

Where the Research is Limited: Evidence Gaps and Clinical Reasoning

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The evidence base for handwriting instruction is strong in two areas: it benefits literacy development (Research Brief 1), and direct, explicit, cognitively integrated approaches are most effective (Research Brief 2). However, no research was found for more specific questions, such as **which lined paper to use, how long to practise, which formation scripts to teach, and which font type to use**. The GHS addresses these four design questions through methodical clinical reasoning, cognitive load theory, and practice-based evidence, rather than controlled-trial evidence, because no such trials were found. This document describes the state of research in each area and explains the theoretical and clinical rationale for how the GHS addresses each gap.

Question 1 (Lined Paper): What Size and What Configuration?

What the research says

- Lined paper improves legibility for primary school students compared with unlined paper. A 2025 study in Reading and Writing found a significant positive effect of line presence on overall handwriting legibility in third-grade students, regardless of their fine motor or visuomotor skill levels (Guilbert & Fernandez, 2025). Note: The same study found no effect of lined paper on handwriting fluency, so the benefit is limited to legibility.
- A four-line writing grid (Top Line, Mid-Guide, Baseline, and Lower Guide) may be optimal for early primary students to ensure appropriate letter sizing when printing, compared with a two-line system (Reidlinger, Candler, & Neville, 2012). This study found the difference was specific to letter size, with no differences in legibility, form, alignment, or spacing between the two paper types.
- Beyond these findings, there is no evidence specifying optimal line sizes in millimetres, supporting a graduated progression system, or comparing outcomes between colour-coded and standard guiding lines.

Integrated Hourglass link:

To bridge the research with practical application, the Integrated Hourglass provides an explanatory framework. Spatial guides function as external regulatory supports, reducing the visuomotor demand on a child whose internal spatial regulation is still developing. This relationship aligns with the Visual-Motor Integration and Visual Perception components of the

Perceptual-Motor layer in the Integrated Hourglass and helps explain why a four-line system better supports size control than a two-line system.

In summary, the research and the Integrated Hourglass together support the use of external spatial scaffolds, but do not specify precise parameters for line size or configuration. This sets the stage for considering practical approaches in the absence of concrete evidence.

The gap and the GHS response

While there are no established specifications for optimal handwriting line sizes, timing of progression to smaller lines, or the effectiveness of colour-coded zones compared with standard (non-colour-coded) guiding lines, Australian schools commonly follow the progression: Foundation, 24mm; Year 1, 18mm; Year 2, 12mm; and, typically, Year 3 and beyond, standard 8/9mm lined paper. To address this gap, the GHS applies clinical reasoning grounded in Cognitive Load Theory (Sweller, 1988; Sweller et al., 2019), sequentially reducing spatial demands as automaticity develops:

- Larger line sizes (24mm) reduce the precision demands on immature fine motor systems, allowing the child to focus cognitive resources on letter formation rather than on spatial constraints. As motor automaticity develops, line size is progressively reduced.
- The four-line system (Top Line, Mid-Guide, Baseline, Lower Guide) is consistent across all paper sizes in the series, giving students a stable spatial language that does not change as they progress. This reduces the extraneous cognitive load associated with learning a new reference system at each transition.
- The colour-coded Blue-Green-Yellow variant provides additional visual differentiation of zones for students with visual-motor integration difficulties, consistent with the principle of reducing extraneous load whilst maintaining a high intrinsic load. As the colours are an optional overlay on the four-line system, students with colour vision deficiency can still access the zones by their position and label. Alternatively, a greyscale-lined system with appropriate contrast could be developed to further improve accessibility for all students.
- Progression through the series is competency-based and not age-normed. There is no research basis for assigning a line size to a year level.

Question 2 (Dosage): How Much Practice, How Often?

What the research says

- A scoping review of 24 peer-reviewed studies on formal handwriting curricula found typical dosage parameters of approximately 13 weeks of intervention, a median of 20 minutes per session, and 3 sessions per week; the mean session length (34 minutes) is inflated by a single weeklong intensive program (Gee, Lloyd, & Ewoniuk, 2025).
- Graham's synthesis of the handwriting literature suggests that, from kindergarten (Foundation) through Year 3, handwriting should be taught in short daily sessions. He

recommends approximately 50–100 minutes per week for handwriting mastery, which equates to roughly 10–20 minutes of dedicated daily practice (Graham, 2010).

- A minimum of 20 direct handwriting sessions has been reported as necessary to achieve reliable improvement (Hoy, Egan, & Feder, 2011).
- The consistent finding across the literature is that brief, frequent, spaced practice is more effective than infrequent, longer sessions.

Integrated Hourglass link:

Dosage relates to both the Cognitive Integration layer, where working memory integration occurs, and the Perceptual-Motor layer, where motor memory is established through repetition. The research shows that spacing practice over time, rather than massing it, produces stronger memory encoding that operates across both layers simultaneously. This provides a theoretical rationale for daily brief practice rather than longer weekly sessions.

Together, the research and the Integrated Hourglass converge on the principle that frequent, brief, and spaced handwriting practice is most effective for skill acquisition and retention. However, specific dosage parameters for different classroom contexts remain undefined, necessitating practical recommendations.

The gap and the GHS response

While the research is generally consistent in direction, it does not specify an optimal Tier 1 (whole-class) dosage for classroom or clinical contexts, nor does it distinguish between dosage for initial skill acquisition and maintenance of automaticity. Accordingly, the GHS recommends the following, based on the general research findings and principles from Cognitive Load Theory:

Tier	Recommended Dosage	Rationale
Tier 1 (whole class)	10–15 minutes daily	Consistent with Graham’s (2010) synthesis and Cognitive Load Theory: short sessions maintain high attentional engagement and allow spaced repetition across the week.
Tier 2/3 (targeted intervention)	15–20 minutes, 3–5 sessions per week, minimum 15–20 sessions	Consistent with Hoy et al. (2011) and intervention literature. Frequency and duration are increased; content is individualised to specific formation difficulties.

Importantly, GHS does not treat handwriting practice as a separate or additional event. Wherever possible, formation practice is embedded within phonics and literacy tasks, so that handwriting dosage is concurrent with literacy instruction.

Question 3 (Formation Scripts/Cue): Which Verbal Cues Work Best?

What the research says

- Direct handwriting instruction that pairs visual cues with verbal mediation, in which the child talks through the letter-formation sequence whilst writing, improves automatic handwriting (the rate of producing legible letters) and transfers to improved word reading (Berninger et al., 2006).
- A meta-analysis and meta-synthesis of handwriting interventions for students from kindergarten to Year 6 found that explicit handwriting instruction significantly improved writing fluency compared with no instruction or non-handwriting instruction (López-Escribano, Martín-Babarro, & Pérez-López, 2022). The review also found that performance feedback, in which students receive specific guidance on letter formation, was among the most effective intervention types. Furthermore, successful programs typically paired direct modelling of letter formation with this feedback.
- No comparative research was found on different types of verbal cues, such as metaphorical, character-based, landscape-based, or spatially explicit cues, nor was there evidence to establish which type yields better formation outcomes.
- Consistency of approach is what matters most: the specific verbal cue is less important than using a consistent cue reliably across all instruction and practice (Wolf et al., 2017).
- In summary, the research supports the use of verbal cues paired with visual and motor modelling for handwriting instruction, but does not identify a superior cue type. This sets the stage for considering theoretical and practical approaches.

Integrated Hourglass link:

Verbal mediation in handwriting instruction operates across both streams of the Integrated Hourglass. The verbal cue engages the Language & Literacy layer (oral language, vocabulary) in the top-down stream, while simultaneously guiding motor execution in the Perceptual-Motor layer of the bottom-up stream. This action-perception coupling, mediated by language, is the dual-stream integration that the GHS approach is designed to facilitate.

Together, the research and the Integrated Hourglass framework highlight that verbal cues are effective when paired with modelling and feedback, regardless of cue type. However, the absence of comparative evidence means clinical reasoning must guide the choice of cue in practice.

The gap and the GHS response

The research indicates that verbal cues are effective and should be consistent, but does not compare cue types or provide evidence that any one type is superior. Currently, a wide variety of cue types are used: character-based cues (“tall man starts at the top and goes down”), positional metaphors (“under the gate and over the gate”), colour-landscape metaphors (“sky, grass, ground”), and spatially explicit cues (“start at the dot, back around and down to the baseline”). None has a stronger evidence base than another; thus, the key takeaway is that consistency matters more than cue type.

GHS uses spatially explicit, literal formation scripts grounded in Cognitive Load Theory because other cue types summarised impose avoidable processing demands. The reasons for not using the other cue types are as follows:

- Metaphorical cues impose extraneous cognitive load: the child must translate the metaphor before executing the movement. This translation step competes for the same working memory resources needed for motor planning, precisely the resources Cognitive Load Theory seeks to protect.
- Colour-landscape cues (“sky, grass, ground”) require an additional abstraction: mapping a visual metaphor onto a spatial zone system. For children with language processing difficulties, this adds an unnecessary layer of processing. The GHS uses the zone names themselves as the spatial vocabulary, simplifying the verbal cue and the visual scaffold into one system.
- The spatially explicit cues in the GHS use the same vocabulary as the four-line system. Each cue describes exactly what the hand/pencil does in the spatial terms the child can already see on the page, so there is no metaphor to translate. This position is grounded in theory and clinical reasoning rather than in directly applicable evidence. It is offered transparently as a practical recommendation, not as an evidence-based mandate.

Question 4 (Font Style): Print, Pre-Cursive, or Cursive?

What the research says

A common question in handwriting instruction is font type: whether to teach manuscript (print), pre-cursive, or fully joined cursive, and at what stage to introduce each. This topic remains one of the least resolved, and the underlying research is genuinely varied.

- **Print (manuscript) supports early letter recognition.** Because the letter forms children practise in handwriting match those they encounter in reading materials, manuscript instruction reduces the cognitive load of mapping between written and printed forms. Berninger and colleagues recommend print as the starting point, noting that it transfers more effectively to word recognition in the early years (Wolf, Abbott, & Berninger, 2017).

- **Consistency of style over at least two years is the strongest finding.** Wolf et al. (2017) found that maintaining the same handwriting format for at least two years, rather than switching between styles, led to better outcomes in handwriting, spelling, and composing. Notably, this study did not compare manuscript and cursive to determine which was superior; it compared consistency with inconsistency. The finding concerns the stability of instruction, not style choice.
- **Cursive is not demonstrably faster than print.** The widely held assumption that cursive writing is faster than print is not well supported by the research. A comparative study of 715 French-speaking children found that those taught cursive only wrote significantly more slowly by the end of Grade 2 than those taught manuscript or a manuscript-then-cursive sequence (Morin, Lavoie, & Montésinos-Gelet, 2012). The commonly assumed speed advantage of cursive over print is not consistently documented in the research, and the study concluded that writing development is better served by teaching a single consistent style rather than two.
- **Cursive is not a remedy for dyslexia.** The argument that joined script prevents letter reversals rests on the premise that dyslexia is a visual processing difficulty, and that premise is not supported: the proportion of reversals is similar in children with and without dyslexia, reversals are more noticeable in dyslexic writing because there is more error overall rather than proportionally more reversal, and the underlying deficit is phonological rather than visual. Handwriting difficulty in dyslexia is more closely associated with spelling and orthographic demand than with graphomotor ability, and it responds to structured, explicit handwriting teaching (Hebert et al., 2018).
- **Print (manuscript) is well-suited to Australian curriculum contexts.** The ACT/NSW Print font, used throughout the GHS, is a standard print (manuscript) font: discrete, unjoined letterforms with no entry or exit strokes. This is a familiar font that children encounter in some of their classroom materials, so there is no mismatch between the letterforms they practise writing and those they encounter in class. Whilst there is almost no research base specifically examining ACT/NSW Print as a distinct category, it sits squarely within the manuscript tradition that Berninger et al. (2006) and others recommend as the appropriate starting point for early writers (Wolf et al., 2017).
- **Teaching two competing styles simultaneously increases cognitive load.** When a school uses one font in literacy materials and a different font in handwriting instruction, children must maintain two separate letter-form schemas. For students with learning difficulties, who are already managing a higher cognitive load than their peers, this misalignment is an additional burden. This aligns with the Wolf et al. (2017) principle that maintaining a single, consistent format reduces the switching costs associated with competing motor programmes.

Integrated Hourglass link:

Font type sits at the intersection of the Language & Literacy layer (top-down) and the Perceptual-Motor layer (bottom-up) of the Integrated Hourglass. For optimal learning, the letter forms children practise in handwriting should match those they are learning to read. When handwriting and reading fonts are misaligned, children are forced to maintain competing orthographic schemas at a critical stage, precisely when consolidating the sound-symbol relationship is most important. This alignment is especially vital for children with neurodivergent profiles or learning difficulties, as it reduces extraneous cognitive load during a sensitive developmental window and supports all students in building strong literacy foundations.

The gap and the GHS response

There is no high-quality, controlled evidence establishing that any one font type produces superior handwriting or literacy outcomes over another. The available research supports the following practical conclusions, which the GHS adopts:

GHS font type rationale: ACT/NSW Print

- **Alignment with reading materials:** ACT/NSW Print closely matches the font children encounter in many of their readers and classroom materials. There is limited misalignment between the letter forms they practise writing and those they are learning to read.
- **School-system alignment:** ACT/NSW Print is the mandated handwriting font for schools in ACT and NSW. Using this font means teachers can use GHS materials alongside their existing curriculum resources with minimal font conflicts.
- **Reduced extraneous cognitive load through font consistency within the GHS system:** ACT/NSW Print is used across all GHS materials: animation PPT, lined paper, Word templates, and dictation resources. The child always encounters the same letterforms, regardless of which tool is being used. Consistency within the system eliminates a source of extraneous load and aligns with the finding by Wolf et al. (2017) that maintaining a single handwriting format for at least two years yields better outcomes.

Note for other states and territories: The GHS line system, formation sequence, verbal scripts, and pedagogical approach are font-agnostic. The approach can be implemented using any state-appropriate font by installing the relevant font and using the provided Word templates. The clinical and theoretical rationale remains the same. Details on installing and changing fonts are included in the GHS resources.

Summary: Positioning the GHS

The GHS is a practical, theory-led approach to handwriting instruction that integrates cognitive load theory and motor-learning principles with structured clinical reasoning and practice-based experience.

GHS draws directly on evidence where the research base is strong, demonstrating that handwriting instruction supports literacy, cognitive strategy approaches are effective, and direct, frequent practice is essential.

In areas where empirical research is limited (line sizing, optimal dosage parameters, formation script comparison, and font type selection), GHS relies on Cognitive Load Theory, developmental motor-learning principles, and structured clinical reasoning to guide practice.

This absence of evidence is not a limitation of the approach. Rather, it identifies the very gap the GHS was developed to address, offering teachers and therapists a theoretically grounded, clinically reasoned, and practically adaptable system to support handwriting instruction.

Note: This document reflects the research located at the time of writing and will be revised as further evidence becomes available.

References

- Berninger, V. W., Rutberg, J. E., Abbott, R. D., Garcia, N., Anderson-Youngstrom, M., Brooks, A., & Fulton, C. (2006). Tier 1 and Tier 2 early intervention for handwriting and composing. *Journal of School Psychology, 44*(1), 3–30. <https://doi.org/10.1016/j.jsp.2005.12.003>
- Gee, B., Lloyd, K., & Ewoniuk, J. (2025). Exploring the dosage of handwriting curricula among school-aged children. *Academic Journal of Health Sciences & Research, 1*(3). <https://irispublishers.com/ajhsr/fulltext/Exploring-the-Dosage-of-Handwriting-Curricula-Among-School-Aged-Children.ID.000518.php>
- Graham, S. (2010). Want to improve children's writing? Don't neglect their handwriting. *American Educator, 33*(4), 20–27. <https://www.aft.org/sites/default/files/graham.pdf>
- Guilbert, J., & Fernandez, J. (2025). The use of lined paper in child education: Impact of line presence on handwriting quality. *Reading and Writing, 38*(9), 2543–2561. <https://doi.org/10.1007/s11145-024-10612-w>
- Hebert, M., Kearns, D. M., Hayes, J. B., Bazis, P., & Cooper, S. (2018). Why children with dyslexia struggle with writing and how to help them. *Language, Speech, and Hearing Services in Schools, 49*(4), 843–863. https://doi.org/10.1044/2018_LSHSS-DYSLC-18-0024
- Hoy, M. M. P., Egan, M. Y., & Feder, K. P. (2011). A systematic review of interventions to improve handwriting. *Canadian Journal of Occupational Therapy, 78*(1), 13–25. <https://doi.org/10.2182/cjot.2011.78.1.3>
- López-Escribano, C., Martín-Babarro, J., & Pérez-López, R. (2022). Promoting handwriting fluency for preschool and elementary-age students: Meta-analysis and meta-synthesis of research from 2000 to 2020. *Frontiers in Psychology, 13*, 841573. <https://doi.org/10.3389/fpsyg.2022.841573>
- Morin, M.-F., Lavoie, N., & Montésinos-Gelet, I. (2012). The effects of manuscript, cursive or manuscript/cursive styles on writing development in Grade 2. *Language and Literacy, 14*(1), 110–124. <https://doi.org/10.20360/G21S3V>
- Reidlinger, W., Candler, C., & Neville, M. (2012). Comparison of differently lined paper on letter production quality in first graders. *Journal of Occupational Therapy, Schools, & Early Intervention, 5*(2), 155–164. <https://doi.org/10.1080/19411243.2012.701544>
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285.
- Sweller, J., van Merriënboer, J. J. G., & Paas, F. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review, 31*(2), 261–292. <https://doi.org/10.1007/s10648-019-09465-5>
- Wolf, B., Abbott, R. D., & Berninger, V. W. (2017). Effective beginning handwriting instruction: Multimodal, consistent format for 2 years, and linked to spelling and composing. *Reading and Writing, 30*, 299–317. <https://doi.org/10.1007/s11145-016-9674-4>