



Improving Kindergarten Students' Letter-Sound Recognition Through Multi-Sensory Learning Activities

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Abstract:

Letter-sound recognition is a foundational skill for early literacy, yet many kindergarten learners struggle to master grapheme-phoneme correspondence through traditional, single-modality instruction alone. This systematic literature review examines the effectiveness of multisensory learning activities—those that simultaneously engage visual, auditory, kinesthetic, and tactile (VAKT) pathways—in improving letter-sound recognition among kindergarten and early childhood learners. Following a systematic review methodology, 37 peer-reviewed studies, theses, dissertations, and program evaluations published between 2000 and 2026 were identified, screened, and synthesized. Sources were drawn from general education, special education, and second-language (ESL/EFL) contexts across multiple countries, reflecting the global relevance of the topic. Four major themes emerged from the synthesis: (1) multisensory instruction strengthens letter-sound correspondence and phonemic awareness; (2) multisensory approaches are particularly effective for at-risk, struggling, and special-needs learners; (3) multisensory strategies transfer successfully across first-language and second-language literacy contexts; and (4) the design of multisensory instruction—including technology integration, games, differentiation, and teacher preparation—shapes program effectiveness. The review concludes that multisensory learning activities constitute an evidence-based, developmentally appropriate strategy for kindergarten letter-sound instruction, with implications for curriculum design, teacher training, and future research.

Keywords: kindergarten education, letter-sound recognition, multisensory learning, phonemic awareness, early literacy, systematic literature review

Introduction:

Letter-sound recognition—the ability to associate printed graphemes with their corresponding phonemes—is one of the earliest and most predictive markers of later reading achievement (White, 2009). Kindergarten represents a critical developmental window in which children move from pre-literate awareness of print to the beginnings of decoding, and difficulties established at this stage tend to compound across subsequent grades if left unaddressed (Simmons, 2021).

Traditional approaches to teaching the alphabetic principle have historically relied on rote memorization, flashcard drills, and repetitive visual exposure to letters. While such methods can produce short-term gains for some learners, a growing body of research indicates that they are insufficient for young children whose cognitive, sensory, and motor systems are still developing an integrated understanding of symbol-sound relationships (Glunt, 2000).

Multisensory learning—instruction that deliberately combines two or more sensory channels, most commonly visual, auditory, kinesthetic, and tactile (VAKT) pathways—has emerged as a widely recommended alternative to single-modality drill. The theoretical rationale rests on the premise that when multiple sensory pathways are engaged simultaneously, neural encoding of information becomes more robust, memory traces are reinforced through redundant channels, and learners with varying sensory strengths and processing styles are better accommodated (Park, 2022). Rather than treating the letter as a static visual symbol alone, multisensory activities might have children trace letters in sand or on textured surfaces while saying the corresponding sound aloud, build



letter shapes from clay or pipe cleaners, or use full-body movement to represent a letter's form (Hubbard, 2021). Programs of this kind descending from Orton-Gillingham style tutoring, sandpaper-letter traditions, and structured-literacy approaches—have been implemented across general education classrooms, special education settings, and second-language instruction with a wide range of reported outcomes.

Despite the popularity of multisensory instruction, the evidence base is fragmented across disciplines, countries, and learner populations. Studies have examined multisensory letter-sound instruction with typically developing kindergarteners (Walker, 2023), children at risk of reading difficulty (Bøg et al., 2021), learners with intellectual disabilities (Moustafa & Ghani, 2016), children with dyslexia (Mass Villadiego, 2024), and English-as-a-foreign-language learners in non-English-speaking countries (Sapi'ee & Tan, 2020). Because these bodies of literature have rarely been synthesized together, practitioners and policymakers seeking to adopt multisensory strategies must currently piece together isolated, context-specific findings rather than draw on a unified picture of the evidence.

This review addresses that gap by systematically identifying, appraising, and synthesizing the available literature on multisensory learning activities and kindergarten letter-sound recognition. Specifically, the review is guided by four questions: (1) What evidence exists that multisensory instruction improves letter-sound correspondence and phonemic awareness among kindergarten learners? (2) How effective are multisensory approaches for at-risk, struggling, and special-needs learners specifically? (3) Do multisensory strategies transfer across first-language and second-language (ESL/EFL) literacy contexts? (4) What instructional design features—including technology, games, differentiation, and teacher preparation—influence the effectiveness of multisensory programs?

By consolidating findings across 37 sources spanning more than two decades and multiple countries, this review aims to provide early childhood educators, reading specialists, special education practitioners, and school administrators with a coherent, evidence-informed basis for designing and evaluating multisensory letter-sound instruction. The remainder of this paper proceeds as follows: a review of the relevant literature and theoretical frameworks; a description of the systematic review methodology used to identify and synthesize sources; a presentation of findings organized around four major themes; and a discussion of the implications, limitations, and directions for future research.

Literature Review:

This section synthesizes the theoretical foundations and empirical findings that inform the study of multisensory learning and kindergarten letter-sound recognition. The literature is organized into five areas: the theoretical foundations of multisensory learning, direct evidence linking multisensory instruction to letter-sound development, findings from at-risk and special-needs populations, evidence from second-language and cross-cultural contexts, and the role of instructional tools, technology, and teacher preparation in shaping outcomes.

Multisensory instruction is grounded in structured-literacy and Orton-Gillingham traditions, which propose that deliberately connecting visual, auditory, kinesthetic, and tactile channels strengthens the neural pathways underlying reading (Karpovich, 2018). Montessori's sandpaper letters, one of the earliest documented multisensory tools, invite children to trace a letter's shape with their fingers while naming its sound, an approach still referenced in contemporary kindergarten literacy research (Hubbard, 2021).

Cognitive load theory and dual-coding theory offer complementary explanations: presenting information through more than one modality reduces the burden on any single processing channel and creates multiple retrieval routes in memory. Consistent with this reasoning, research on multisensory letter integration with five-year-olds has shown that combining visual and motor input during letter learning produces stronger implicit learning of reading-related associations than visual input alone (Labat et al., 2020). Taken together, these frameworks suggest that multisensory instruction is not simply a matter of adding sensory novelty to a lesson, but of deliberately structuring redundant, mutually reinforcing pathways to the same underlying knowledge.



A substantial cluster of studies has examined the direct link between multisensory activities and gains in letter-sound correspondence. Walker (2023) found that small-group multisensory instructional techniques improved kindergarteners' letter-sound knowledge relative to conventional instruction. Similarly, Rakhmawati et al. (2018) reported that multisensory activities enhanced young children's ability to recognize both the sounds and visual forms of letters. Kalogris (2024) examined multisensory phonics methods embedded within a K–2 inclusion reading curriculum and found measurable improvements in decoding accuracy. Attia (2020) demonstrated that a multisensory synthetic phonics program improved automatic word recognition and spelling among young learners, suggesting that gains extend beyond isolated letter-sound pairs into connected reading and writing tasks. Ghoneim and Elghotmy (2015) similarly found that a multisensory phonics program improved phonemic awareness and reading accuracy among pre-service teachers being trained to deliver EFL instruction, underscoring that the benefits of multisensory training are not limited to the youngest learners but also strengthen the instructional skills of the educators who deliver such programs.

Complementing these intervention studies, Bower (2017) investigated visual phonics a system of hand cues paired with letter sounds—and found it to be an effective tool for promoting literacy development in kindergarten classrooms by adding a kinesthetic-visual layer to auditory phonics instruction. Nagel (2022) examined differentiated literacy instruction, an approach closely aligned with multisensory principles because it varies the sensory and cognitive demands of tasks according to learner readiness, and found it supported more consistent literacy growth in a kindergarten classroom.

Rueter et al. (2026) extended this line of inquiry into the prekindergarten level, showing that building early reading foundations, including multisensory letter work, helped prepare children for the literacy demands of kindergarten. Caylor (2026) similarly used explicit, multisensory-informed instruction to strengthen phonemic awareness in a kindergarten action research study, reinforcing that these approaches continue to be actively applied and refined in current classroom practice.

Multisensory instruction has attracted particular attention as a strategy for learners who struggle to acquire reading skills through conventional means. Bøg et al. (2021), together with the related working paper by Isaksson et al. (2019), reported on a randomized field experiment testing a multi-sensory tutoring program for students at risk of reading difficulties, finding meaningful improvements in reading-related outcomes relative to a control condition—among the strongest causal evidence available in this literature given its experimental design. Simmons (2021) found that an emergent reading skills intervention incorporating multisensory elements improved both letter recognition and phoneme identification among pre-kindergarten children. Potter (2010) examined multisensory instruction with special-needs students from diverse backgrounds and found it improved reading outcomes, while Ezechinyere et al. (2020) reported similar benefits for children with dyslexia in public primary schools. Moustafa and Ghani (2016), in two related studies, found that a multisensory approach improved both letter-sound correspondence and letter identification among students with mild intellectual disabilities, indicating that the benefits of multisensory instruction extend to learners with cognitive impairments and not only to typically developing at-risk readers.

Ho et al. (2001) similarly found multisensory training effective in improving the reading and writing skills of Chinese children with dyslexia, and van Staden and Purcell (2016) documented gains in spelling development among second-language learners with auditory processing difficulties following multisensory instruction. Mass Villadiego (2024) presented a case study of a child with dyslexia in which a multisensory approach was used to promote English reading, while Ashbaugh (2016) used action research to examine multisensory spelling techniques with students with dyslexia specifically. Across this body of work, a consistent pattern emerges: learners who do not respond well to single-modality instruction often show meaningful gains once instruction is redesigned to engage multiple sensory pathways simultaneously.

Beyond first-language literacy, multisensory instruction has been widely studied in English-as-a-foreign-language and English-as-a-second-language settings. El-Morsy (2017) found multisensory learning improved letter recognition



among preschool dyslexic children learning EFL in an Arabic-speaking context. Sarudin et al. (2019) and Sapi'ee and Tan (2020) both reported gains in word recognition and phonological awareness among young ESL learners, the latter specifically in a rural setting where resource constraints make low-cost multisensory materials especially valuable.

Mohamed (2021) used multisensory-based activities to support dysgraphic primary-stage pupils' EFL writing skills, while Abd El-Wahab et al. (2019) and Fanilag et al. found comparable benefits for EFL and ESL reading skills and motivation. Solichah and Fardana (2024) conducted a scoping review of multisensory programs as early literacy interventions and concluded that the approach shows consistent promise across the diverse populations and contexts in which it has been studied, echoing the pattern found across the individual studies reviewed here.

A final strand of literature examines how multisensory principles are operationalized through specific tools, technologies, and instructional design choices. Chin et al. (2024) found that interactive games enhanced kindergarteners' letter recognition, suggesting that digital and game-based formats can deliver multisensory engagement at scale. Fanilag et al. similarly explored innovative and technological multisensory approaches to literacy among primary ESL learners. Jordan (2019) and Holmes (2018) each evaluated structured multisensory reading programs—the latter an adaptation of a phonics program branded “Shake, Rattle, and Read”—and found positive effects on kindergarten reading achievement, pointing to the value of well-designed commercial or semi-commercial multisensory curricula.

Kreinbrink (2023) examined preschool approaches to teaching alphabet knowledge more broadly, situating multisensory letter instruction within the wider landscape of early alphabet pedagogy. Taken together, this body of work suggests that the effectiveness of multisensory instruction is not automatic; it depends on thoughtful program design, adequate teacher preparation, and alignment with learners' developmental needs.

Methodology:

This study employed a systematic literature review design to identify, appraise, and synthesize existing empirical and theoretical work on multisensory learning activities and kindergarten letter-sound recognition. A systematic review approach was selected, rather than a traditional narrative review, because it offers a transparent, replicable, and comprehensive method for handling a literature base that is fragmented across disciplines (general education, special education, and second-language education), countries, and study designs. The review followed the broad stages common to systematic review methodology: formulation of review questions, development of a search strategy, application of explicit inclusion and exclusion criteria, study selection, data extraction, and thematic synthesis.

Records were compiled from sources published between 2000 and 2026, encompassing peer-reviewed journal articles, doctoral dissertations, master's theses, and formal program evaluations. Search terms combined variants of the following: “multisensory,” “multi-sensory,” “VAKT,” “letter-sound correspondence,” “letter recognition,” “phonemic awareness,” “kindergarten,” “pre-kindergarten,” “early literacy,” “at-risk readers,” “dyslexia,” “intellectual disability,” and “ESL/EFL literacy.” These terms were combined using Boolean operators to capture studies at the intersection of multisensory pedagogy and early alphabetic knowledge, rather than studies addressing either construct in isolation.

Studies were included in the review if they met the following criteria: (a) the intervention or instructional approach under study engaged at least two sensory modalities (for example, visual and kinesthetic, or auditory and tactile); (b) the target population consisted of kindergarten-aged children or a closely adjacent population, such as pre-kindergarten or early primary learners, or pre-service/in-service teachers being trained to deliver early-literacy instruction; (c) the study reported outcomes related to letter recognition, letter-sound correspondence, phonemic or phonological awareness, or a closely related early-literacy skill; and (d) the full text of the source was available for review. Studies were excluded if they addressed multisensory instruction exclusively with adult learners unrelated



to early-literacy instruction, focused solely on content areas unrelated to alphabetic or phonological knowledge, or lacked any empirical, evaluative, or scholarly synthesis component.

Applying these criteria, 37 sources were retained for full synthesis. The final set of included studies spans quantitative experimental and quasi-experimental designs, qualitative case studies and action research, doctoral and master's theses, and one scoping review, reflecting the methodologically diverse nature of the multisensory-instruction literature. Included sources also span a wide range of geographic and linguistic contexts, including the United States, the United Kingdom, Sweden, Indonesia, Malaysia, Kuwait, Egypt, Nigeria, Hong Kong, South Africa, and the Philippines, among others, which supports the generalizability of the thematic patterns identified below.

For each included source, the following information was extracted: author(s) and year of publication; the population and context under study (for example, typically developing kindergarteners, at-risk readers, learners with intellectual disability, or ESL/EFL learners); the nature and components of the multisensory intervention; the study design; and the key reported outcomes. Thematic synthesis, consistent with established systematic review practice, was then used to group findings into overarching themes. This process involved line-by-line coding of extracted outcomes, development of descriptive themes that stayed close to the language of the primary studies, and generation of broader analytic themes that could speak directly to the review questions.

Because the included studies vary widely in design, sample size, and measurement approach, this review does not attempt to pool effect sizes or conduct a formal meta-analysis; instead, it offers a qualitative synthesis of patterns and convergences across the literature. Other limitations of the methodology include the possibility of publication bias favoring studies with positive findings, the inclusion of unpublished theses and dissertations of varying methodological rigor, and reliance on titles and available abstracts for a small number of non-English-language sources. These limitations are revisited in the concluding section of this paper.

Findings and Discussion:

Multisensory Instruction Strengthens Letter-Sound Correspondence and Phonemic Awareness

The most consistent and direct finding across the reviewed literature is that multisensory instruction produces measurable gains in kindergarteners' letter-sound correspondence and related phonemic awareness skills. Across nearly every study that directly measured this outcome, multisensory conditions outperformed, or at minimum matched, single-modality comparison conditions, and in several cases the reported differences were large enough to be considered practically, and not merely statistically, meaningful.

Walker (2023) provides one of the clearest demonstrations of this pattern, reporting that kindergarteners who received small-group multisensory instruction showed greater gains in letter-sound knowledge than peers exposed to standard classroom instruction alone. This finding is echoed by Rakhmawati et al. (2018), whose study of young children found that multisensory activities improved both the ability to recognize letter sounds and the ability to recognize letter forms, suggesting that the benefits of multisensory instruction extend across the two components of the alphabetic principle rather than being limited to one or the other.

Kalogris (2024) extended this line of evidence into an inclusive K–2 classroom setting, finding that a multisensory phonics method embedded within the existing reading curriculum produced measurable gains in decoding accuracy for a mixed-ability group of learners, which is an important finding given that many kindergarten classrooms are, by necessity, inclusive rather than homogeneous in ability level.

The strength of the multisensory effect also appears to extend beyond isolated letter-sound pairs into more complex literacy tasks. Attia (2020) found that a multisensory synthetic phonics program improved not only automatic word recognition but also spelling among young learners, indicating that once children have internalized letter-sound correspondences through multisensory means, that knowledge transfers into the encoding, and not only the decoding, side of literacy. This bidirectional transfer is theoretically important: it suggests that multisensory



instruction is not merely a motivational add-on that keeps young children engaged during an otherwise conventional phonics lesson, but a mechanism that changes how firmly the underlying grapheme-phoneme association is encoded in memory.

Several studies point toward a plausible explanation for why multisensory instruction outperforms single-modality approaches: the deliberate engagement of multiple, mutually reinforcing pathways to the same piece of knowledge. Labat et al. (2020) found that combining visual and motor input during letter learning produced stronger implicit learning of reading-related associations among five-year-olds than visual input alone, providing direct experimental support for the theoretical claim that redundant sensory coding strengthens memory traces.

Karpovich (2018), reviewing the implementation of multisensory techniques in letter-knowledge instruction, similarly frames the approach as one that connects abstract visual symbols to concrete physical actions and sounds, making the letter-sound relationship less arbitrary and more memorable for a young child whose abstract symbolic reasoning is still developing. Consistent with this framing, Park (2022) found that multisensory alphabet instruction for young children was effective in part because it accommodated the varied sensory learning preferences present in any typical kindergarten classroom, rather than requiring all children to learn equally well through a single visual or auditory channel.

The benefits of multisensory instruction for letter-sound development are not confined to formal intervention studies; they also appear in research on specific instructional tools and techniques. Bower (2017) found that visual phonics—a system pairing hand cues with letter sounds—supported literacy development in kindergarten by adding a kinesthetic-visual bridge to what is otherwise a purely auditory phonics task. Hubbard (2021), reflecting on the use of sandpaper letters, a tactile-kinesthetic tool with roots in Montessori pedagogy, similarly found that the physical act of tracing a letter's shape while naming its sound reinforced the letter-sound bond more durably than visual exposure alone. These smaller-scale, tool-specific findings converge with the larger intervention studies to paint a coherent picture: whether delivered through formal programs, hand cues, or tactile materials, activities that route letter-sound learning through more than one sensory channel consistently outperform those that do not.

Differentiated and explicit approaches to multisensory instruction appear to compound these benefits further. Nagel (2022) found that differentiating literacy instruction according to learners' readiness levels, an approach that inherently varies the sensory and cognitive demands placed on different learners, supported more consistent literacy growth across an entire kindergarten classroom rather than benefiting only the strongest or weakest students. Caylor (2026) similarly demonstrated, through an explicit-instruction action research study, that deliberately and systematically teaching phonemic awareness—rather than allowing it to develop incidentally—produced stronger gains than incidental, immersion-only approaches, particularly when instruction incorporated multisensory elements. Rueter et al. (2026) extended these findings downward into the prekindergarten level, showing that early exposure to multisensory reading-foundation activities helped better prepare children for the letter-sound demands they would encounter upon entering kindergarten, suggesting that the benefits of multisensory instruction may be cumulative when introduced earlier in a child's literacy trajectory rather than being reserved for kindergarten alone.

Ghoneim and Elghotmy (2015) contribute an additional and somewhat distinct piece of evidence: their study found that a multisensory phonics program improved not only outcomes for children but also the phonemic awareness and reading accuracy of the pre-service teachers being trained to deliver EFL reading instruction. This finding implies that the mechanism underlying multisensory instruction's effectiveness—stronger encoding through redundant sensory pathways—is not specific to the developing cognitive systems of five- and six-year-olds, but reflects a more general principle of learning that benefits learners of different ages, provided the content being learned (in this case, phonemic and letter-sound knowledge) is itself novel to the learner.

Taken together, the studies reviewed under this theme converge on a clear and well-replicated conclusion: multisensory instruction reliably strengthens kindergarteners' letter-sound correspondence and phonemic



awareness relative to single-modality instruction, and this effect appears to be driven by the redundant, mutually reinforcing sensory pathways that multisensory activities create. The consistency of this finding across small-group interventions, classroom-embedded curricula, and specific instructional tools lends considerable weight to the recommendation that kindergarten letter-sound instruction should, wherever feasible, be designed to engage more than one sensory modality simultaneously.

Multisensory Approaches Are Effective for At-Risk, Struggling, and Special-Needs Learners

A second major theme emerging from this review is that multisensory instruction appears to be particularly, and in some cases disproportionately, effective for learners who struggle to acquire letter-sound knowledge through conventional, single-modality instruction. This includes children formally identified as at risk of reading difficulty, children with diagnosed learning disabilities such as dyslexia, and children with intellectual disabilities.

The strongest causal evidence in this review comes from Bøg et al. (2021) and the closely related working paper by Isaksson et al. (2019), which together report on a randomized field experiment testing a multi-sensory tutoring program for students at risk of reading difficulties. Because the study used random assignment to treatment and control conditions, its findings carry more weight than the correlational or single-group pre-post designs common elsewhere in this literature, and the reported improvements in reading-related outcomes for the treatment group provide relatively rigorous confirmation that multisensory tutoring can causally improve outcomes for at-risk readers, rather than merely correlating with them. Simmons (2021) offers a complementary finding at an even earlier developmental stage, reporting that an emergent reading skills intervention incorporating multisensory elements improved both letter recognition and phoneme identification among pre-kindergarten children, suggesting that the protective, remediating effect of multisensory instruction for at-risk learners can be detected even before children formally enter kindergarten.

Evidence from special-needs populations reinforces this pattern. Moustafa and Ghani (2016), in two related studies conducted with students with mild intellectual disabilities in Kuwait, found that a multisensory approach improved both letter-sound correspondence and letter identification, two related but distinct components of early literacy. The fact that gains were documented on both outcomes, using what appears to be a similar or overlapping intervention and population, strengthens confidence that the effect is not an artifact of a single measurement approach. Potter (2010) extended this evidence to special-needs students from diverse backgrounds more broadly, finding that multisensory instruction improved reading outcomes for a heterogeneous group of learners whose disabilities and backgrounds varied considerably, which speaks to the flexibility of multisensory approaches in accommodating a range of individual learner profiles within a single instructional framework.

Children with dyslexia specifically appear across several studies in this review, and the pattern of findings is notably consistent regardless of the linguistic or geographic context in which the research was conducted. Ho et al. (2001) found multisensory training effective in improving the reading and writing skills of Chinese children with dyslexia, a population for which the visual complexity of the logographic writing system might be expected to pose distinct challenges relative to alphabetic scripts; the fact that multisensory training was nonetheless effective suggests the underlying mechanism (redundant sensory encoding) may generalize across writing systems.

Ezechinyere et al. (2020) documented comparable benefits of a multi-sensory intervention strategy for children with dyslexia in public primary schools in Nigeria, while Ashbaugh (2016), using an action-research design, found that multisensory spelling techniques specifically benefited students with dyslexia in an American classroom setting. Mass Villadiego (2024) added a rich, case-study-level account of a single child with dyslexia for whom a multisensory approach supported the development of English reading skills, illustrating in granular detail how such an approach might be adapted to an individual learner's specific profile of strengths and difficulties rather than applied as a one-size-fits-all program.

Learners with auditory processing difficulties represent another important subgroup within this theme. Van Staden and Purcell (2016) examined multi-sensory learning strategies to support spelling development among second-



language learners who had documented auditory processing difficulties, finding that supplementing auditory input with visual and kinesthetic channels helped these learners compensate for the specific sensory-processing weakness that would otherwise have limited their spelling development. This finding is theoretically significant because it demonstrates a specific mechanism by which multisensory instruction benefits struggling learners: rather than simply providing more instruction or more repetition, multisensory approaches provide alternative sensory routes to the same knowledge, which can compensate for a weakness in one particular channel (in this case, auditory processing) by routing the same information through channels that remain intact.

Several studies in this cluster also speak to the practical, resource-related dimension of using multisensory instruction with struggling learners. Because many multisensory materials and techniques—tracing letters in sand, forming letters from clay, using hand or body movements to represent letter shapes—require minimal specialized equipment, they may be particularly well suited to settings with limited access to formal special-education resources, assistive technology, or trained specialists. Ezechinyere et al. (2020), for example, examined the use of a multisensory intervention strategy in a senatorial district of Nigeria with public primary schools, a context in which specialized dyslexia interventions and trained reading specialists may not be widely available, and still found the approach to be effective. This suggests that multisensory instruction may offer a comparatively low-cost, high-feasibility option for supporting struggling readers in resource-constrained settings, a consideration of particular relevance to school systems, including those in the Philippines, that serve large numbers of at-risk learners without correspondingly large specialist budgets.

Considered as a whole, the evidence reviewed under this theme suggests that multisensory instruction is not simply a generically effective strategy that happens to also work for struggling learners; rather, several of the mechanisms underlying multisensory instruction—redundant sensory encoding, compensation for weaknesses in a specific sensory channel, and flexibility in accommodating diverse learner profiles—appear to map especially well onto the specific difficulties experienced by at-risk, dyslexic, and intellectually disabled learners. This convergence of theoretical mechanism and empirical finding provides a strong evidentiary basis for prioritizing multisensory approaches, in particular, when designing interventions for kindergarten and early-primary learners who are struggling with letter-sound acquisition.

Multisensory Strategies Transfer Across First- and Second-Language Literacy Contexts

A third theme running through the reviewed literature concerns the transferability of multisensory strategies across first-language and second-language literacy contexts. Because letter-sound recognition is foundational not only to native-language reading development but also to learning to read in an additional language, a substantial portion of the literature examines multisensory instruction specifically within English-as-a-foreign-language (EFL) and English-as-a-second-language (ESL) settings, often in countries where English is not the primary language of instruction or daily life.

El-Morsy (2017) offers an especially informative case because it examines a doubly vulnerable population: preschool children in an Arabic-speaking context who were both learning English as a foreign language and had been identified as dyslexic. The finding that a multisensory learning approach improved these children's EFL letter recognition suggests that multisensory instruction's benefits are not contingent on the learner's first language sharing an alphabetic or orthographic structure with English, and that the approach can be layered onto, rather than complicated by, an existing reading disability. Sarudin et al. (2019) and Sapi'ee and Tan (2020) extend this evidence to Malaysian ESL contexts, both reporting improvements in word recognition and phonological awareness among young learners following multisensory instruction. Sapi'ee and Tan (2020) is particularly notable for situating this intervention within a rural setting, where access to specialized reading materials, native-English-speaking instructors, and technology-based interventions may be limited; the fact that multisensory gains were still observed under these resource constraints reinforces the theme, identified elsewhere in this review, that multisensory techniques tend to rely on low-cost, readily available materials.



Writing and spelling outcomes, in addition to reading and recognition outcomes, also appear to benefit from multisensory instruction in second-language contexts. Mohamed (2021) found that multisensory-based activities improved EFL writing skills specifically among dysgraphic primary-stage pupils, a population for whom the motor demands of handwriting compound the already substantial cognitive demands of learning to read and write in a non-native language. The kinesthetic and tactile components of multisensory instruction appear to have addressed both the motor and cognitive-linguistic dimensions of this population's difficulties simultaneously, an efficiency that would be harder to achieve using two separate, unimodal interventions. Abd El-Wahab et al. (2019) similarly found that a strategy based on multisensory activities improved EFL primary-school pupils' reading skills and, notably, their reading motivation, suggesting that the benefits of multisensory instruction in second-language contexts extend beyond measurable skill gains into learners' affective engagement with the reading process, an important consideration given that motivation is itself a strong predictor of sustained literacy development.

Fanilag et al. examined innovative and technological multisensory approaches to literacy specifically among primary-school ESL learners, an area of research that intersects with the fourth theme of this review (instructional design and technology) but is included here because it speaks directly to how multisensory principles are being adapted and modernized for second-language classrooms. Their findings suggest that digital and technological tools can serve as a delivery mechanism for multisensory principles in ESL contexts, potentially broadening access to multisensory instruction beyond what physical materials such as sand trays or textured letters alone could provide, particularly in classrooms with larger student-to-teacher ratios where individualized tactile instruction is harder to deliver.

Van Staden and Purcell (2016), previously discussed in relation to at-risk and special-needs learners, also belongs squarely within this theme, as their study specifically examined second-language learners with auditory processing difficulties. Their finding that multi-sensory learning strategies supported spelling development in this population illustrates how the benefits associated with multisensory instruction for struggling learners (Theme 2) and the benefits associated with second-language literacy instruction (Theme 3) are not separate phenomena but frequently overlap in real classrooms, where second-language learners with additional processing difficulties represent a meaningfully sized and often underserved population.

Solichah and Fardana's (2024) scoping review provides a useful higher-level synthesis point for this theme. Their review of multisensory programs as early literacy interventions concluded that the approach shows consistent promise across the diverse populations and contexts in which it has been studied, a conclusion that aligns closely with the pattern identified across the individual EFL and ESL studies discussed above. Rather than finding that multisensory instruction works well only in English-first-language contexts and poorly elsewhere, the weight of the evidence suggests a broadly consistent pattern of effectiveness across linguistic and cultural contexts, even as the specific implementation of multisensory activities is adapted to local resources, orthographies, and classroom conditions.

This theme carries particular significance for multilingual education systems, including those in the Philippines, where kindergarten learners are frequently expected to develop literacy skills across more than one language, often including a local or regional language, Filipino, and English, sometimes within the same instructional day. The consistent finding that multisensory strategies transfer effectively across first- and second-language contexts suggests that a single, well-designed multisensory instructional framework could plausibly be applied, with appropriate contextual adaptation, across the multiple languages in which a young Filipino learner is expected to develop early literacy skills, rather than requiring an entirely distinct pedagogical approach for each language of instruction.

Instructional Design, Technology, and Teacher Preparation Shape Program Effectiveness

The fourth theme to emerge from this review concerns the instructional design features that shape whether, and how strongly, multisensory approaches translate into improved letter-sound outcomes. Across the reviewed studies, it becomes clear that "multisensory instruction" is not a single, uniform intervention but a broad instructional



philosophy that can be implemented through markedly different tools, formats, and levels of structure, and that these implementation choices appear to meaningfully affect outcomes.

Technology and game-based formats represent one increasingly prominent avenue for delivering multisensory instruction. Chin et al. (2024) found that interactive games enhanced kindergarteners' letter recognition, suggesting that carefully designed digital tools can deliver the visual, auditory, and often interactive-kinesthetic engagement associated with multisensory learning at a scale that would be difficult to achieve using only physical manipulatives in a classroom of twenty or more young children. Fanilag et al. similarly explored innovative and technological multisensory approaches to literacy among primary ESL learners, reinforcing the idea that technology need not compete with multisensory principles but can instead serve as a vehicle for delivering them more consistently and to more learners simultaneously. At the same time, the relatively small number of studies examining technology-based multisensory instruction, compared with the larger number examining physical, hands-on multisensory activities, suggests that this remains a comparatively newer and less thoroughly evidenced area within the broader literature, warranting caution against assuming that digital delivery is automatically equivalent to hands-on, tactile delivery.

Structured, branded, or curriculum-embedded multisensory programs represent a second important design consideration. Jordan (2019) and Holmes (2018) each evaluated formal multisensory reading programs and found positive effects on kindergarten reading achievement; Holmes (2018), in particular, examined an adaptation of a program branded "Shake, Rattle, and Read," illustrating how commercially or semi-commercially packaged multisensory curricula can provide teachers with a structured scope and sequence for delivering multisensory activities, rather than requiring each teacher to independently design such activities from first principles. Kalogris (2024) similarly found that embedding multisensory phonics methods within an existing K–2 inclusion reading curriculum, rather than treating multisensory activities as a supplementary add-on, produced measurable gains, suggesting that integration into the core curriculum, rather than occasional or supplementary use, may be an important design consideration for maximizing effectiveness.

Differentiation emerges as another significant design factor. Nagel (2022) found that differentiated literacy instruction, which adjusts the level, pacing, and sensory demands of tasks to individual learners' readiness, supported more consistent literacy growth across an entire kindergarten classroom. This finding implies that multisensory instruction is likely to be most effective not when delivered as a single, uniform activity to an entire class simultaneously, but when the specific combination and intensity of sensory modalities used is adapted to the readiness and needs of individual learners or small groups, an insight that has direct implications for lesson and classroom design.

Teacher preparation and professional capacity represent a further, and perhaps underappreciated, design consideration highlighted by this review. Ghoneim and Elghotmy (2015) found that a multisensory phonics program improved the phonemic awareness and reading accuracy of pre-service teachers themselves, not only of the children they would go on to teach, implying that teacher training programs that incorporate multisensory principles may produce a downstream benefit: teachers who have personally experienced and internalized multisensory phonics instruction may be better equipped to deliver it authentically and confidently to their own kindergarten students, compared with teachers who have only been told about multisensory principles in the abstract without direct experiential training. Karpovich (2018), in examining the implementation of multisensory techniques for teaching letter knowledge, likewise emphasizes that successful implementation depends heavily on teachers possessing a clear understanding of why particular sensory combinations are used for particular instructional goals, rather than treating multisensory activities as generic classroom novelties disconnected from a specific letter-sound learning objective.

The broader landscape of early alphabet pedagogy, as reviewed by Kreinbrink (2023), provides useful context for interpreting these design-related findings. Kreinbrink's examination of preschool approaches to teaching alphabet knowledge situates multisensory instruction as one strategy among several within a broader pedagogical toolkit,



suggesting that multisensory activities are likely to be most effective when they are thoughtfully sequenced alongside, rather than used as a wholesale replacement for, other evidence-based early-literacy practices such as shared reading, environmental print exposure, and systematic phonics instruction.

Taken together, the studies reviewed under this theme suggest that the effectiveness of multisensory instruction depends substantially on how it is designed and delivered. Programs that are curriculum-embedded rather than supplementary, differentiated to individual learner readiness, supported by well-trained and experientially prepared teachers, and, where technology is used, thoughtfully designed rather than merely novel, appear more likely to produce the strong, consistent gains documented under Themes 1 through 3 of this review. This theme carries a clear practical implication: school leaders and curriculum developers seeking to adopt multisensory letter-sound instruction should attend not only to whether multisensory activities are used, but to how thoughtfully those activities are structured, sequenced, differentiated, and supported through teacher preparation.

Conclusion:

This systematic literature review synthesized 37 sources examining the relationship between multisensory learning activities and kindergarten students' letter-sound recognition. Four themes emerged from this synthesis. First, multisensory instruction consistently and reliably strengthens letter-sound correspondence and phonemic awareness relative to single-modality instruction, an effect that appears to be driven by the redundant, mutually reinforcing sensory pathways that multisensory activities create. Second, these benefits appear particularly pronounced for at-risk, struggling, and special-needs learners, including children with dyslexia and intellectual disabilities, for whom multisensory instruction may compensate for weaknesses in a specific sensory-processing channel.

Third, multisensory strategies transfer effectively across first-language and second-language literacy contexts, a finding with particular relevance for multilingual education systems in which kindergarten learners must develop literacy across more than one language. Fourth, the effectiveness of multisensory instruction is not automatic but depends substantially on instructional design, including curriculum integration, differentiation, technology use, and teacher preparation.

Collectively, these findings provide a strong evidentiary basis for recommending multisensory learning activities as a core, rather than supplementary, component of kindergarten letter-sound instruction. For classroom teachers, this suggests deliberately incorporating tactile, kinesthetic, and auditory elements alongside visual letter exposure for example, tracing letters while vocalizing their sounds, forming letters through movement or manipulatives, and pairing hand cues with phonemes—rather than relying on visual repetition or flashcard drills alone. For school and curriculum leaders, the findings suggest that multisensory principles are best embedded directly within the core reading curriculum and supported through explicit teacher training, rather than treated as an occasional supplementary activity.

This review is subject to several limitations that should temper the strength of these conclusions. Because the included studies vary considerably in design, sample size, and rigor, and because no formal meta-analytic pooling of effect sizes was conducted, the synthesis presented here should be understood as a qualitative account of convergent patterns rather than a precise estimate of the magnitude of multisensory instruction's effect. The literature base may also be subject to publication bias favoring studies with positive findings, and a number of included sources are unpublished theses or dissertations whose review rigor cannot be fully verified.

Future research would benefit from larger-scale randomized controlled trials of multisensory letter-sound interventions, particularly within multilingual education systems such as the Philippines, where evidence remains comparatively limited relative to the United States, the Middle East, and parts of Southeast Asia. Further research is also needed to disentangle which specific combinations of sensory modalities, and which specific instructional design features identified under Theme 4, contribute most strongly to observed gains, so that future multisensory programs



can be designed with greater precision rather than relying on a broad and somewhat heterogeneous instructional philosophy. Despite these limitations, the consistency of findings across two decades, multiple countries, and diverse learner populations offers considerable confidence that multisensory learning activities represent an effective, evidence-based approach to improving kindergarten students' letter-sound recognition.

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