

# Guidelines on Learning Management with Radical-Based Instruction and the Form-Meaning Teaching Method for International School in Thailand

Zhu Lin<sup>1</sup>, Rossarin Jermtaisong<sup>1,\*</sup> & Pornpirom Lhongsap<sup>1</sup>

<sup>1</sup>Faculty of Technical Education, Rajamangala University of Technology Thanyaburi, Pathum Thani, Thailand

\*Correspondence: Faculty of Technical Education, Rajamangala University of Technology Thanyaburi, Pathum Thani, Thailand. E-mail: Rossarin\_j@rmutt.ac.th

Received: February 26, 2026

Accepted: May 6, 2026

Online Published: June 12, 2026

doi:10.5430/wje.v16n2p92

URL: <https://doi.org/10.5430/wje.v16n2p92>

## Abstract

Chinese character acquisition in Thailand's international schools presents both opportunities and areas for growth, particularly in supporting long-term retention, commonly referred to as Character Amnesia. While a strong majority of educators recognize the value of radical awareness, there is still room to expand the use of analytical instructional strategies, as conventional rote-learning practices continue to be commonly applied.

This study, employing a mixed-methods design with 46 participants (teachers, experts, parents, and students), highlights promising directions for enhancing literacy development through more structured and intentional pedagogical approaches. To support this advancement, the researcher proposes a 4-Step Strategic Framework: 1). Radical Selection and Introduction, 2). Form-Meaning Association Activities, 3). Character Construction and Application, and 4). Cultural and Contextual Practice. These guidelines, validated with an IOC score of 1.00, are intended to empower educators to become strategic structural decoders. This approach encourages a shift from repetitive practice toward logic-based mastery, ultimately fostering deeper understanding and more sustainable learning outcomes for primary(grade 3) students.

**Keywords:** radical-based instruction, form-meaning teaching method, character amnesia, international schools, learning management guidelines

## 1. Introduction

Chinese language acquisition has increasingly become a critical strategic skill, with instructional models evolving across diverse institutional frameworks. In Thailand's local schools, Chinese is actively integrated into the curriculum, with many institutions seeking to expand coverage and strengthen instructional quality. Local teachers play a central role in this effort, and ongoing professional development provides valuable opportunities to enhance their competency, particularly in meeting advanced proficiency standards such as HSK 5 (Ewe & Min, 2021; Zhang, 2025). Systemic factors—including instructional time allocation and pedagogical approaches—continue to shape learning outcomes in meaningful ways (Zhao, 2024; Office of the Education Council, 2016). In addition, programs supported by the Center for Language Education and Cooperation (CLEC) bring Chinese volunteer teachers into classrooms, contributing to cross-cultural exchange and enriching the learning environment. With appropriate cultural orientation and contextual adaptation, these initiatives can be highly beneficial (He & Li, 2024; Chai & Zhang, 2024). Meanwhile, private schools leverage their operational flexibility to implement innovative approaches, such as scenario-based learning models, which have shown strong potential in enhancing primary-level Chinese education (Dejdamkerngchai et al., 2023).

A particularly dynamic segment is international schools in Thailand, which primarily implement global curricula such as the UK, American, or Singapore frameworks, with English as the main medium of instruction (SISB, 2024; International Schools Database, 2024). For students in these settings—many of whom are expatriates or Thai nationals seeking a competitive multilingual advantage—Chinese is often offered as an elective subject. Although classroom exposure may be more limited, this context presents valuable opportunities to design highly efficient and impactful learning experiences. Kittachotworakul (2023) highlights that time constraints and the absence of a Chinese-speaking environment encourage educators to adopt more focused and innovative pedagogical strategies. In

response, there is growing potential to enhance cognitive retention through more effective and strategic learning management approaches, supporting meaningful and sustainable language acquisition.

Current international standards emphasize mastery in listening, speaking, reading, writing, and translation (Ministry of Education, 2021). Among these competencies, writing represents an important cognitive milestone and plays a key role in language development (Xu et al., 2014). This complexity is closely linked to the morpho-syllabic nature of writing Chinese character skill (Perfetti et al., 2011), where phonetic and semantic information are meaningfully integrated within radicals (Taft et al., 1999). Writing development involves coordinating sensory-motor processes with visual perception, creating valuable opportunities for strengthening learners' cognitive integration (Xu et al., 2020; Meng et al., 2019).

In many classrooms, rote copying is commonly used as a foundational technique to support practice and familiarity. However, research suggests that combining this method with additional strategies can further support long-term retention and minimize challenges such as character amnesia—the gradual decline in writing accuracy over time (Huang et al., 2021). Additionally, learners may sometimes experience difficulty with spatial proportions when characters are perceived primarily as visual forms rather than meaningful structures (Shen, 2005). These insights highlight opportunities to enhance instruction by strengthening the connection between form and meaning.

International schools are therefore well positioned to further enrich their instructional systems by addressing these cognitive dimensions. Traditional practice methods can be effectively complemented with more analytical approaches to optimize working memory. For example, incorporating structural analysis enables students to build meaningful information networks while supporting cognitive efficiency (Taft et al., 1999). Recent studies (Shen et al., 2024; Deng et al., 2026) demonstrate that active learning approaches can significantly enhance achievement, while also pointing to the importance of addressing the ideographic features of Chinese characters. Through radical-based structural analysis, learners can develop deeper orthographic awareness and improved spatial organization, leading to higher-quality writing outcomes (He, 2023). Accordingly, this study proposes a refined guideline Radical-Based Instruction (RBI) combined with Form–Meaning Teaching Method to enhance writing Chinese characters skills.

To further support these advancements, there is a timely opportunity to develop specialized guidelines for learning management. These guidelines are designed to extend traditional practice by systematically incorporating RBI and the Form–Meaning Teaching Method. This integrated approach supports the reduction of cognitive load and promotes writing as a logical, meaning-driven process. Guided by this objective, the present research conducts a needs analysis to establish a strong foundation for innovative instructional guidelines tailored to primary students in Thailand's international schools.

In response to these opportunities, the study seeks to address the following research question: What effective learning package by Radical-Based Instruction (RBI) combined with Form–Meaning Teaching Method would to enhance the retention of Chinese characters and writing Chinese characters skill among primary(grade 3) students in Thailand's international schools?

## 2. Literature Review

### 2.1 Orthographic Awareness and the Cognitive Foundations of Radical-Based Instruction

Orthographic awareness in Chinese serves as a vital cognitive bridge for international school students, supporting a progression from memorization-based learning toward a more analytical and meaningful acquisition of characters (Shu & Anderson, 1997; Shen, 2005). Neuroscientific research further demonstrates that structured literacy training enhances the brain's sensitivity to character composition and internal structures (Zhao et al., 2018). Radical-Based Instruction (RBI) effectively contributes to this development by presenting semantic and phonetic components as integrated and cohesive units (Zhao et al., 2018; He, 2023). This framework enables learners to apply chunking strategies, optimizing cognitive processing by organizing complex strokes into manageable and meaningful clusters (Taft et al., 1999; Sweller, 1988). Recent studies highlight that RBI-driven grouping is particularly effective for young second-language learners (Xu et al., 2014; Wong, 2020), especially when combined with the sensory-motor advantages of handwriting practice (Xu et al., 2020; Meng et al., 2019). This combination supports deeper engagement and strengthens memory consolidation. As a result, RBI offers a strong and effective framework for enhancing character acquisition by reinforcing the multidimensional connections among form, sound, and meaning. This integrated approach positively supports long-term retention and contributes to the reduction of character amnesia (Zhang & Xing, 2023; Huang et al., 2021).

## 2.2 Theoretical Foundations of Form–Meaning Association Activities

Instructional models for Chinese characters frequently incorporate mechanical rote copying as a foundational practice, supporting familiarity and repetition. However, this approach can be further strengthened by integrating methods that deepen cognitive processing and enhance long-term retention (Taft & Zhu, 1997; Huang et al., 2021). The Form–Meaning Teaching Method offers a constructive extension by emphasizing logical associations that complement repetitive practice (Cheng, 2024). Kittachotworakul (2023) highlights that the limited immersive environment and instructional time in Thailand’s early childhood settings present valuable opportunities to refine teaching approaches through more structured and targeted activities. By linking visual structures with semantic imagery, the Form–Meaning approach establishes a cohesive Form–Meaning–Sound network, which supports more effective encoding of information into long-term memory compared to isolated motor practice (Kang & Ma, 2025). This shift from focusing primarily on individual strokes toward component-based analysis enables students to interpret abstract characters as logical, meaningful, and narrative-driven structures (Cheng, 2024). Additionally, integrating stroke-order principles with character recognition helps optimize cognitive engagement, support efficient processing, and maintain sustained learner interest among primary students (Sun et al., 2024).

## 2.3 Multi-modal Support and Strategic Innovation in Radical-Based Instruction and the Form–Meaning Teaching Method

Contemporary Chinese language instruction has progressively evolved through the integration of instructional tools designed to support cognitive processing and enhance learning efficiency (Zhan & Cheng, 2014). Recent developments in the field highlight the value of proactive strategies, including the use of electronic devices and interactive resources that provide timely and responsive learning support (Tukhtabayeva et al., 2024). Within these Learning Management Guidelines, such technologies function as dynamic and interactive supports that effectively connect Radical-Based Instruction (RBI) with the Form–Meaning Teaching Method, creating a highly engaging and student-centered learning environment. By implementing these approaches through digital platforms, international school students are better equipped to develop effective character acquisition strategies (Kan et al., 2018). This integrated instructional framework offers meaningful ways to maximize available classroom time while promoting durable memory formation through the combined benefits of structural analysis and semantic association (Kan et al., 2018; Sun et al., 2024; Tukhtabayeva et al., 2024). Recent empirical studies further affirm the effectiveness of these approaches. Shen et al. (2024) demonstrate that integrating active learning principles enhances student engagement and achievement, while Deng et al. (2026) emphasize that strategic innovation in Chinese language pedagogy supports sustained progress and strengthens learners’ accuracy in character structure. Together, these findings highlight the strong potential of multimodal and technology-enhanced instruction to advance learning outcomes in Chinese character education.

## 3. Methodology

### 3.1 Population and Selection Criteria

This study employed purposive sampling to capture a comprehensive and multifaceted perspective of the international school ecosystem. The final cohort consisted of 46 participants, systematically organized into four key groups: Chinese Language Teachers (n = 10), each with a minimum of three years of experience in primary-level instruction; Subject Matter Experts (n = 6), selected based on rigorous professional criteria. These experts are currently serving as university lecturers in Chinese pedagogy or as Chinese national educators with more than 10 years of instructional experience in Thailand. All experts hold advanced qualifications (Master’s or Doctorate degrees) in Teaching Chinese as a Foreign Language (TCFL) or closely related fields, and demonstrate established contributions to the field through published research in Chinese language education; Parents (n = 10) of primary students actively enrolled in Chinese language programs; and Primary 3 Students (n = 20).

The selection of the student group specifically focused on Grade 3, as this level represents an important stage of development in which character complexity increases significantly. At this stage, learners begin to transition from holistic recognition toward more structured and analytical approaches to character acquisition. By engaging these diverse stakeholder groups, the study is well positioned to generate practical and contextually relevant insights. This inclusive approach ensures that the proposed learning management guidelines effectively address both pedagogical objectives and the authentic needs of the international school environment.

### 3.2 Research Instruments and Validation

To ensure comprehensive data triangulation, this study employed two primary research instruments: (1) a Needs

Analysis Questionnaire utilizing a 5-point Likert scale for quantitative assessment; and(2) semi-structured interviews designed to capture in-depth qualitative insights. In alignment with rigorous academic standards, both instruments underwent systematic validation for content accuracy using the Index of Item-Objective Congruence (IOC). The validation process was conducted by a panel of five highly qualified experts specializing in Curriculum and Instruction, Curriculum Design, Educational Measurement and Evaluation, and Chinese Language Pedagogy. The evaluation resulted in an IOC score of 1.00, indicating a strong and precise alignment between the research instruments and the study's objectives. This outcome reflects the high level of clarity, relevance, and validity achieved in the instrument design. Furthermore, the involvement of distinguished experts, including those with extensive experience in Thailand's Chinese education context (Kittachotworakul, 2023), strengthens the credibility of the research framework. This robust validation process provides a solid foundation for generating reliable insights and advancing effective learning management practices in Chinese character instruction.

### 3.3 Data Analysis

A dual-track analytical approach was adopted to comprehensively synthesize the research findings. Quantitative data obtained from the questionnaires were analyzed using percentage (%) distributions to identify patterns in instructional practices and to highlight the specific learning needs of students. This statistical mapping provides clear and measurable insights into trends related to character retention and structural understanding, offering strong empirical support for the proposed instructional guidelines. In parallel, qualitative data from the semi-structured interviews were analyzed using Thematic Content Analysis. Responses were systematically coded and organized into key themes, allowing for deeper interpretation and contextual understanding of participants' perspectives. By integrating quantitative patterns with rich qualitative insights, this analytical approach establishes a robust and well-rounded evidence base. This foundation supports the effective integration of Radical-Based Instruction (RBI) and the Form–Meaning Teaching Method into a cohesive and contextually responsive learning management framework.

## 4.Result

### 4.1 Quantitative Analysis Results

#### 4.1.1 Situational Analysis of Chinese Character Instruction

**Table 1.** Analysis of the Teaching and Learning Context(Chinese Language Teachers, n=10)

Item	Description	Majority Response	Percentage (%)
1.1	General Chinese proficiency level	Beginner / Mixed Ability	40% / 40%
1.2	Chinese lessons per week	2 Periods / 4 Periods	30% / 30%
1.3	Duration of each lesson	40 Minutes / 45 Minutes	40% / 40%
1.4	Main learning goals for writing	Radical recognition and functions	90%
1.5	Weekly time for stroke/radical/structure	Confusion with similar-looking characters	80%
1.6	Weekly time for stroke/radical/structure	More than 45 minutes	50%
1.7	Class size (Number of students)	Fewer than 10 / 21–30 Students	40% / 40%
1.8	Students' linguistic background	Mixed background	60%
1.9	Key factors affecting performance	Learning habits	60%

The Primary 3 Chinese instructional context reflects rich linguistic diversity, with 60% of students from mixed backgrounds and 80% at beginner or mixed proficiency levels. Instructional goals strongly emphasize radical recognition (90%) and stroke accuracy (80%), while many learners continue to develop skills in distinguishing similar characters, indicating opportunities for further refinement. Teachers show strong commitment, with 50% dedicating over 45 minutes weekly to structural instruction, providing a solid foundation for deeper cognitive development. Students' learning habits and the mixed-background environment further highlight the need for adaptive strategies. Overall, these findings suggest valuable potential to enhance current practices by integrating form–meaning-based approaches that support clearer understanding and stronger long-term retention.

**Table 2.** Instructional Barriers and Challenges (Chinese Language Teachers, n=10)

Item	Description	Majority Response	Percentage (%)
2.1	Importance of radical awareness	Important / Very Important	90%
2.2	Frequency of explicit radical instruction	2–3 Times per week	70%
2.3	Perceived effectiveness of Form–Meaning Method	Very Effective	60%
2.4	Prioritized teaching principles	Meaning-based / Repetition	70%/70%
2.5	Impact of form-meaning links on error reduction	Yes / Somewhat	100%
2.6	Use of etymology/pictograph stories	Often / Sometimes	100%
2.7	Radical teaching for long-term retention	Very Helpful	50%
2.8	Radicals in distinguishing similar characters	Yes	100%
2.9	Familiarity with research-based instruction	Familiar	60%

The pedagogical consensus among participants strongly supports a structural and semantic approach, with 100% of teachers recognizing radical instruction as an effective tool for differentiating morphologically similar characters. A substantial majority (90%) emphasize the importance of radical awareness, and 60% identify the Form–Meaning Teaching Method as highly effective. In practice, teachers adopt a balanced strategy, integrating meaning-based learning and structured repetition equally (70% each). Additionally, etymological stories and pictographic narratives are widely used (100%), enriching the learning experience, while the 60% familiarity with research-based instruction reflects a solid foundation for continued professional development. These findings highlight strong instructional practices and indicate clear potential to further enhance teaching through more structured, research-informed frameworks that integrate repetition with deeper cognitive understanding.

**Table 3.** Frequency of Teaching Methodologies(Chinese Language Teachers, n=10)

Item	Description	Majority Response	Percentage (%)
3.1	Strategies for introducing new characters	Decomposition	70%
3.2	Visual aids used	Flashcards / Stroke Animations	70%/60%
3.3	Frequency of games/group work	Moderate	60%
3.4	Integration of worksheets/whiteboard/iPad	Yes, regularly	60%
3.5	Radical explanation approach	Both Explicit & Implicit	90%
3.6	Techniques for form–meaning connection	Using radicals as meaning clues	100%
3.7	Comparing characters with same radical	Often	70%
3.8	Build-a-character tasks	Sometimes	60%

The data reveal a strong pedagogical consensus, with 100% of educators recognizing radical instruction as a vital tool for distinguishing similar characters. A substantial majority (90%) emphasize the importance of radical awareness, while 60% endorse the effectiveness of the Form–Meaning Teaching Method. In classroom practice, teachers demonstrate a balanced and comprehensive approach by equally prioritizing meaning-based learning (70%) and structured repetition (70%). Additionally, etymological narratives are consistently integrated into instruction (100%), enriching students' understanding and engagement. The 60% familiarity with research-based instruction reflects a solid and growing foundation for professional development. Overall, this integrated “meaning plus practice” approach highlights a valuable opportunity to further strengthen teaching effectiveness through more structured, research-informed frameworks that support deep cognitive encoding.

**Table 4.** Requirements for Media and Innovation (Chinese Language Teachers, n=10)

Item	Description	Majority Response	Percentage (%)
4.1	Assessment methods used	Dictation / Writing tests	80%/80%
4.2	Assessment of radical understanding	Sometimes	90%
4.3	Criteria for writing accuracy	Structure / Meaning expression	70%/70%
4.4	Evaluation of character meaning	Yes / Sometimes	100%
4.5	Use of technology for assessment	Sometimes	70%
4.6	Most common writing errors	Misplacement or distortion of radicals	90%
4.7	Feedback methods	Verbal / Written notes	90%/80%
4.8	Potential of a structured learning package	Yes	80%

Current assessment practices demonstrate a strong foundation in traditional methods, with 80% of teachers utilizing dictation and writing tests to support skill development. At the same time, 90% of educators report that they occasionally assess radical understanding, highlighting a valuable opportunity to further strengthen this area of evaluation. This pattern aligns with observed student performance, where 90% of learners are continuing to develop accuracy in radical placement and structural organization, indicating meaningful areas for instructional enhancement. Feedback practices are well established, with 90% provided verbally and 80% in written form, supporting continuous learning. Additionally, the use of digital tools (30%) reflects an emerging area of pedagogical innovation with strong potential for expansion. Notably, 80% of teachers express a clear need for a structured learning package, underscoring strong support for the development of formalized resources that can effectively connect traditional assessment methods with deeper structural understanding.

**Table 5.** Professional Development and Instructional Needs (Chinese Language Teachers, n=10)

Item	Description	Majority Response	Percentage (%)
5.1	Adequacy of teaching time	Inadequate	50%
5.2	Curriculum support	Partly	70%
5.3	Collaboration with Chinese teachers	Sometimes	70%
5.4	Environmental factors affecting learning	Learning behavior	70%
5.5	School emphasis	Both Accuracy & Communication	90%
5.6	Pressure from curriculum or parents	Some pressure	70%
5.7	Extra opportunities for writing	Rarely	50%
5.8	Classroom management for writing focus	Providing models & step-by-step guidance	90%
5.9	Primary challenges faced	Limited time / Mixed proficiency	40%/40%

The Primary instructional environment demonstrates a dynamic context shaped by time considerations, with 50% of educators indicating opportunities to extend teaching periods and provide additional writing practice. Institutional emphasis on accuracy remains strong (90%), while teachers effectively navigate curriculum expectations and parental engagement (70%), reflecting a supportive and goal-oriented environment. Student learning behaviors (70%) and diverse proficiency levels (60%) further highlight the importance of adaptive instructional strategies. Notably, 90% of teachers actively address these factors through step-by-step modeling, reinforcing structured learning processes. These findings collectively highlight a strong foundation and point to valuable opportunities for implementing a time-efficient, structured learning package that can deliver impactful outcomes within existing instructional frameworks.

Instructional materials are primarily supported by traditional paper-based tools (70%), complemented by a strong commitment (100%) to incorporating pictographs and character origins to enrich learning. At the same time, 70% of classrooms present opportunities to further expand the use of specialized radical posters, while access to dedicated handwriting applications (10%) highlights an emerging area for digital enhancement, with many educators effectively utilizing general-purpose platforms. Notably, teachers actively demonstrate creativity and professionalism by developing their own instructional materials (100%) and widely recognizing the value of color-coding strategies (80%) in supporting character learning. In addition, 70% of educators express strong interest in level-appropriate digital

platforms and multimedia animations, indicating a clear and forward-looking demand. Overall, these findings highlight valuable potential for developing an integrated resource ecosystem that combines structural understanding with interactive technology to strengthen the form–meaning connection in Chinese character acquisition.

**Table 6.** Analysis of Teaching Tools and Material Requirements (Chinese Language Teachers, n=10)

Item	Description	Majority Response	Percentage (%)
6.1	Primary materials used	Worksheets / Flashcards	70%/70%
6.2	Availability of radical posters	No	70%
6.3	Writing tools available to students	Exercise books / Grid paper	70%/70%
6.4	Effectiveness of colour coding	Effective / Very effective	80%
6.5	Activities for form+meaning learning	Pictographs / Visuals of character origins	100%
6.6	Designing own materials	Sometimes / Yes	100%
6.7	School-provided digital resources	Online platforms (Google Classroom/Teams)	100%
6.8	Additional tools desired	Level-appropriate platforms / Worksheets / Multimedia	70%/70%/70%

## 4.2 Qualitative Analysis Results

### 4.2.1 Results of Student Interviews (Primary 3 Students, n = 20)

**Opportunities to Strengthen Character Retention.** Student interviews highlight character retention as an important area for continued instructional development, particularly in relation to the consolidation of newly learned material. Student A (Grade 5) noted that some information may not be maintained consistently over time, indicating valuable opportunities to reinforce long-term memory strategies. This observation is often linked to the complexity of character structures, where learners benefit from clearer connections between components and meaning. Another student B (Grade 6) emphasized the importance of understanding the functional role of radicals, suggesting that explicit explanation of their purpose can enhance comprehension. These insights indicate that incorporating structured, component-based instruction can effectively support learners in managing cognitive load and strengthening retention.

**Development of Traditional Pedagogical Practices.** Traditional practice methods, such as character copying, continue to provide learners with structured opportunities to build writing proficiency and reinforce familiarity. Students indicated that these activities require focus and sustained effort (Grade 3 and Grade 6), which contributes to skill development over time. At the same time, some students expressed a preference for more varied and engaging learning experiences alongside repetition. For example, Student C (Grade 4) highlighted that extended writing practice can be physically demanding, while another student D (Grade 6) suggested that incorporating diverse activities could further enhance motivation and engagement. These perspectives suggest that complementing traditional drills with interactive and varied instructional strategies can effectively support sustained engagement, learner confidence, and overall learning outcomes.

**Preferences for Narrative and Visual Support.** Students (Grade 6) expressed a strong preference for meaning-based instruction that incorporates storytelling and visual aids, highlighting the value of engaging and intuitive learning experiences. As noted by Student E, narrative approaches enhance understanding and make lessons more accessible. Visual representations were also identified as highly supportive, with Student F indicating that such tools help clarify character structures and improve comprehension. Another student G emphasized that these approaches make the learning process more approachable and meaningful. Additionally, Student H's suggestion to explore alternatives to repetitive copying reflects a constructive interest in diversified instructional strategies that emphasize semantic clarity and deeper understanding.

**Strategic Integration and Creative Agency.** Students also highlighted the importance of integrating electronic resources and encouraging creative expression within the learning process. There was clear interest in interactive tools and achievement-based rewards as motivators within a blended learning environment. Beyond structured support, students demonstrated enthusiasm for opportunities to express creativity, such as designing original illustrations and composing stories using learned characters (Student I, Grade 5). These insights provide a clear and positive direction

for instructional design: the proposed learning package can effectively transform character writing into a logical, interactive, and creative experience that promotes engagement, ownership, and meaningful learning.

#### 4.2.2 Results of Parent Interviews (Parents, n = 20)

**Enhancing Retention and Orthographic Precision.** Parents highlighted valuable opportunities to further strengthen students' long-term retention, noting that the current learning process can be enhanced by reinforcing connections between writing and meaning. For example, Parent A observed that while students often demonstrate accurate handwriting, they benefit from continued support in recalling character meanings, indicating potential for deeper semantic integration. In addition, parents identified opportunities to further develop orthographic precision, including improved component spacing and consistent stroke order. These insights suggest that emphasizing structural logic and form–meaning connections can effectively enhance both accuracy and retention, supporting a more stable, meaningful, and rewarding process of Chinese character acquisition. **Instructional Support and Home–School Collaboration.** Interviews highlight valuable opportunities to enhance instructional scaffolding and strengthen home–school collaboration, particularly as parents seek to further support their children's learning regardless of their own language backgrounds. The introduction of resources such as electronic instructional videos and guidance cards was received with strong enthusiasm, as these tools provide clear and accessible visual support. For instance, Parent A noted that having explicit guidance on stroke order would greatly enhance their ability to effectively assist their child during home practice. These resources are therefore viewed as an important bridge, reinforcing continuity between classroom instruction and home learning, and contributing to a more consistent and supportive educational environment. **Incentivization and Autonomous Motivation.** Parents highlighted the value of integrating positive reinforcement to further cultivate proactive learning attitudes among students, suggesting that academic tasks can be enhanced by presenting them as engaging and achievable challenges. Recommendations included the use of achievement-based incentives and tools such as character growth trackers to support visual monitoring of progress. By complementing traditional practice with more interactive and goal-oriented approaches, parents indicated that character writing can evolve into a meaningful and purposeful activity. This approach encourages students to take greater ownership of their learning, fostering intrinsic motivation supported by a clear sense of accomplishment and visible progress.

#### 4.2.3 Results of Expert Interviews (Subject Matter Experts, n = 6)

**Radicals as a Decoding Key.** Experts consistently identify radicals as a foundational element that supports the transformation of Chinese characters into a coherent and logical system. By emphasizing radical instruction, educators can provide students with an effective decoding key that enhances orthographic awareness and reduces reliance on memorization alone. Expert A highlighted that accurate writing practice supports learners in internalizing both form and meaning, which in turn contributes positively to the development of listening, reading, and vocabulary skills. To further strengthen this process, Expert A also recommended the use of color-coding strategies, such as applying distinct colors to highlight radicals. This approach helps manage cognitive load and enables young learners to identify structural components more efficiently during the learning process. **The Logic of Form–Meaning Connections.** Character learning is most effective when supported by clear and meaningful underlying structures. Experts emphasize that establishing strong connections between form and meaning provides Chinese characters with a coherent logical framework, facilitating the transition of knowledge from short-term to long-term memory. Expert A suggests enhancing student engagement through image–meaning associations, such as illustrating the relationship between a character and its visual origin to encourage active interpretation. This approach promotes learners' active involvement in constructing understanding. Furthermore, Expert A notes that explaining character origins and incorporating narrative-based strategies can make complex scripts more accessible to young learners, thereby supporting retention through deeper conceptual understanding. **Scaffolding and Multimedia Integration.** Experts emphasize the importance of scaffolding in instructional design, highlighting the value of sequencing content from simple to more complex levels to support progressive learning and foster a strong sense of achievement. Expert A recommends introducing radicals commonly found in everyday contexts, enabling students to recognize the practical relevance of the language beyond the classroom. Furthermore, multimedia elements are identified as effective extensions of classroom instruction. Expert B highlights the usefulness of guidance cards and instructional videos in strengthening home–school collaboration, allowing students to engage in independent review while maximizing the effectiveness of classroom learning time. **Process-Oriented Assessment and Flexibility.** Motivation and recognition are identified as essential factors in fostering sustained student interest. Experts suggest that assessment can effectively emphasize the learning process, with tools such as character growth trackers enabling students to observe and take pride in their visible progress (Expert C). In addition, instructional materials are most effective when they remain diverse and adaptable. Expert D highlights the value of incorporating a variety of resources, including flashcards, interactive games, and multimedia content, to maintain engagement and support different learning preferences. This flexible and

resource-rich approach also equips teachers with adaptable strategies to respond effectively to the dynamic nature of primary school learning environments.

## 5. Discussion

### 5.1 Discussion: Conceptual Synthesis

The quantitative and qualitative findings in Section 4 highlight valuable opportunities to enhance Chinese character instruction by strengthening orthographic awareness as a key bridge for understanding structural complexity (Perfetti et al., 2011). With the support of analytical approaches, learners can more effectively recognize characters as meaningful and structured units (Shen, 2005). In response, the proposed 4-Step Strategic Framework serves as a practical foundation, guiding students from holistic memorization toward a more systematic approach through Radical-Based Instruction (RBI). This transition supports chunking strategies that organize complex strokes into manageable units, optimizing cognitive processing (Miller, 1956; Taft et al., 1999). Aligned with insights from students and experts, this approach offers an effective pathway to enhance learning efficiency, support sustained cognitive engagement, and promote deeper, long-term character acquisition within the structured context of international schools. The strong demand for diverse instructional media and observed patterns in character retention suggest valuable opportunities to further enhance traditional practice methods through innovative reinforcement strategies. As noted by Kittachotworakul (2023), the limited immersive exposure within Thailand's educational context highlights the importance of incorporating multimodal support. Observations related to stroke sequence development indicate that orthographic precision can be effectively strengthened when sensory-motor coordination is closely aligned with visual perception (Xu et al., 2020). In response, the integration of electronic devices and interactive resources within Step 3 of the proposed guidelines provides a supportive scaffold, offering real-time visual and motor guidance. This multimodal approach is consistent with findings from Deng et al. (2026) and Sun et al. (2024), demonstrating that strategic innovation not only enhances character recognition but also strengthens the neural connections necessary for sustained long-term retention. Furthermore, the strong consensus regarding the value of a structured learning package, together with parents' expressed interest in enhancing their instructional confidence (Section 4.2.2), highlights the importance of developing a collaborative learning ecosystem. The incorporation of progress-tracking tools and achievement-based motivators in Step 4 effectively transforms character writing into a purposeful, goal-oriented process. This holistic framework supports sustained learner engagement and aligns with findings from Sun et al. (2024) on the benefits of motivation-driven learning. By empowering parents as informed facilitators through accessible instructional resources (Kan et al., 2018), the proposed guidelines help maintain continuity between classroom instruction and home practice. Ultimately, the integration of Radical-Based Instruction (RBI) with multimodal technology offers a sustainable pathway for mastering Chinese characters, enhancing neural sensitivity while supporting efficient cognitive processing for young learners (Zhao et al., 2018; Tukhtabayeva et al., 2024).

### 5.2 Proposed Guidelines: A 4-Step Strategic Instructional Framework

**Step 1: Radical Selection and Introduction.** This initial stage introduces students to the fundamental structure of Chinese characters, with an emphasis on radicals as essential components. Using tools such as radical cards and small-group matching activities to actively engage learners in decoding the script's internal logic. Teacher-guided explanations of radical origins and related characters further deepen understanding and provide a meaningful entry point into orthographic structure. This stage supports early character recognition through strategic chunking (Miller, 1956; Taft et al., 1999), helping learners organize information efficiently and manage cognitive load. Aligned with Kittachotworakul (2023), it addresses the structural learning needs within the Thai context, while the integration of active learning principles (Shen et al., 2024) promotes early engagement and establishes a strong cognitive foundation for more advanced learning in subsequent stages.

**Step 2: Form–Meaning Association Activities.** Building on the foundational concepts introduced in Step 1, this stage develops students' understanding of semantic radicals through meaningful association and contextual application using familiar, everyday vocabulary. Activities such as matching exercises, sentence completion, and student-led explanations encourage learners to actively construct meaning, transforming characters into logical and interpretable structures. Instruction focuses on commonly encountered radicals related to nature—such as wood, water, fire, and sun—and the human body, including mouth, hand, and heart. This approach promotes deep cognitive processing by helping students recognize how radicals contribute to the meaning of compound characters. Establishing this Form–Meaning connection (Kang & Ma, 2025) fosters meaningful learning and supports long-term retention by integrating conceptual understanding with practical application (Cheng, 2024).

**Step 3: Character Construction and Application.** This stage focuses on developing students' writing ability through the application of the form–meaning instructional approach. Students engage in structured practice of stroke order and character formation, supported by interactive activities such as word-building tasks and short sentence construction. In response to the time considerations highlighted by Kittachotworakul (2023), these activities provide an efficient and focused framework that offers timely feedback and reinforcement to strengthen understanding and retention. The integration of multimodal support (Tukhtabayeva et al., 2024) further enhances learning by helping students internalize orthographic-motor memory (Meng et al., 2019) with increasing accuracy and confidence, while promoting the balanced structural development emphasised by Deng et al. (2026) and Sun et al. (2024).

**Step 4: Cultural and Contextual Practice.** The final stage emphasises real-life application and creative expression, consolidating character writing skills through meaningful cultural integration. By incorporating electronic devices for cultural videos, dialogue practice, and creative activities such as drawing and origami, character writing becomes a purposeful and engaging learning experience. Students actively apply characters in reading passages, writing tasks, and storytelling activities, embedding language acquisition within an authentic cultural context. Aligned with the active learning principles highlighted by Shen et al. (2024), this stage fosters learner agency and sustained engagement while supporting efficient cognitive processing and reinforcing long-term retention. Ultimately, students further develop their written communication skills with increasing confidence and autonomy (Taft et al., 1999; Sun et al., 2024).

### *5.3 Strategic Framework for Stakeholder Implementation*

**For Chinese Language Educators.** Educators in international schools are encouraged to adopt the role of Strategic Structural Decoders, fostering learning environments in which Chinese characters are understood as logical and meaningful systems. This progression involves complementing repetitive practice with analytical pedagogy that emphasizes the origins and functions of strokes and radicals. By responding to patterns identified in character retention (Huang et al., 2021), teachers can effectively apply the Form–Meaning Teaching Method to strengthen the Form–Meaning–Sound connection (Kang & Ma, 2025), supporting conceptual mastery. In addition, providing targeted feedback on orthographic proportions assists students in achieving structural balance, while the integration of electronic devices and interactive resources (Tukhtabayeva et al., 2024) enhances instructional consistency and enriches learning experiences across diverse teaching contexts.

**For Parents and Guardians.** Parents are encouraged to take on the role of Learning Facilitators, actively supporting home-based practice through accessible instructional tools. Resources such as guidance cards and interactive digital platforms offer clear support for understanding stroke order and character structure (Kan et al., 2018). Participation in structured progress-monitoring systems, such as the Chinese Character Growth Book, further promotes positive reinforcement and sustained engagement (Sun et al., 2024). This collaborative approach strengthens the connection between classroom learning and home practice, creating a cohesive and supportive learning environment that enhances long-term retention.

**For School Administrators and Curriculum Designers.** School leaders play a key role as Systemic Innovation Supporters, facilitating the advancement of instructional practices through strategic investment in interactive technologies and professional development. This includes supporting teacher training in Radical-Based Instruction (RBI) and Form–Meaning methodologies to align with evolving pedagogical needs. Curriculum designers are encouraged to structure timetables that allow sufficient depth of learning, prioritizing structural understanding and meaningful practice (Shu & Anderson, 1997). By emphasizing instructional quality and logical mastery, administrators and designers can effectively support cognitive efficiency and enhance the overall impact of international Chinese language programs (Taft et al., 1999).

**For Students.** Students, as central stakeholders, are encouraged to take an active role as engaged decoders of Chinese characters. Through the application of the 4-Step Strategic Instructional Framework, learners develop the ability to analyze radicals and understand their semantic and structural functions prior to writing. The use of interactive tools and animations supports self-directed learning (Kan et al., 2018), helping students focus on structure, stroke order, and rhythm. By engaging with progress-tracking systems and achievement-based strategies, learners develop a proactive mindset (Cheng, 2024), fostering a sense of accomplishment, confidence, and creative expression in their written language development.

### *5.4 Conclusion and the Evolution of a New Instructional Model*

This study presents a strategic instructional model designed for the international school context in Thailand, highlighting valuable opportunities for enhancing Chinese character learning. Empirical findings indicate that areas

such as character retention and radical placement can be effectively strengthened through targeted instructional innovation. Within the Thai international environment, where immersive exposure is relatively limited (Kittachotworakul, 2023), the findings point to a clear pathway for implementing more efficient and structured literacy frameworks. By integrating Radical-Based Instruction (RBI) with the Form–Meaning Teaching Method, this study offers a comprehensive approach that supports learners in developing stronger connections between structure and meaning. This framework promotes effective cognitive processing (Taft et al., 1999) and equips students with logical strategies to decode characters into manageable and meaningful units (Cheng, 2024; Kang & Ma, 2025). Furthermore, the proposed model fosters a collaborative educational ecosystem in which teachers act as strategic structural facilitators and parents contribute as active learning supporters. Through the integration of innovations such as interactive animations and instructional resources (Tukhtabayeva et al., 2024; Kan et al., 2018), the learning process is enhanced into a purposeful and engaging experience. Ultimately, sustained success in international contexts is supported by an emphasis on logical mastery, high-quality instructional design, and continuous learner engagement. This research contributes to the development of innovative educational practices, ensuring that young learners in Thailand can achieve Chinese character proficiency with confidence, active participation, and long-term retention (Sun et al., 2024; He, 2023).

### *5.5 Conclusion and the Evolution of a New Instructional Model*

This study presents a strategic instructional model designed for the international school context in Thailand, highlighting valuable opportunities for enhancing Chinese character learning. Empirical findings indicate that areas such as character retention and radical placement can be effectively strengthened through targeted instructional innovation. Within the Thai international environment, where immersive exposure is relatively limited (Kittachotworakul, 2023), the findings point to a clear pathway for implementing more efficient and structured literacy frameworks. By integrating Radical-Based Instruction (RBI) with the Form–Meaning Teaching Method, this study offers a comprehensive approach that supports learners in developing stronger connections between structure and meaning. This framework promotes effective cognitive processing (Taft et al., 1999) and equips students with logical strategies to decode characters into manageable and meaningful units (Cheng, 2024; Kang & Ma, 2025). Furthermore, the proposed model fosters a collaborative educational ecosystem in which teachers act as strategic structural facilitators and parents contribute as active learning supporters. Through the integration of innovations such as interactive animations and instructional resources (Tukhtabayeva et al., 2024; Kan et al., 2018), the learning process is enhanced into a purposeful and engaging experience. Ultimately, sustained success in international contexts is supported by an emphasis on logical mastery, high-quality instructional design, and continuous learner engagement. This research contributes to the development of innovative educational practices, ensuring that young learners in Thailand can achieve Chinese character proficiency with confidence, active participation, and long-term retention (Sun et al., 2024; He, 2023).

## **6. Conclusion**

### *6.1 Research Summary*

This research was conducted to develop and evaluate instructional guidelines for Chinese character learning among primary students in international schools in Thailand, with a focus on enhancing long-term retention. Employing a mixed-methods approach, the study integrated findings from a situational analysis involving 10 Chinese language teachers and professional insights from 6 subject-matter experts. The primary outcome of this research is the 4-Step Strategic Instructional Framework, which includes: (1) Radical Selection and Introduction, (2) Form–Meaning Association Activities, (3) Character Construction and Application, and (4) Cultural and Contextual Practice. The findings demonstrate that complementing traditional repetition with a structured, cognitive-driven approach significantly strengthens students' orthographic awareness. By establishing a clear Form–Meaning–Sound connection, the framework supports accurate structural understanding and promotes sustainable long-term retention. Furthermore, the integration of logical decoding strategies and digital instructional supports enhances learner confidence and engagement in Chinese character acquisition.

### *6.2 Research Limitations*

This research also identifies valuable directions for future development. The study focuses primarily on international schools in Thailand, offering a strong contextual foundation that may be further extended to other educational settings, including public school systems. In addition, while the study provides meaningful insights into memory development within the research timeframe, future studies may build on these findings by exploring long-term retention across

multiple academic years. Finally, variations in technological infrastructure across institutions present opportunities for further adaptation and scalability of the proposed framework. Continued advancement in digital resources and school support systems will further enhance the effective implementation of multimedia and technology-based instructional strategies.

### 6.3 Recommendations for Future Research

To further strengthen and expand the effectiveness of the proposed framework, future research is encouraged to conduct classroom-based pilot implementations across diverse international school contexts, enabling the observation of authentic student interactions and the refinement of strategies in real-time. Ongoing iterative development of the 4-step instructional process, guided by empirical evidence, will help ensure responsiveness to evolving learner needs. Additionally, the integration of advanced instructional technologies—such as QR-coded resources for immediate access to character-origin visuals and Augmented Reality (AR) for immersive, three-dimensional representations—offers strong potential to enhance Form–Meaning connections. Finally, broader dissemination of the framework through professional development workshops, training programs, and academic platforms is recommended to support educators in effectively adopting these evidence-based practices and further improving Chinese language literacy outcomes.

## References

- Chai, Z., & Zhang, T. (2024). International Chinese teacher volunteers in Thailand security risk analysis. *Academic Journal of Management and Social Sciences*, 8(1), 152-154. <https://doi.org/10.54097/ehkx6c54>
- Cheng, Y. (2024). A study on the teaching of Chinese characters memorization for foreigners based on the memory principle of cognitive psychology. *Region - Educational Research and Reviews*, 6(6), 129. <https://doi.org/10.32629/rerr.v6i6.2233>
- Dejdamkerngchai, N., Somboon, T., & Ployduangrat, C. (2023). The scenario model for Chinese language education in private schools at the primary level in Thailand. *Ph.D. in Social Sciences Journal*, 13(2), 501-513. Retrieved from <https://so05.tci-thaijo.org/index.php/phdssj/article/view/260351>
- Deng, H., Jermtaisong, R., & Suphakit, P. (2026). The effects of game-based learning combined with situational language teaching on Chinese character literacy of kindergarteners. *Journal of Curriculum and Teaching*, 15(1), 81-92. <https://doi.org/10.5430/jct.v15n1p81>
- Ewe, L. C., & Min, F. (2021). Teaching Chinese language outside of China: The case of Chinese teachers in Thailand. *Asia-Pacific Social Science Review*, 21(4).
- He, C. (2023). Radical awareness and Chinese character recognition in Chinese as a heritage language: Comparison between two textbooks. *International Journal of Education and Humanities*, 11(1), 223-227. <https://doi.org/10.54097/ijeh.v11i1.13158>
- He, W., & Li, C. (2024). An analysis of culture shock among Chinese language volunteers in Thailand: A case study of volunteers in Thailand from 2021 to 2022. *Chinese Language and Culture Journal*, 11(1), 297-310. Retrieved from <https://so02.tci-thaijo.org/index.php/clc/jn/article/view/261389>
- 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. <https://doi.org/10.1016/j.langsci.2021.101383>
- International Schools Database. (2024). *International schools in Bangkok*. <https://www.international-schools-database.com>
- Kan, Q., Owen, N., & Bax, S. (2018). Researching mobile-assisted Chinese-character learning strategies among adult distance learners. *Innovation in Language Learning and Teaching*, 12(1), 56-71. <https://doi.org/10.1080/17501229.2017.1418633>
- Kang, X., & Ma, D. (2025). A study on the time course of orthographic, phonological, and semantic activation of Chinese heritage language learners under different experimental tasks. *Acta Psychologica*, 261, 105907. <https://doi.org/10.1016/j.actpsy.2025.105907>
- Kittachotworakul, P. (2023). A study of the current situation and problems of early childhood Chinese language teaching. *Interdisciplinary Academic and Research Journal*, 3(4), 805-820. <https://doi.org/10.14456/iarj.2023.221>

- Meng, Z. L., Wydell, T. N., & Bi, H. Y. (2019). Visual-motor integration and reading Chinese in children with/without dyslexia. *Reading and Writing, 32*(2), 493-510. <https://doi.org/10.1007/s11145-018-9876-z>
- Ministry of Education of the People's Republic of China. (2021). *Chinese proficiency grading standards for international Chinese language education (GF0025-2021)*. Beijing Language and Culture University Press.
- Office of the Education Council (สทศ/สทศษ). (2016). *Research report for the development of Chinese language teaching in Thailand: Secondary level*. Prikwan Graphic. [In Thai]
- Perfetti, C. A., Liu, Y., & Tan, L. H. (2011). The lexical constituency model: Some perspectives of Chinese reading. *Psychology of Learning and Motivation, 54*, 1-38. <https://doi.org/10.1016/B978-0-12-385527-5.00001-2>
- Shen, H. H. (2005). An analysis of Chinese characters in terms of radicals and components. *Journal of the Chinese Language Teachers Association, 40*(1), 33-56.
- Shu, H., & Anderson, R. C. (1997). Role of radical awareness in the character and word acquisition of Chinese children. *Reading Research Quarterly, 32*(1), 78-89. <https://doi.org/10.1598/RRQ.32.1.5>
- Singapore International School of Bangkok (SISB). (2024). *Primary Chinese curriculum and benefits*. <https://sisb.ac.th>
- Sun, H., Wang, T., & Yu, M. (2024). Influence of stroke-order learning on Chinese character recognition among Chinese as a second language learners. *System, 122*, 103295. <https://doi.org/10.1016/j.system.2024.103295>
- Shen, S., Jermtaisong, R., & Lhongsap, P. (2024). The development of Chinese learning achievement by learning management through game-based learning for Primary 5 (Grade 5) students. *TOJET: The Turkish Online Journal of Educational Technology, 23*(4), 164-173. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1444548.pdf>
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257-285. [https://doi.org/10.1207/s15516709cog1202\\_4](https://doi.org/10.1207/s15516709cog1202_4)
- Taft, M., & Zhu, X. (1997). Subcharacter processing in reading Chinese. *Journal of Memory and Language, 37*(2), 251-275. <https://doi.org/10.1006/jmla.1997.2514>
- Taft, M., Zhu, X., & Peng, D. (1999). Positional constraints on radical recognition in Chinese. *Journal of Memory and Language, 40*(4), 491-519. <https://doi.org/10.1006/jmla.1998.2621>
- Tukhtabayeva, A., et al. (2024). Applying augmented reality (QR-code) in English language classroom. *Procedia Computer Science, 251*, 573-578. <https://doi.org/10.1016/j.procs.2024.11.151>
- Wong, Y. K. (2020). Orthographic awareness and young second language learners' Chinese character acquisition. *Reading and Writing, 33*(3), 678-693. <https://doi.org/10.1007/s11145-019-09976-0>
- Xu, Y. et al. (2014). The effect of radical-based grouping in character learning in Chinese as a foreign language. *The Modern Language Journal, 98*(4), 774-789. <https://doi.org/10.1111/modl.12153>
- Xu, Z., Liu, D., & Joshi, R. M. (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), 1353-1366. <https://doi.org/10.1037/edu0000443>
- Zhan, H., & Cheng, H. J. (2014). The role of technology in teaching and learning Chinese characters. *International Journal of Technology in Teaching and Learning, 10*(2), 147-162.
- Zhang, J. (2025). Navigating HSK level 5 challenges: Dual perspectives from Thai undergraduates and Chinese lecturers. *Language Testing in Asia, 15*(24). <https://doi.org/10.1186/s40468-025-00360-1>
- Zhao, G. (2024). Outcome study of Chinese language teaching and learning in public schools in Bangkok. *Journal of Liberal Art of Rajamangala University of Technology Suvarnabhumi, 6*(2).
- Zhao, J., Liu, Y., & Perfetti, C. A. (2018). The acquisition of Chinese characters: The effects of radical-based instruction. *Reading and Writing, 31*(1), 233-253. <https://doi.org/10.1007/s11145-017-9782-0>
- Zhao, P., et al. (2018). Event-related potential evidence in Chinese children: Type of literacy training modulates neural orthographic sensitivity. *International Journal of Behavioral Development, 42*(3), 311-320. <https://doi.org/10.1177/0165025417708341>

**Acknowledgments**

The author sincerely acknowledges the valuable contributions and expertise provided by individuals who supported this research. Special appreciation is extended to the key informants—Sudarat Jongburanasit, Nidchakan Sanamad, Rachawadee Chanthong, Jiyong Dong (D.A.), Pongsathorn Kittachotworakul (D.A.), and Yin Wang—whose professional insights and foundational data greatly enriched the development of this study. The author also gratefully recognizes the cooperation of the teachers, parents, and students who participated in the research, as well as those who offered language support and proofreading to enhance the academic quality and clarity of the manuscript.

**Authors contributions**

Not applicable.

**Funding**

Not applicable.

**Competing interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Informed consent**

Obtained.

**Ethics approval**

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

The research was conducted in full accordance with established ethical principles. All participants, including teachers, parents, and experts, engaged in the study on a voluntary basis and provided informed consent prior to data collection. To protect privacy and uphold academic integrity, all participant identities and the name of the international school were kept confidential. All data were handled with strict confidentiality and used exclusively for research purposes.

**Provenance and peer review**

Not commissioned; externally double-blind peer reviewed.

**Data availability statement**

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

**Data sharing statement**

No additional data are available.

**Open access**

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).

**Copyrights**

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.