foreign language pronunciation tutoring: Some issues and a prototype. Language Learning & Technology, 2(2), 62–76. https://scholarspace.manoa.hawaii.edu/server/api/core/bitstreams/a8ae4416-0f1d-403e-bc76-5ac6c87b3960/content

Golonka, E., Bowles, A., Frank, V., Richardson, D., & Freynik, S. (2014). Technologies for foreign language learning: A review of technology types and their effectiveness. Computer Assisted Language Learning, 27(1), 70–105.

He, W. (2020). [How to apply technology to Chinese language teaching in the Chinese language flagship program at URI in the U.S.]. [International Chinese Education], 5(4), 5–15.

He, W., & Jiao, D. (2010). Curriculum design and special features of "computer Chinese" and Chinese for tomorrow. In J. Chen, C. Wang, & J. Cai (Eds.), Teaching and learning Chinese: Issues and perspectives (pp. 217–236). Information Age Publishing.

He, W., Jiao, D., Shao, Q., & Livaccari, C. (2008). Preface for teachers. In Chinese for tomorrow: A new five-skilled approach, textbook (Vol. 1, pp. xvii–xxxv). Cheng & Tsui Company.

Jin, H. (2003). Empirical evidence on character recognition in multimedia Chinese tasks. Concentric: Studies in English Literature and Linguistics, 29(2), 36–58.

Johnson, C. (2021). Language learners' perceptions of automatic speech recognition as a writing tool: A technology acceptance model analysis [Unpublished Master's thesis]. Concordia University. https://spectrum.library.concordia.ca/id/eprint/988549/1/Johnson_MA_F2021.pdf

Lai, Y. (2009). Asymmetry in Mandarin affricate perception by learners of Mandarin Chinese. Language and Cognitive Processes, 27(7–8), 1265–1285. https://doi.org/10.1080/01690960802113850

Liu, J., & Jongman, A. (2012). American Chinese learners' acquisition of L2 Chinese affricates /ts/ and /tsh/. Proceedings of Meetings on Acoustics, 18(1), 060005. https://doi.org/10.1121/1.4798223

Liu, K. K., Thurlow, M. L., Press, A. M., & Dosedel, M. J. (2019). *A review of the literature on computerized speech-to-text accommodations* (NCEO Report 414). University of Minnesota, National Center on Educational Outcomes. https://files.eric.ed.gov/fulltext/ED600670.pdf

Lu, M., Hallman, G., & Black, J. (2013). Chinese character learning: Using embodied animations in initial stages. Journal of Technology and Chinese Language Teaching, 4(2), 1–24.

Mackey, A., Abbuhl, R., & Gass, S. M. (2012). Interactionist approaches. In S. Gass & A. Mackey (Eds.), The Routledge handbook of second language acquisition (pp. 7–23). Routledge.

McCrocklin, S., & Edalatishams, I. (2020). Revisiting popular speech recognition software for ESL speech. TESOL Quarterly, 54(4), 1086–1097. https://onlinelibrary.wiley.com/doi/10.1002/tesq.3006

McCue, T. J. (2019, April 24). Voice typing can help you write more effectively in less time. Forbes. www.forbes.com/sites/tjmccue/2019/04/24/how-to-write-more-words-effectively-in-less-time/?sh=5e23ee547e3e

Neri, A., Cucchiarini, C., & Strik, H. (2003). Automatic speech recognition for second language learning: How and why it actually works. In Proceeding of international congress of phonetic sciences (pp. 1156–1160). http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.6.7376&rep=rep1&type=pdf

Paz, Z. (n.d.). Speech to text for students with disabilities, apps, tools, and software. www.ldrfa.org/speech-to-text-apps-tools-and-software

Shadiev, R., Hwang, W.-Y., Chen, N.-S., & Huang, Y.-M. (2014). Review of speech-to-text recognition technology for enhancing learning. Educational Technology & Society, 17(4), 65–84.

Shen, H. (2005). An investigation of Chinese-character learning strategies among non-native speakers of Chinese. System, 33(1), 49–68.

Tong, X. L., Tong, X. H., & McBride-Chang, C. (2015). A tale of two writing systems: Double dissociation and metalinguistic transfer between Chinese and English word reading among Hong Kong children. Journal of Learning Disabilities, 48(2), 130–145. https://doi.org/10.1177/0022219413492854

Wald, M. (2006). An exploration of the potential of automatic speech recognition to assist and enable receptive communication in higher education. Research in Learning Technology, 14(1), 9–20. https://doi.org/10.1080/09687760500479977. www.tandfonline.com/doi/full/10.1080/09687760500479977

Wang, L. (2013). The effects of single and dual coded multimedia instructional methods on Chinese character learning [Unpublished doctoral dissertation]. Middle Tennessee State

University.
Xie, T. (1999). Using computers in Chinese language teaching. In M. Chun (Ed.), Mapping the course of the Chinese language field: Chinese Teachers Association monograph series (Vol. 3, pp. 103–119). Chinese Language Teachers Association. https://web.csulb.edu/~txie/papers/Using_computers.htm
Xie, T. (2011). “Hand-writing” vs. “electronic-writing”: Which way we should go in teaching Chinese? Journal of Chinese Teaching and Research in the U.S., 98–102. http://web.csulb.edu/~txie/papers/E-writing.pdf
Yang, C., & Yu, A. C. L. (2019). The acquisition of Mandarin affricates by American second language learners. Taiwan Journal of Linguistics, 17(2), 91–122. https://doi.org/10.6519/TJL.201907_17(2).0004
Yaniafari, R. P., Olivia, V., & Suharyadi. (2022). The potential of ASR for improving English pronunciation: A review. In The international English language teachers and lecturers (iNELTAL) (pp. 281–289). KnE Social Sciences. https://doi.org/10.18502/kss.v7i7.10670
Ye, L. (2013). Shall we delay teaching characters in teaching Chinese as a foreign language? Foreign Language Annals, 46(4), 610–627. https://doi.org/10.1111/flan.12049
Zhan, H., & Cheng, H. (2014). The role of technology in teaching and learning Chinese characters. International Journal of Technology in Teaching & Learning, 10(2), 147–162.
Zhang, P. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology and Chinese Language Teaching, 12(2), 1–28.

E-Writing in Chinese as a Second and Foreign Language Learning: A Systematic Review

Allen, J. R. (2008). Why learning to write Chinese is a waste of time: A modest proposal. Foreign Language Annals, 41(2), 237–251. https://doi.org/10.1111/j.1944-9720.2008.tb03291.x
Cao, F., Vu, M., Chan, D. H. L., Lawrence, J. M., Harris, L. N., Guan, Q., Xu, Y., & Perfetti, C. A. (2013). Writing affects the brain network of reading in Chinese: A functional magnetic resonance imaging study. Human Brain Mapping, 34(7), 1670–1684. https://doi.org/10.1002/hbm.22017
Chai, C., Wong, L., Sim, S., & Deng, F. (2012). Exploring the relationships between students’ ability of computer-based Chinese input and other variables associated to their performance in composition writing. Turkish Online Journal of Educational Technology, 11(3), 153–161.
Chen, J. []. (2013). [A multi-angles study on computer-based writing and paper-based writing] [,] Master’s thesis]. Central China Normal University.
Chen, J., Luo, R., & Liu, H. (2017). The effect of pinyin input experience on the link between semantic and phonology of Chinese character in digital writing. Journal of Psycholinguistic Research, 46(4), 923–934. https://doi.org/10.1007/s10936-016-9470-y
Dang, M., Zhang, R., Wang, X., & Yang, J. (2019). The Interaction between phonological and semantic processing in reading Chinese characters. Frontiers in Psychology, 9, 1–10. https://doi.org/10.3389/fpsyg.2018.02748
Feng, Y., & Yang, Y. [ ]. (2013). [On the principles of computer input of Chinese characters in Chinese language teaching in North American Universities]. [Chinese Language Globalization Studies], 1, 33–40.
Gong, Y., Guo, Q., Li, M., Lai, C., & Wang, C. (2021). Developing literacy or focusing on interaction: New Zealand students’ strategic efforts related to Chinese language learning during study abroad in China. System, 98. https://doi.org/10.1016/j.system.2021.102462
Gong, Y., Gao, X., & Lyu, B. (2020). Teaching Chinese as a second or foreign language to non-Chinese learners in mainland China (2014–2018). Language Teaching, 53(1), 44–62. https://doi.org/10.1017/S0261444819000387
Gong, Y., & Gao, X. (2024). Language teachers’ identity tensions and professional practice in intercultural teaching. Language Teaching Research. https://doi.org/10.1177/13621688241241125.
Gong, Y., Lai, C., & Gao, X. (2022). Language teachers’ identity in teaching intercultural communicative competence. Language, Culture and Curriculum, 35(2), 134–150.

https://doi.org/10.1080/07908318.2021.1954938
Gong, Y., Lyu, B., & Gao, X. (2018). Research on teaching Chinese as a second or foreign language in and outside mainland China: A bibliometric analysis. The Asia-Pacific Education Researcher, 27(4), 277–289. https://doi.org/10.1007/s40299-018-0385-2.
Guan, C., Liu, Y., Chan, D. H. L., Ye, F., & Perfetti, C. A. (2011). Writing strengthens orthography and alphabetic-coding strengthens phonology in learning to read Chinese. Journal of Educational Psychology, 103(3), 509–522. https://doi.org/10.1037/a0023730
Guan, C., Perfetti, C. A., & Meng, W. (2015). Writing quality predicts Chinese learning. Reading and Writing, 28(6), 763–795. https://doi.org/10.1007/s11145-015-9549-0
Jen, T., & Xu, P. (2000). Penless Chinese character reproduction. Sino-Platonoic Papers, 102. http://sino-platonic.org/complete/spp102_teach_chinese.pdf
Jiang, X., & Zheng, Y. [ ]. (2015). [A survey study of CSL learners' attitudes toward hand-writing and typing]. [Research on Chinese Applied Linguistics], 1, 53–77.
Kang, H. (2011). Computer-based writing and paper-based writing: A study of beginning-level and intermediate-level Chinese learners' writing [Doctoral dissertation]. The Ohio State University. ProQuest Dissertation and Thesis Global.
Ke, C., & Everson, M. E. (1999). Recent research in CFL reading and its pedagogical implications. In M. Chu (Ed.), Mapping the course of the Chinese language field (pp. 189–203). Chinese Language Teachers Association.
Kiefer, M., Schuler, S., Mayer, C., Trumpp, N. M., Hille, K., & Sachse, S. (2015). Handwriting or typewriting? The influence of pen-or keyboard-based writing training on reading and writing performance in preschool children. Advances in Cognitive Psychology, 11(4), 136. https://doi.org/10.5709/acp-0178-7
Lu, X., Ostrow, K. S., & Heffernan, N. T. (2019). Save your strokes: Chinese handwriting practice makes for ineffective use of instructional time in second language classrooms. Aera Open, 5(4). https://doi.org/10.1177/2332858419890326
Lyu, B., Lai, C., Lin, C., & Gong, Y. (2021). Comparison studies of typing and handwriting in Chinese language learning: A synthetic review. International Journal of Educational Research, 106(2). https://doi.org/10.1016/j.ijer.2021.101740
Ma, X., Gong, Y., Gao, X., & Xiang, Y. (2017). The teaching of Chinese as a second or foreign language: A systematic review of the literature 2005–2015. Journal of Multilingual and Multicultural Development, 38(9), 815–830. https://doi.org/10.1080/01434632.2016.1268146
Shen, H. (2005). An investigation of Chinese-character learning strategies among non-native speakers of Chinese. System, 33(1), 49–68. https://doi.org/10.1016/j.system.2004.11.001
Siok, W. T., & Fletcher, P. (2001). The role of phonological awareness and visual-orthographic skills in Chinese reading acquisition. Developmental Psychology, 37(6), 886. https://doi.org/10.1037/0012-1649.37.6.886
Tan, L., Xu, M., Chang, C., & Siok, W. (2013). China's language input system in the digital age affects children's reading development. Proceedings of the National Academy of Sciences of the United States of America, 110(3), 1119–1123. https://doi.org/10.1073/pnas.1213586110
Wang, Z. []. (2012). “” “”?— [“Writing” or “inputting”-discussion on overseas students' learning of Chinese characters inputting]. [The Journal of Moderation of Chinese Language Education], 1, 71–77.
Wong, L., Chai, C., & Gao, P. (2011). The Chinese input challenges for Chinese as second language learners in computer-mediated writing: An exploratory study. Turkish Online Journal of Educational Technology, 10(3), 233–248.
Wu, S. []. (2010). [A cognitive analysis of the international students' use of writing tools in Chinese writing]. () [Journal of Yunnan Normal University (Teaching and Research on Chinese as a Foreign Language Edition)], 2, 9–20.
Xie, T. []. (2011). “”“”— [Handwriting vs. typewriting: Which way we should go in teaching Chinese]. [Journal of Chinese Teaching and Research in the U.S.], 98–102.
Zhang, P. (2021). Typing to replace handwriting: Effectiveness of the typing primary approach for L2 Chinese beginners. Journal of Technology and Chinese Language Teaching, 12(2), 1–28. www.tclt.us/journal/2021v12n2/zhangn.pdf
Zhang, Q., & Min, G. (2019). Chinese writing composition among CFL learners: A comparison between handwriting and typewriting. Computers and Composition, 54, 102522. https://doi.org/10.1016/j.compcom.2019.102522

Zhang, T., & Ke, C. (2018). The Routledge handbook of Chinses second language acquisition. In C. R. K. (Eds.), Research on L2 Chinese character acquisition (pp. 103–133). Routledge.
Zheng, B., Warschauer, M., & Farkas, G. (2013). Digital writing and diversity: The effects of school laptop programs on literacy processes and outcomes. Journal of Educational Computing Research, 48(3), 267–299. https://doi.org/10.2190/EC.48.3.a
Zhou, W., Kwok, V. P., Su, M., Luo, J., & Tan, L. (2020). Children's neurodevelopment of reading is affected by China's language input system in the information era. Science of Learning, 5(1), 1–9. https://doi.org/10.1038/s41539-020-0062-0
Zhu, Y., Shum, S. K. M., Tse, S. K. B., & Liu, J. (2016). Word-processor or pencil-and-paper? A comparison of students' writing in Chinese as a foreign language. Computer Assisted Language Learning, 29(3), 596–617. https://doi.org/10.1080/09588221.2014.1000932
Zhu, Y., Zhou, X., Li, X., Zhang, X., & Gao, T. [ ]. (2011). [The influence of writing instruments on Chinese writing tests of foreign students in China]. [Modern Educational Technology], 21(3), 71–75.
Zhu, Z., Liu, L., Ding, G., & Peng, D. [ ]. (2009). [The influence of pinyin typewriting experience on orthographic and phonological processing of Chinese characters]. [Acta Psychologica Sinica], 41(9), 785–792. https://doi.org/10.3724/sp.J.1041.2009.00785

E-Writing-Based Pedagogy to Advance Chinese Language Learning: Practices From Heritage and Non-Heritage Teaching at a Major Canadian University

Allen, J. R. (2008). Why learning to write Chinese is a waste of time: A modest proposal. Foreign Language Annals, 41(2), 237–251. https://doi.org/10.1111/j.1944-9720.2008.tb03291.x
The Economist. (2022, May 19). Technology is making it easier to write and learn Chinese. The Economist. www.economist.com/culture/2022/05/18/technology-is-making-it-easier-to-write-and-learn-chinese
Everson, M. E. (2011). Best practices in teaching logographic and Non-Roman writing systems to L2 learners. Annual Review of Applied Linguistics, 31, 249–274. https://doi.org/10.1017/s0267190511000171
Guan, C. Q., Liu, Y., Chan, D. H., Ye, F., & Perfetti, C. A. (2011). Writing strengthens orthography and alphabetic-coding strengthens phonology in learning to read Chinese. Journal of Educational Psychology, 103(3), 509–522. https://doi.org/10.1037/a0023730
Hodaeian, M., & Biria, R. (2015). The effect of backward design on intermediate EFL learners' L2 reading comprehension: Focusing on learners' attitudes. Journal of Applied Linguistics and Language Research, 2, 80–93.
Korotchenko, T. V., Matveenko, I. A., Strelnikova, A. B., & Phillips, C. (2015). Backward design method in foreign language curriculum development. Procedia—Social and Behavioral Sciences, 215, 213–217. https://doi.org/10.1016/j.sbspro.2015.11.624
Leung, C. (2012). Outcomes-based language teaching. In A. Burns & J. C. Richards (Eds.), The Cambridge guide to pedagogy and practice in language teaching (pp. 161–179). Cambridge University Press.
Linge, O. (2022). Time quality: Studying the right thing at the right time. In Hacking Chinese. www.hackingchinese.com/time-quality-and-studying-chinese/
Lu, X., Ostrow, K. S., & Heffernan, N. T. (2019). Save your strokes: Chinese handwriting practice makes for ineffective use of instructional time in second language classrooms. AERA Open, 5(4), 233285841989032. https://doi.org/10.1177/2332858419890326
Lyu, B., Lai, C., Lin, C., & Gong, Y. (2021). Comparison studies of typing and handwriting in Chinese language learning: A synthetic review. International Journal of Educational Research, 106, 101740. https://doi.org/10.1016/j.ijer.2021.101740
Paesani, K. (2017). Redesigning an introductory language curriculum: A backward design approach. L2 Journal, 9(1). https://doi.org/10.5070/l29130408
Richards, J. C. (2013). Curriculum approaches in language teaching: Forward, central, and backward design. RELC Journal, 44(1), 5–33. https://doi.org/10.1177/0033688212473293
Tais. (2022, May 4). Why you should learn to write Chinese characters by hand and how to start. www.digmandarin.com/learn-to-write-chinese-characters-by-hand-and-how-to-start.html

Tan, L. H., Xu, M., Chang, C. Q., & Siok, W. T. (2013). China's language input system in the digital age affects children's reading development. Proceedings of the National Academy of Sciences of the United States of America, 110, 1119–1123. www.pnas.org/doi/abs/10.1073/pnas.1213586110

Tyler, R. W. (1949). Basic principles of curriculum and instruction. The University of Chicago Press.

Wiggins, G. P., & McTighe, J. (2005). Understanding by design. ASCD.

Zhang, P. N. (2021). Typing to replace hand-writing: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology and Chinese Language Teaching, 12(2), 1–28.

Zhang, Q., & Min, G. (2019). Chinese writing composition among CFL learners: A comparison between handwriting and typewriting. Computers and Composition, 54, 1–15. https://doi.org/10.1016/j.compcom.2019.102522

Zhu, L., Shum, S. M., Tse, S. K., & Liu, J. (2016). Word-processor or pencil-and-paper? A comparison of students' writing in Chinese as a foreign language. Computer Assisted Language Learning, 29(3), 596–617. https://doi.org/10.1080/09588221.2014.10009

Computerized Chinese to Promote the Three Modes of Communication in an Intermediate Level L2 Chinese Class

ACTFL. (2012). Retrieved July 6, 2022, from www.actfl.org/resources/actfl-proficiency-guidelines-2012

ACTFL. (2022). Retrieved July 6, 2022, from www.actfl.org/uploads/files/general/OralProficiencyWorkplacePoster_2022-10-13-062609_ocga.pdf

He, W. (2009a). [Listening, speaking, reading, typing, and writing: Development directions in teaching Chinese as a foreign language] (pp. 45–60). [Nanjing University Press].

He, W. (2009b). [How to integrate technology into the Chinese language teaching syllabus]. In [Research on teaching Chinese as a foreign language from a multidimensional perspective] (pp. 193–198).

He, W. (2022). Innovative excellence: A case study of a Chinese language flagship program. In Y. Zhang & X. Gao (Eds.), Frontiers of L2 Chinese language education: A global perspective (pp. 8–29). Routledge.

Hu, X. (2020). Learning practices in Chinese character recognition: An analysis of student outcomes and perceptions [Doctoral dissertation]. The University of Rhode Island.

Hu, X., He, W., & Huang, L. (2019). The computer Chinese approach: Connecting pronunciation to character recognition in novice Chinese. The 15th International Conference on Chinese Language Pedagogy.

Interagency Language Roundtable (ILR). (2011). Language skill level descriptions—Writing. www.govtilr.org/Skills/ILRscale5.htm

Luo, H., & Yang, C. (2018). Twenty years of telecollaborative practice: Implications for teaching Chinese as a foreign language. Computer Assisted Language Learning, 31(5–6), 546–571.

Macalister, J., & Nation, I. S. P. (2019). Language curriculum design. Routledge.

Winke, P., Zhang, X., Rubio, F., Gass, S., Soneson, D., & Hacking, J. (2020). The proficiency profile of language students: Implications for programs. Second Language Research & Practice, 1(1), 25–64. http://hdl.handle.net/10125/69840

Towards a Curricularized Approach to L2 Hanzi Teaching and Learning in the Digital Age

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268.

Feldman, L. B., & Siok, W. W. (1999). Semantic radicals contribute to the visual identification of Chinese characters. Journal of Memory and Language, 40(4), 559–576.
Godfroid, A. (2019). The different aspects of vocabulary knowledge. In S. Webb (Ed.), The Routledge handbook of vocabulary studies (pp. 433–453). Routledge.
Henson, A. (2022, April 25). Semantic components: Meaning and form components. Outlier Linguistics Chinese Blog. www.outlier-linguistics.com/blogs/chinese/semantic-components-meaning-and-form-components
Jiang, N., Hou, F., & Jiang, X. (2020). Analytic versus holistic recognition of Chinese words among L2 learners. The Modern Language Journal, 104(3), 567–580.
2005, — 2005 12 [Jiang, X. (2005). Hanzi instruction for Western learners: Separating reading and writing, prioritizing recognition over writing].
2007 “”*2*91–97. [Jiang, X. (2007). An experimental study on the effect of the method of “teaching the learner to recognize characters more than writing”. Shijie Hanyu Jiaoxue/Chinese Teaching in the World, 2, 91–97].
2003 [Ke, C., & Shen, H. (2003). Looking backward and forward: A review of Chinese character instruction research in the United States. Yuyan Jiaoxue yu Yanjiu/Language Teaching & Research, 3].
Kirschner, P., & Hendrick, C. (2020). How learning happens: Seminal works in educational psychology and what they mean in practice. Routledge.
Li, Y. (2019). The Chinese writing system in Asia: An interdisciplinary perspective. Routledge.
Nation, I. S. P. (2013). Learning vocabulary in another language. Cambridge University Press.
Nation, I. S. P. (2019). The different aspects of vocabulary knowledge. In S. Webb (Ed.), The Routledge handbook of vocabulary studies (pp. 15–29). Routledge.
Wang, S. H. (1998). A study on the learning and teaching of Hanzi-Chinese characters. Working Papers in Educational Linguistics, 14(1), 69–101.
Xu, P., & Jen, T. (2005). Penless Chinese language learning: A computer-assisted approach. Journal of the Chinese Language Teachers Association, 40(2), 25–42.
Zhang, P. N. (2021). Typing to replace handwriting: Effectiveness of the typing-primary approach for L2 Chinese beginners. Journal of Technology & Chinese Language Teaching, 12(2), 1–28.

Afterword

Allen, J. (2008). Why learning to write Chinese is a waste of time: A modest proposal. Foreign Language Annals, 41, 237–251.
Byrd, A., Flores, L., Green, D., Hassel, H., Johnson, S., Kirschenbaum, M., Lockett, A., Losh, E., & Mills, A. (2023, July). MLA-CCCC Joint Task Force on Writing and AI Working Paper: Overview of the Issues, Statement of Principles, and Recommendations. MLA-CCCC Working Paper #1. https://hcommons.org/app/uploads/sites/1003160/2023/07/MLA-CCCC-Joint-Task-Force-on-Writing-and-AI-Working-Paper-1.pdf
DeKeyser, R. (2005). What makes learning second-language grammar difficult? A review of issues. Language Learning, 55, 1–25.
Huang, S., Zhou, Y., Du, M., Wang, R., & Cai, Z. G. (2021). Character amnesia in Chinese handwriting: A mega-study analysis. Language Sciences, 85, 101383.
Kyle, K. (2022). L2 writing and vocabulary development. In R. M. Manchón & C. Polio (Eds.), The Routledge handbook of second language acquisition and writing. Routledge.
Polio, C. (2016). E-book module on second language teaching: Teaching second language writing. Routledge.
Polio, C. (2022). Writing and grammar development. In R. M. Manchón & C. Polio (Eds.), The Routledge handbook of second language acquisition and writing. Routledge.
Polio, C., & Park, J. H. (2016). Language development in second language writing. In R. M. Manchón & P. Matsuda (Eds.), Handbook of second and foreign language writing (pp. 287–306). De Gruyter.
Poole, F. J., & Polio, C. (2024). From Sci-Fi to the classroom: Implications of AI in task-based writing. TASK: Journal on Task-Based Language Teaching, 3(2).