

Evidence-Based Class Literacy Instruction for Children With Speech and Language Difficulties

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This study investigated the response to class-wide phonological awareness and oral language teaching for 40 children who entered school with speech and language difficulties. A stepped wedge research design was adopted to compare the immediate impact of the 10-week teacher-led instruction. The progress of the children with speech and language difficulties was monitored over the first school year and compared with 110 children with language difficulties alone and 95 children with typical development. Children with speech and language needs showed a strong intervention response in phoneme awareness and vocabulary learning but needed more support to transfer skills to word decoding and spelling. Implementing the approach earlier in the school year resulted in stronger literacy performance at the year-end for all three groups. The importance of positive speech-language pathologist and teacher collaborations to support a systematic approach to evidence-based foundational literacy teaching is discussed. **Key words:** oral language, phoneme, phonological awareness, speech sound disorder, teaching practice, vocabulary

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THE CUMULATIVE benefits from successful early reading and writing attempts for beginner learners are well established (Duff et al., 2015; Sparks et al., 2014). Ensuring all learners experience the longer term benefits from early literacy success is both a global priority and a global challenge. Many countries report persistent and wide variability in their children's reading abilities at around 10 years of age (Mullis et al., 2017), with longitudinal data suggesting that children who struggle with reading may experience literacy challenges into adulthood (del Tufo & Earle, 2020). Such findings have led to the prioritization of interventions focused on children's early literacy learning.

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One group of children whose early literacy development requires additional support and careful monitoring is children who enter school with speech and oral language difficulties (Lewis et al., 2019). Analysis of literacy growth trajectories for these children highlights the need to provide proactive support to enhance their literacy outcomes. McLeod et al. (2019) analyzed reading and spelling achievement growth for 4,332 children (recruited at 4 years of age) in Grades, 3, 5, and 7 from the Longitudinal Study of Australian Children. Parents had identified whether they had concerns about their children's speech and language development at preschool and again when they were aged 6–7 years. Consistent with previous large-scale longitudinal studies (e.g., Johnson et al., 2010), children whose parents identified speech and language needs performed consistently lower than their peers whose parents had no concerns about their children's speech and language development on all measures of literacy administered. This significant difference in performance was evident even when controlling for other potential ecological and health influences on children's literacy development. Comparisons of the shape and trend of reading and writing achievement over time (at Grades 3, 5, and 7) were similar for children with and without speech or language difficulties.

This parallel trajectory of literacy growth for children with and without speech and language difficulty is concerning as it indicates children with such difficulties are not catching up to their peers, which could result in longer term educational inequities. There is an urgent need, therefore, to better understand teaching and intervention practices that will accelerate early literacy learning for children with both speech and language learning needs to ensure they benefit from the positive long-term health, social, and economic benefits that are associated with higher literacy and educational achievement.

A focus on understanding facilitators of early literacy success in children with both speech and oral language difficulties is war-

ranted, given these children's additional potential challenges. Accurate speech production involves a complex array of perceptual, linguistic, nonlinguistic, cognitive, and motor skills (Waring et al., 2019). Understanding which aspects of speech and language processing are a relative strength for these children and which aspects will need specific support will help realize greater benefits from literacy teaching practices (Dodd, 2011). For example, depending on the nature of their speech difficulty, children with speech sound disorder may require additional support in abstracting the rules that govern the alphabetic principle or in accessing an accurate underlying phonological representation of a word to facilitate efficient integration of phonological knowledge in word reading and spelling tasks (Sutherland & Gillon, 2007). They may require more encouragement and appropriate scaffolding to articulate letter names or sounds or to read words aloud due to their speech production difficulty. They also may need more support to strengthen their phonological working memory to enhance their phoneme awareness and word learning, given the unique contribution of phonological working memory to speech accuracy (Waring et al., 2019). Improving these children's phonological awareness skills may be particularly important, as strong phonological awareness knowledge in the presence of a speech sound disorder may be a protective factor for improved literacy outcomes (Rvachew, 2007).

Surprisingly, there is limited detailed information relating to how children with both speech and language difficulties respond to quality classroom literacy instruction. Most intervention studies aimed at improving reading and/or spelling development for children with speech and language difficulties are at the small-group or individual level (e.g., Al Otaiba et al., 2009). Findings from interventions delivered at the individual level suggest potential benefits from considering speech, reading, and spelling goals in an integrated way. Following individual therapy sessions (up to 20 hr of intervention in total)

where a speech-language pathologist (SLP) implemented the intervention, Gillon (2000) and McNeill et al. (2009) demonstrated that it is possible to improve speech production, phonological awareness, word reading, and spelling concurrently through focused and evidence-based phoneme awareness intervention. For example, in Gillon's study, the details reported for five children from the larger cohort (aged 5 and 6 years) who had severe speech impairment suggested remarkable improvement in some aspects of these children's speech production. All five children improved by between 20% and 30% in the percentage of consonants correctly articulated in single-word speech production during the 4-month period they received phoneme awareness intervention. However, the conditions and supports necessary for classroom teachers to help children attain similar outcomes within larger group or classroom contexts have not been carefully explored.

In a recent randomized controlled intervention study (Wilcox et al., 2020), the progress of 289 preschool children with developmental speech and/or language impairments was monitored in response to whole-class instruction over a school year. Findings indicated that a more systematic approach for teaching the necessary foundational learning skills for literacy success (referred to as TELL: Teaching Early Literacy and Language) that also included coaching and mentoring opportunities for classroom teachers resulted in significantly greater gains in the children's foundational literacy skills than business-as-usual literacy instruction. The usual curriculum had similar targets as the TELL curriculum (e.g., improving children's phonic knowledge, phoneme awareness, vocabulary, print awareness, listening comprehension, and oral narrative skills), yet observations of teachers implementing the usual curriculum revealed that less than half included explicit instruction in all elements (e.g., >40% did not include phonological awareness instruction at any of the four observation points across the school year). In contrast, treatment

fidelity for teachers implementing TELL was high. In addition, teachers implementing the TELL curriculum included small-group differentiated instruction to supplement whole-class instruction based on the teachers' regular monitoring of children's progress data. The teaching intensity in foundational literacy skill areas specific to individuals' needs was therefore greater in the TELL teaching condition. Specific details, however, as to how the children who had speech versus language difficulties responded to the approach were not described in this study.

Our current study extends previous research through detailing the response to evidence-based classroom literacy instruction for children in their first year of school who have speech and language difficulties. The participants were drawn from a wider study (Gillon et al., 2019) that investigated the feasibility of an integrated approach, referred to as the Better Start Literacy Approach, for children entering school with low levels of oral language (OL). The approach included the following: (a) professional learning and development as well as in-class coaching for teachers; (b) teacher-led phoneme awareness, vocabulary, and OL intervention over a 10-week period, supported by SLPs or other remedial specialist; and (c) workshops for children's parents/family members to enhance their children's language skills in areas aligned to the class intervention. In Gillon et al.'s (2019) study, the response to this intervention for 5- and 6-year-old children ($n = 141$) from low socioeconomic communities in New Zealand was described. Importantly, analysis of the data revealed that, with appropriate supports, teachers can effectively accelerate phoneme awareness and vocabulary knowledge in children with low levels of OL in ways that advance these children's ability to decode written words. With regard to literacy-related outcomes, the study reported effect sizes using Cohen's (1988) index of $d = 0.88$ for nonword decoding and $d = 0.60$ for phoneme awareness when comparing growth in response to the Better Start Literacy Approach with that

in response to business-as-usual classroom practice. The data reported here advance this work through analyzing the response to intervention for children with both speech and language difficulties compared with those with OL weakness alone. This analysis will help elucidate whether children who have speech difficulty in addition to lower OL require increased intervention intensity or differentiated intervention strategies to ensure their early literacy success.

Specifically, the study reported here addressed the following research questions:

1. What is the response to whole-class phonological awareness and OL teaching for children with both speech sound production difficulties and weak OL compared with children with weak OL alone?
2. What is the impact of providing earlier whole-class phonological awareness and OL teaching on year-end reading and spelling performance?

METHOD

The researchers were invited into the community to undertake this research following a series of meetings and workshops with community and school leaders. Leaders recognized the high number of children entering their schools with low levels of OL, and they shared the common goal of ensuring early literacy success for all their young learners.

Participants

Participants were from a low socioeconomic community that was significantly impacted by a series of devastating earthquakes in Christchurch, New Zealand. The children (aged 5 years at study commencement, the typical age for school entry in New Zealand) were born in the year of the major earthquake (2011) or the following year. The participants' community was negatively impacted in several ways, such as neighborhoods being demolished, preschools closing, and parents stressed with serious challenges of managing housing

issues. The participants were part of Gillon et al.'s (2019) study, which evaluated the impact of teacher-implemented early literacy intervention for children with weak OL. Approval from the university's human ethics committee was obtained prior to the commencement of the study.

The OL of all children from seven schools in the community ($n = 247$) was screened using the Recalling Sentences subtest of the Clinical Evaluation of Language Fundamentals Preschool–Second Edition Australian and New Zealand Standardized Edition (CELF-P2; Wiig et al., 2006) and the Initial Phoneme Identity subtest of a computer-based phonological awareness screening and monitoring assessment (Com-PASMA; see Carson et al., 2013, 2014). These tests were selected as they measure skill areas strongly associated with children's early literacy success (Adlof et al., 2010). From the cohort of 247 children, 152 (61.5%) children were identified as having weak OL, with the remaining 95 children forming the group of children with typical language development (TD group).

Weak OL ability from the screening assessment was operationally defined as achieving a scaled score of 7 or below on the Recalling Sentences subtest and/or scoring below 50% correct on the Initial Phoneme Identity assessment. From the 152 children with weak OL, 150 completed a comprehensive language and phonological awareness assessment (see the next section); two students left the region. During screening assessment, 51 children from the group of children with weak OL ability were noted as having unclear speech and/or presenting with speech production errors. The Phonology and Inconsistency subtests of the Diagnostic Evaluation of Articulation and Phonology (Dodd et al., 2002) were administered to these children. Children were classified as exhibiting speech sound disorder if they achieved a standard score of 5 or below for the percent consonants correct (PCC) metric. There were 40 children who were identified as having speech disorder (SD) in addition to lower OL skills. The average PCC for this group was

82.2% ($SD = 11.3\%$). The majority of children in the OL + SD group presented with mild speech delays with PCC of 80% or greater ($n = 28$). The average inconsistency percentage was 26.5% ($SD = 16\%$), and eight children met the 40% criterion for inconsistent speech production. Three children used at least one atypical speech error pattern systematically. Only one child with speech difficulty was receiving speech therapy services during the study.

Participants who exhibited typical OL performance on the screening assessment were monitored by evaluating their reading and spelling ability at the end of the school year. There was some attrition throughout the study, with six participants from the TD group, 10 participants from the OL group, and one participant from the OL + SD group moving schools over the course of the school year.

Study design

Gillon et al.'s (2019) intervention study utilized a stepped wedge design where Strand A (consisting of 10 classes from three schools) had an immediate start of the intervention whereas Strand B (consisting of 12 classes from four schools) had a 12-week delayed start to the intervention. Gillon et al.'s (2019) study reported only on those children with weak OL skills. In Table 1, data are separated into those with lower OL and those with lower OL + SD and these two groups are compared with peers with TD. Demographic variables and performance in the screening assessment are reported. Analyses confirmed that the three groups (TD, lower OL, lower OL + SD) did not differ in age, $F(2, 244) = 2.21$, $MSE = 11.9$, $p = .14$. There was a difference in scores achieved in the Recalling Sentences subtest, $F(2, 244) = 50.80$, $MSE = 53.1$, $p < .001$, and the Initial Phoneme Identity task, $F(2, 244) = 60.84$, $MSE = 5.0$, $p < .001$. Post hoc testing showed that the TD group outperformed the lower OL group ($p < .001$) and the lower OL + SD group ($p < .001$) on Recalling Sentences and Initial Phoneme Identity, but there was

Table 1. Demographic information and assessment screening scores (and standard deviations in parentheses) for the three groups

	Typical OL ($n = 95$)		Lower OL ($n = 110$)		Lower OL + SD ($n = 40$)	
	Strand A ($n = 40$)	Strand B ($n = 55$)	Strand A ($n = 58$)	Strand B ($n = 52$)	Strand A ($n = 18$)	Strand B ($n = 22$)
Age in months	64.5 (3.2)	64.9 (3.2)	64.0 (3.0)	63.7 (3.3)	64.1 (2.7)	63.8 (2.9)
Gender (M:F)	23:16	32:25	27:31	20:33	11:7	15:7
Initial phoneme identification	8.3 (2.0)	8.0 (2.1)	4.9 (2.4)	4.9 (2.5)	5.1 (1.8)	4.5 (2.4)
CELF-P2 Recalling Sentences	9.4 (2.7)	9.9 (2.3)	6.8 (2.6)	6.6 (3.1)	5.8 (3.0)	5.8 (3.4)

Note. CELF-P2 = Clinical Evaluation of Language Fundamentals Preschool-Second Edition subtest with scaled score reported; OL = oral language; SD = speech difficulty. Strand A received the intervention first; Strand B received the intervention second (approximately 12 weeks after Strand A).

no significant difference between the lower OL and lower OL + SD groups on these tasks. There was no difference between participants from Strand A and Strand B on age, $F(1, 241) = 2.183$, $MSE = 11.4$, $p = .14$, Initial Phoneme Identity, $F(1, 241) = 0.558$, $MSE = 5.0$, $p = .46$, or Recalling Sentences, $F(1, 241) = 1.267$, $MSE = 7.4$, $p = .26$, performance at the outset of the study.

Comprehensive oral language assessment

The Word Structure, Expressive Vocabulary, and Sentence Structure subtests of the CELF-P2 (Wiig et al., 2006) were administered to the lower OL and lower OL + SD groups identified through the screening measures. These subtests combined provide the CELF-P2 Core Language Index score as reported in Table 2.

Pre- and postintervention assessments

The following assessments were administered to the lower OL and lower OL + SD groups immediately before and after completion of the 10-week intervention. Further detail regarding the administration procedures is reported in Gillon et al. (2019).

- Computer-based phonological awareness screening and monitoring assessment (Com-PASMA; Carson et al., 2013): The

Initial Phoneme Identity (10 items), Phoneme Segmentation (18 items), Phoneme Blending (15 items), and Letter-Sound (18 items) tasks of the Com-PASMA were administered. These tasks proved to have sufficient content validity and internal consistency to measure and differentiate skills for 5-year-old children over the course of their first year at school (Carson et al., 2015). All were receptive tasks, meaning children's performance was not inhibited by the presence of speech production errors.

- Nonword reading probe: Children read 10 nonwords that were consonant-vowel-consonant structure (e.g., vab, zug). The total number of graphemes (out of 30) read correctly was calculated for analysis. Children received credit for responses that were incorrect due to the use of a consistent speech sound error.
- Vocabulary probe: The probe included 20 words from the intervention (10 elaborated, 10 nonelaborated). Children were asked to "tell me what [item] means," followed by "tell me anything about [item]?" if further prompting was required.

The performance of the lower OL and lower OL + SD groups is shown in Table 2. These groups showed equivalent performance in OL, letter-sound knowledge, and

Table 2. Summary of performance of the lower OL and lower OL + SD groups at baseline

Measure	Lower OL, <i>M (SD)</i>	Lower OL + SD, <i>M (SD)</i>	<i>p</i>
CELF-P2 Sentence Structure ^a	7.6 (3.3)	7.3 (2.9)	.59
CELF-P2 Expressive Vocabulary ^a	6.9 (2.7)	6.5 (2.1)	.41
CELF-P2 Word Structure ^a	7.8 (3.3)	7.0 (3.6)	.20
CELF-P2 Core Language Index ^b	84.2 (16.7)	81.8 (14.9)	.44
Letter-sound knowledge (/18)	11.1 (5.2)	8.2 (5.5)	.01*
Combined phoneme awareness (/43)	12.5 (6.4)	10.0 (4.5)	.04*
Nonword reading (no. graphemes/30)	4.8 (6.4)	3.3 (4.5)	.17
Vocabulary probes (/40)	3.1 (1.8)	2.5 (1.8)	.20

Note. CELF-P2 = Clinical Evaluation of Language Fundamentals Preschool-Second Edition; OL = oral language; SD = speech difficulty. * $p < .05$.

^aScaled score, expected performance of 7-13.

^bComposite standard score, expected performance of 85-115.

nonword decoding. There was a difference in their phoneme awareness ($p = .04$) and letter-sound knowledge ($p = .01$), with the lower OL group outperforming the OL + SD group.

Distal measures

Follow-up literacy measures were completed by the TD, lower OL, and lower OL + SD groups at the end of the school year (~24 weeks following the whole-class intervention for Strand A children and 12 weeks following the intervention for Strand B children). The following measures were administered:

- Neale Analysis of Reading Ability (NARA; Neale, 1999). Children read short stories of increasing complexity using Form 1. (Kuder-Richardson reliability coefficient for Form 1 reading accuracy = 0.95 for children in Year 1 at school.) Raw scores from the reading accuracy component were tabulated, but standard scores were not calculated because of the young age of the cohort.
- The Essential Spelling List (Schonell, 2014). For this assessment, children spell words of increasing difficulty. Raw scores (number of words correct) and a qualitative analysis of representation of phonological information in the spelling attempt were used. The phonological scoring system involved analyzing children's attempts of the first 10 spelling words. These items all had a consonant-vowel-consonant structure with short vowels (i.e., net, can, fun, top, rag, sat, hit, lid, cap, had). These items were scored out of 30 (i.e., three graphemes per word) according to a phonological scoring system: 1 point was awarded for each correct phoneme-grapheme match (e.g., net: net = 3 points, nat [vowel error] = 2 points). Plausible graphemes for an intended target (e.g., substituting "k" for "c") also were scored correct, given the focus was on use of a phonological strategy. Clear letter reversals were not counted as errors.

Intervention overview

The Better Start Literacy Approach (Gillon et al., 2020) implemented in the current study was based on a number of evidence-based principles to enhance children's phonological awareness, letter knowledge, vocabulary, and word reading skills. The phonological awareness activities were derived from activities proven effective in previous studies and focused on explicit teaching of phoneme-level skills (initial phoneme identity, phoneme segmentation, and phoneme blending) and the transfer of these skills to word reading and spelling (see Gillon, 2017, for a discussion of principles of effective phonological awareness instruction). The vocabulary intervention involved elaboration techniques of target vocabulary during the sharing of quality children's storybooks based on Justice et al.'s (2005) intervention activities. Each story had four target vocabulary words, and a sticker was placed at the bottom of the appropriate page for the teacher to read a definition of the target word verbatim to elaborate the meaning of the word. Oral language activities that provided children opportunities to use vocabulary such as retelling of the story and story discussion also were included.

The intervention was embedded in a culturally responsive framework (e.g., Gillon & Macfarlane, 2017) where teachers were supported to demonstrate cultural competencies that are aligned to the New Zealand educational framework in supporting Māori learners (New Zealand's indigenous population). For example, activities and storybooks that affirmed the identity, language, and culture of Māori children and their families were incorporated. The intervention included quality online professional development for teachers, as well as in-class coaching and support. On average, teachers received 12 hr of support during the intervention implementation over the 10-week period either by an SLP or a member of the research team (doctoral student who was an experienced teacher or an SLP). In addition, workshops that positively engaged children's parents and family

members in their children's learning in ways that aligned to the Better Start Literacy Approach class activities were offered. These workshops were offered at multiple times to help meet the needs of working parents.

The intervention details were co-constructed between the research team and the participating class teachers (described further in Gillon et al., 2019). It consisted of a 10-week program that was delivered by classroom teachers for 30 min a day, four times weekly. This intervention replaced part of the teachers' usual class literacy activities, but children continued to receive their small-group guided reading and writing activities that were part of their business-as-usual literacy instruction. Teachers were provided with the quality storybooks, colorful game activities, and resources for the intervention. For the first week, teachers also were provided with detailed lesson plans for each day. Each lesson plan followed the same format of three key components: (a) shared storybook with vocabulary activities; (b) letter knowledge and phoneme awareness skill-building activities; and (c) skill transfer to reading and writing activities. Activities were linked across these three components such as some of the target words for the phoneme awareness activities were drawn from the storybook, or related to the storybook theme, and the storybook chosen highlighted the week's target letter sounds (see the Appendix for an abbreviated version of a lesson plan and Gillon et al., 2020, for video examples). For Weeks 2–8, teachers were provided with plans for three of the four lessons. They were supported to develop their own activities within the lesson plan format for the fourth lesson of each week. This helped teachers adapt the specific intervention activities to their children's needs and interests. During the last 2 weeks of the intervention, SLPs or a research team member supported the teachers to implement their own daily plans (using the lesson plan template to ensure the key areas were covered in each lesson) based on children's needs and interests.

Intervention fidelity

Intervention fidelity was monitored through the teachers completing online daily checklists related to implementation of the key components of the lesson plan as well as video or audio analysis of teachers' lessons. Analysis of a randomly selected 20% of teachers' checklists indicated that 96% included all key intervention components of their lesson plans. The missing element in 4% of cases was the transfer to reading and writing activities, which teachers reported running out of time to implement within the 30 min. The random selection of 10% of recordings for detailed analysis indicated 100% adherence to the lesson plan content and 92% adherence to the instructional time of 30 min (± 5 min of instructional time). Those who did not adhere to the time frame typically spent more time (e.g., up to 45 min) implementing the activities.

Scoring reliability

The language (CELF-P2 subtests, vocabulary probes), phoneme awareness, and reading (nonword decoding, NARA) assessments were scored in real time by the examiners who were well trained on administering and scoring the tasks and then carefully rechecked by the examiner. The examiner discussed a score with a second examiner if there was doubt related to scoring a child's response. An independent examiner then rescored 20% of samples for each assessment task using assessment audio recordings where applicable or children's response sheets. Interrater reliability for all measures was 100%. The spelling responses were initially scored via the phoneme scoring system by the second author. Another member of the research team then independently rescored around 25% of the assessments ($n = 72$). The percentage of agreement in the phoneme-grapheme match analysis was 98.2%. Children's responses on the Diagnostic Evaluation of Articulation and Phonology (Dodd et al., 2002) subtests were transcribed in real time using broad phonetic transcription and

rechecked by the examiner using audio files. The audio files of 100% of the participants were further reviewed by independent assessors, and any differences in transcription were resolved through review and discussion.

RESULTS

A one-way analysis of variance (ANOVA) with repeated measures for time was used to compare the immediate response to classroom teaching for the lower OL and lower OL + SD groups. There was no statistically significant interaction between group and time on phoneme awareness, $F(1, 138) = 1.67$, $MSE = 27.1$, $p = .20$, partial $\eta^2 = .01$, letter-sound knowledge, $F(1, 138) = 0.26$, $MSE = 13.4$, $p = .61$, partial $\eta^2 = .002$, and vocabulary knowledge, $F(1, 138) = 1.09$, $MSE = 3.7$, $p = .30$, partial $\eta^2 = .008$. These results indicate that each group had a similar intervention response in these areas.

There was a statistically significant interaction between group and time on nonword decoding ability, $F(1, 138) = 4.94$, $MSE = 128.0$, $p = .03$, partial $\eta^2 = .034$. Univariate analysis showed there was no difference in decoding between groups at Time 1, $F(1, 138) = 2.02$, $MSE = 34.7$, $p = .16$, partial $\eta^2 = .014$. The lower OL group, however, significantly outperformed the lower OL + SD group in decoding at Time 2, $F(1, 138) = 7.83$, $MSE = 102.7$, $p = .006$, partial $\eta^2 = .054$. These results indicate that children with lower OL skills alone had a stronger intervention response in decoding.

A paired t test showed children with lower OL + SD made significant growth ($p < .05$) in their speech accuracy (PCC), improving from 82.2% ($SD = 11.3$) to 90.6% ($SD = 6.7$) at the end of the year. Case analysis of speech change also showed particularly strong growth for some children who entered the study with more significant speech needs. For example, two children who did not access individualized therapy support had gains of 37% and 20% in their PCC scores during the study.

The aforementioned analyses reveal useful information that support the importance of close monitoring of children with speech and language difficulties even when a quality classroom intervention program is in place. However, from a strengths-based perspective, it also is important to consider the skills that children present with (and can build upon). Table 3 summarizes children's skills in key learning areas of the classroom program at pre- and postintervention across the lower OL and lower OL + SD groups. Changes in the proportion of children who reached a target proficiency score in each area are presented. Proficiency scores were identified as performance at 70%–75% correct. For example, Table 3 shows that 56.4% of the children with lower OL +SD could read seven or more initial graphemes from the 10 pseudo words correctly, but the majority needed more teaching support to decode final graphemes (35.9% could read ≥ 17 initial and final graphemes correctly) and medial graphemes (12.8% could read ≥ 25 of the 30 graphemes correct in the 10 pseudo words).

A two-way ANOVA (Group and Strand) was conducted to examine the effects of OL group and strand on end-of-year performance in reading and spelling measures. The interaction effect between group and strand was not statistically significant for spelling, $F(2, 235) = 0.208$, $MSE = 51.5$, $p = .812$, partial $\eta^2 = .002$, or reading, $F(2, 234) = 1.061$, $MSE = 74.8$, $p = .348$, partial $\eta^2 = .009$. Therefore, an analysis of the main effect of group was performed on these measures. There was a significant main effect for the OL group in spelling, $F(2, 235) = 21.09$, $MSE = 51.5$, $p < .001$, partial $\eta^2 = .152$, and reading, $F(2, 234) = 26.497$, $MSE = 74.8$, $p < .001$, partial $\eta^2 = .185$, performance. Post hoc analysis with Bonferroni adjustment revealed that the TD group outperformed the lower OL and lower OL + SD groups in spelling ($p < .001$) and reading ($p < .001$) as displayed in Table 4.

The lower OL group also scored better than the lower OL + SD group on the spelling

Table 3. Percentage of each group achieving proficiency in phoneme awareness and decoding measures at beginning and end-of-year assessments

Measure	Proficient Score	Lower OL Pretest (% Proficient)	Lower OL Posttest (% Proficient)	Lower OL + SD Pretest (% Proficient)	Lower OL + SD Posttest (% Proficient)	Typical OL Posttest (% Proficient)
Initial phoneme identification	7+	23.8%	86.1%	15.4%	76.9%	98.1%
Phoneme segmentation	10+	2.6%	10.1%	0%	1.0%	30.9%
Phoneme blending	10+	14.9%	69.5%	2.5%	60.5%	87.2%
Letter-sound knowledge	12+	54.4%	90.9%	35.6%	71.1%	96.8%
Nonword reading: Initial grapheme correct	7+	23.8%	73.3%	12.8%	56.4%	90.4%
Nonword reading: Initial + final graphemes correct	17+	7.9%	52.5%	2.6%	35.9%	73.4%
Nonword reading: All graphemes correct	25+	3.0%	32.7%	0%	12.8%	51.1%
Spelling: Initial grapheme correct	7+	-	89.1%	-	64.9%	95.7%
Spelling: Initial + final graphemes correct	17+	-	73.6%	-	48.6%	90.4%
Spelling: All graphemes correct	25+	-	65.5%	-	35.1%	78.7%

Note. OL = oral language; SD = speech difficulty; Nonword reading of 10 consonant-vowel-consonant pseudo words. Spelling of 10 consonant-vowel-consonant real words.

Table 4. End-of-year reading and spelling performance (and standard deviations in parentheses) for all groups

Measure	Typical OL (<i>n</i> = 89)	Low OL (<i>n</i> = 100)	Low OL + SD (<i>n</i> = 39)
Neale Analysis of Reading Ability raw score	14.7 (10.2)	8.3 (8.3)	4.2 (6.4)
Schonell Essential Spelling List raw score (first 10 words): Phonemes correct	13.3 (7.3)	9.6 (7.7)	4.5 (5.0)

Note. OL = oral language; SD = speech difficulty.

($p < .001$) and reading ($p < .05$) measures. There also was a significant main effect of strand for spelling, $F(1, 235) = 4.54$, $MSE = 51.5$, $p = .034$, partial $\eta^2 = .019$, and reading, $F(1, 234) = 11.451$, $MSE = 74.8$, $p = .001$, partial $\eta^2 = .047$, with children in Strand A (who received the intervention first) exhibiting stronger literacy performance at the end of the year (see Figures 1 and 2).

DISCUSSION

This study examined the impact of an evidence-based class-wide phoneme awareness and vocabulary intervention, referred to as Better Start Literacy Approach, for children with speech and language learning needs in their first year of school. The response to this teacher-led, 10-week whole-class intervention

was compared for children with lower OL skills (lower OL group) and those with lower OL skills and speech sound difficulties (lower OL + SD group).

Analyses of the immediate impact of the intervention for children with lower OL and children with lower OL + SD were positive. Significant gains in performance were evident on all measures, and the intervention facilitated equivalent growth in phoneme awareness and vocabulary knowledge for both groups. Children with lower OL alone, however, experienced a stronger intervention response in word decoding despite equivalent OL proficiency scores and growth in phoneme awareness across these groups. These results are consistent with research showing that children with combined speech and language impairment

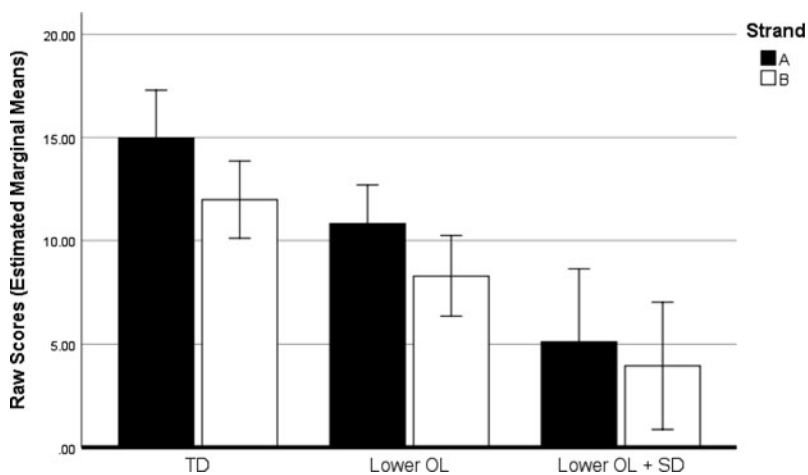


Figure 1. End-of-year spelling performance on the Schonell (raw scores) for children in Strand A, who received the 10-week class program first, and children in Strand B, who received the program second. OL = oral language; SD = speech difficulty; TD = typical language development.

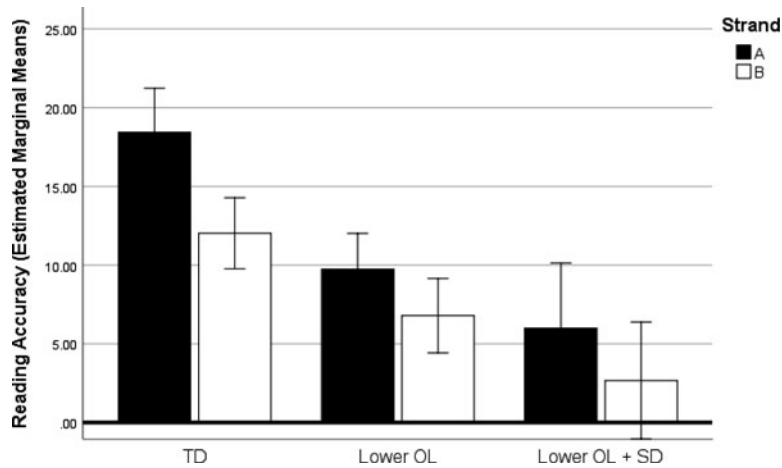


Figure 2. End-of-year reading accuracy on the Neale Analysis of Reading (raw scores) for children in Strand A, who received the 10-week class program first, and children in Strand B, who received the program second. OL = oral language; SD = speech difficulty; TD = typical language development.

require more intensive support with literacy learning (e.g., Lewis et al., 2019). Gillon et al.'s (2019) previous analysis of the impact of this intervention for children with lower levels of OL (including those with speech sound difficulty) showed accelerated growth in phoneme awareness, vocabulary, and decoding ability compared with peers with lower levels of OL who received the usual classroom curriculum. These results highlight the importance of closely monitoring the growth of key foundational literacy learning skills, particularly for children who have speech sound difficulties in addition to OL weakness, even when an evidence-based classroom program is in place.

A competency-based assessment analysis was employed to establish children's acquisition of subcomponents of phoneme awareness, decoding, and encoding knowledge across the school year. The analysis tracked the learning of skills and also provided a tool to identify next steps for instruction. The results showed children across all groups followed a clear developmental pathway in their acquisition of foundational literacy knowledge. This assessment model allowed teachers and SLPs to focus on children's achievements without compromising identification of learning needs. The results also could be

shared with parents in a constructive way that focused on learning progress rather than the child's deficits. A combination of classroom and individual profiles using the competency-based analysis would be useful for teachers and SLPs to use when collaborating to design class-wide and more intensive literacy learning experiences for children with speech and language impairment.

The impact of the implementation of the whole-class approach earlier in the school year on phoneme awareness, reading, and spelling performance at the end of the year was assessed for the lower OL, lower OL + SD, and TD groups. The results showed an advantage for starting the approach 12 weeks earlier on the end-of-year literacy outcomes for all groups regardless of OL or speech sound production status. This finding is consistent with the importance of being proactive in supporting learning and providing positive early learning experiences. In line with the self-teaching hypothesis (Share, 1995), it appears that children who received the intervention first had more opportunity to benefit from the successful decoding experiences provided through the direct teaching approach and to generalize these skills to learning new words. A large body of literature has focused on

identifying factors that help predict the risk of literacy acquisition difficulties for children with speech sound disorders, such as OL functioning, phoneme awareness ability, and speech error type (e.g., Hayiou-Thomas et al., 2017; Lewis et al., 2019; Rvachew, 2007). Although robust assessment is a key part of management planning, our results suggest that a primary priority for SLPs to help facilitate literacy learning of children with speech difficulties must be on optimizing the quality of the classroom instruction. The provision of a quality classroom literacy program is advantageous to all learners and will allow resources for specialist support to be used in a more efficient manner for children with identified learning needs (Justice, 2006).

Clinical implications

There is a scarcity of studies that have explored the response of children with both speech and oral language learning needs to classroom-wide, teacher-led instructional approaches focused on phonological awareness and vocabulary learning, but some common elements are emerging that warrant further investigation and can help guide clinical practice. These include the following:

1. The need for intensive support to help children with both speech and language needs transfer improved phonological awareness skills to reading and writing endeavors. The current study's findings are consistent with Carson et al.'s (2013) examination of the effectiveness of class-wide phonological awareness instruction that included an analysis of the impact of the intervention for seven children with "spoken language impairment" (speech and/or language difficulties). Carson et al. reported that although these children showed equivalent intervention gains in phoneme awareness as children with typical OL ability, they required more intensive support to transfer improved phoneme awareness to the decoding process. Consequently, additional small-group activities to supplement

class activities focused on phoneme manipulation with letter blocks to read and spell new words as well as using phoneme segmentation and blending skills to decode and encode phonetically regular words when reading and writing are recommended.

2. The importance of a systematic approach to evidence-based whole-class instruction for children with speech and language needs. In the current study, Wilcox et al.'s (2020) study, and Carson et al.'s (2013) study, treatment fidelity for teachers implementing the intervention was high. The research protocol in the current study included the sequencing of activities, teachers documenting daily activities that were implemented, and recording teaching sessions for later reflection and analysis, and these elements supported teachers to be adaptive to children's learning needs as well as ensuring all elements and necessary intensity levels of phoneme awareness and vocabulary teaching were implemented. This contrasts with the wide variability in early literacy teaching practices often reported for business-as-usual literacy teaching (Pelatti et al., 2014). Thus, supporting teachers to adopt protocols that foster systematic and intensive teaching to ensure that all learners in the class are acquiring these critical phoneme awareness and vocabulary foundational skills in response to teaching is recommended.
3. The value of quality teacher professional learning and development and in-class coaching in phonological awareness and vocabulary instruction to attaining improved outcomes for children. Similar to Wilcox et al.'s (2020) study, the teachers in the current study received quality professional learning and development prior to intervention implementation and received in-class support from experienced SLPs and a doctoral student who was an experienced teacher during the 10-week intervention period.

This level of in-class support (on average 12 hr over 10 weeks) was much higher than typically would be provided to teachers. We believe that ensuring teachers have the necessary support to modify teaching practices to implement evidence-based phonological awareness and vocabulary instruction is essential to accomplish improved literacy outcomes for children with speech and language needs.

Limitations and future research

This study focused on children's response to the implementation of the Better Start Literacy Approach at the class level. Future research also needs to consider the potential additive benefits of differentiated small-group and individual interventions for children with both speech and language difficulties. In the current study, the children continued to receive their regular small-group reading and writing program outside of the Better Start Literacy Approach instruction. The content and intensity of this small-group work were not monitored. Examining the potential for these in-class small-group teaching sessions to more directly target children's ability to transfer improved phoneme awareness and vocabulary skills to the reading and spelling process would be useful. The level of parent support via attendance at the workshops offered also was not monitored or detailed in this study, and not all measures used in the study had established reliability and validity.

Further research regarding the response of children with speech production difficulties

is required to ensure the spoken and written outcomes for these children can be optimized. Analysis of the speech accuracy of children in the lower OL + SD group showed significant gains in speech production despite only one child receiving speech and language therapy services during the study. Further research that systematically compares gains in speech accuracy in response to individualized programming and integrated speech and phoneme awareness teaching in the classroom context is required to see whether elements of speech accuracy can be effectively taught within class-wide instruction. Increased collaboration between SLPs and teachers for classroom literacy teaching and learning and optimization of small-group and individualized supports from the outset of literacy instruction will likely maximize the reach of SLPs and enhance the benefits for all learners.

Continuing to deepen understanding of the teaching practices and supports that lead to successful early literacy experiences for children with speech and language difficulties is indeed a worthwhile pursuit. Providing support early in their first year at school to ensure these children acquire the necessary foundational skills for literacy success has the potential to lead to more positive learning trajectories for these children that may, in turn, lead to stronger life outcomes. The findings are a powerful demonstration of the positive impact for all learners that can be derived from SLPs and teachers collaborating to enhance the quality of classroom literacy instruction.

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APPENDIX

An example of a lesson plan format used in the Better Start Literacy Approach implemented in this study. Note: This is an abbreviated example of those lesson plans used in the intervention study.

Week 1	Lesson 1 Book Week 1: <i>Marmaduke Duck on the Wide Blue Seas</i> by Juliette MacIver and Sarah Davis
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Target vocabulary in book Week 1: brave, depart, breeze, hoist

Target phoneme/graphemes Week 1: d, m

Target picture cards (word on reverse) Week 1: mat, mop, map, mud, men, dog, dig, dam, dot, den

Example words from book for segmenting and blending activities: Easier: gum, cat, rat, dog, jam, duck, ship. Harder: mist, black, trip, crash, wind

Vocabulary Development with Book
Objective: Learning about new words, developing listening and oral narrative skills.
<p>DAY 1 Read the story: Use written prompts in the book to introduce and elaborate new vocabulary words. Recall the story: Ask children to share something they remember from the story. Use language scaffolding and expansion techniques to extend children's responses.</p>
Phonological Awareness (PA) Skill Building
Objective: Identifying sounds in words and matching phoneme with grapheme.
<p>Phoneme identity: Bring children's attention to the first sound in words and relate phoneme to grapheme. For example: <i>"This week's story is about a duck called Marmaduke. Duck starts with a /d/ sound (display the large letter card d or write d on the board). Now let's find some pictures that start with a /d/ sound"</i>. Work through the target /d/ cards: dog, dig, dam, dot, den.</p> <p>GAME <i>Use /d/ words from picture cards as target words, and /m/ picture cards as distractors.</i></p> <p>Pick out the picture: Place picture cards inside a "special" container (e.g., Marmaduke's Jam jar). The child says the name of the picture selected from the jar and the class help to identify if the word starts with the target sound. Then, put the words that start with /d/ under the letter 'd' on the whiteboard, and read together - pointing to the letter 'd', and emphasizing the /d/ sound at the start of the word.</p> <p>Aim for at least 6 items: 3 target words and 3 distractors.</p> <p>Segmenting and Blending: Encourage children to segment and blend words using your chosen game. "Listen for the sounds in dog: d-o-g, (representing each phoneme with a block or counter) dog- there are three sounds in dog". Harder word from the story book: "trip: - t-r-i-p, trip there are 4 sounds in trip" After you've demonstrated a couple of words, work together as a class to segment words and then blend together again.</p>

Aim for at least 5 items, segmented and blended and one word to spell on the board using segmentation skills (e.g., d-a-m, d-o-t, d-u-ck, t-r-i-p, a-m).

Sound manipulation: Support children to add, move and manipulate sounds in words using letter blocks or letters on the board *“This word says ‘dot’, let’s change it to say ‘hot’. Which letter should I change?”* Chain examples:

dot - hot - hat -mat

den - men - man - pan

Aim for at least 2 manipulation chains with 3 sound changes in each chain.

Link to Reading and Writing

Objective: Transfer PA knowledge to a reading and spelling activity.

Reading and spelling: Explicitly link the skill building activities (identifying phonemes, blending and segmenting words) to a reading or writing activity at the class level and during your small group reading instruction.

Class/ large group level: Card Pairs

Display two target word cards on the board, one /m/ and one /d/ (word side facing out). Read the words together. Then “shuffle the words” and place them back on the board. Select children to point to the word you say. Initially place up two cards that start with different sounds (dog/map), and then move to two cards that both start with ‘d’, so children need to listen and read to the end of the word. Be sure to articulate the sounds in the word very clearly. For children who need additional help show them the large letter m or d and ask them to find the word that starts with the same letter. Increase the difficulty of the task by placing four target words on the board for the children to select the word you say.

Aim to read 6 target words

Link to other reading activities:

1. Draw children’s attention to the words in their reader that start or end with this week’s target sounds.
2. Use phoneme segmenting and blending skills to practice decoding phonetically regular CV or CVC words in their reader.