

During 2020 and 2021, the MultiLit Research Unit conducted trials to investigate the efficacy of MiniLit Sage. The students involved in these trials received a version of the program that was technically still under development, although the instructional content was similar to that in the final version. Results from the 2020 trial are detailed in the MiniLit Sage teaching manual. This extended research summary serves to outline these results as well as those from 2021.

To determine the effect of the program on student achievement, the following literacy skills were assessed at the start and end of two school terms receiving MiniLit Sage:

- ▶ Letter-sound knowledge (York Assessment of Reading for Comprehension – Early Reading [YARC-ER]; Hulme et al., 2012)
- ▶ Early word recognition (YARC-ER; Hulme et al., 2012)
- ▶ Phonological awareness (YARC-ER; Hulme et al., 2012)
- ▶ Nonword reading (i.e., phonological recoding) accuracy (Martin and Pratt Nonword Reading Test; Martin & Pratt, 2001)
- ▶ Word reading fluency (Wheldall Assessment of Reading Lists [WARL]; Wheldall et al., 2015)
- ▶ Nonword reading (i.e., phonological recoding) fluency (Wheldall Assessment of Reading Nonwords [WARN]; Wheldall et al., 2021)
- ▶ Spelling accuracy (South Australian Spelling Test [SAST]; Westwood, 2005)
- ▶ Nonword spelling accuracy (Sutherland Phonological Awareness Test – Revised [SPAT-R]; Neilson, 2003)

Students were screened into MiniLit Sage on the basis of their results on the Martin and Pratt Nonword Reading Test and the WARN, as well as the MiniLit Sage Placement Test. Specifically, students entered the program if their parents consented for them to participate, if they placed suitably low on the Martin and Pratt Nonword Reading Test and MiniLit Sage Placement Test, and if they scored in the bottom quartile (25%) on the WARN.

The program was implemented in schools by learning support staff, most of whom had delivered MiniLit previously. The staff received one day of program training. Ongoing support was then provided to address any questions about program delivery that arose.

Trial schools

Information about the schools involved in the trials is provided in Table 1. The level of socio-educational advantage in the general student populations of the schools ranged from average (ICSEA = 900-1100) to above-average (ICSEA >1100). 47% of the general student population (across schools) had a language background other than English. The mean age of all students at pre-test was 6 years 9 months (SD = 8 months; range = 5;9y to 8;9y). In 2020, six schools (32 students) participated in the trial, while in 2021, four schools (30 students) participated.

Table 1. Brief description of schools involved in trials.

Year	School	Location	<i>n</i>	Mean age	Grade	Gender	ICSEA	% LBOTE*
2020	1	Perth, WA	6	6;3y	Y1 = 5 Y2 = 1	M = 3 F = 3	Above average	30%
2020	2	Sydney, NSW	3	7;5y	Y1 = 2 Y2 = 1	M = 1 F = 2	Average	95%
2020	3	Sydney, NSW	3	7;4y	Y1 = 2 Y2 = 1	M = 2 F = 1	Average	60%
2020	4	Perth, WA	7	6;9y	Y1 = 3 Y2 = 4	M = 5 F = 2	Above average	30%
2020	5	Perth, WA	5	6;5y	Y1 = 5 Y2 = 0	M = 2 F = 3	Average	90%
2020	6	Perth, WA	8	6;11y	Y1 = 5 Y2 = 3	M = 4 F = 4	Average	80%
2021	7	Perth, WA	7	7;1y	Y1 = 0 Y2 = 7	M = 3 F = 4	**	**
2021	8	Perth, WA	6	6;0y	Y1 = 6 Y2 = 0	M = 4 F = 2	Average	65%
2021	9	Brisbane, QLD	10	6;9y	Y1 = 6 Y2 = 4	M = 6 F = 4	Above average	10%
2021	10	Perth, WA	7	6;4y	Y1 = 7 Y2 = 0	M = 3 F = 4	Above average	25%
ALL			Tot. = 62	Av. = 6;9y	Tot. Y1 = 41 Tot. Y2 = 21	Tot. M = 33 Tot. F = 29	Av. = 1093	Av. = 47%

Note: *Rounded to the nearest 5% to preserve schools' anonymity. **One school was recently established, and so demographic information about the student population was unavailable. Values for this school are not included in the averages. ICSEA = Index of Community Socio-Educational Advantage; LBOTE = Language background other than English; Tot. = total.

Schools 2-6 in Table 1 describe the composition of groups who received MiniLit Sage in Semester 2 of 2020. These students did not experience any interruptions to schooling as a result of pandemic-related school closures. Similarly, Schools 7, 9 and 10 also stayed open for the duration of the trial in 2021. School 8 closed for one week. The students in School 1 were the only ones who experienced a significant interruption to schooling, and whose MiniLit Sage instruction stretched across Semester 1 and 2 of 2020. Excluding any periods of school closure for Schools 1 and 8 (during which the program was not delivered), the students received the equivalent of approximately two school terms of instruction, and all instruction was delivered face-to-face.

For the statistical analyses described below, the results from all schools were combined ($n = 62$). This was considered appropriate because: (a) the results from the school that closed for an extended period of time were similar to those from the other schools; (b) the actual number of lessons completed was similar across cohorts; (c) the program content did not substantially change between 2020 and 2021, and; (d) this made for a larger sample size on which to base interpretations.

Did reading skills improve over the instructional period?

The pre- and post-test raw score results were first analysed to determine whether there were any significant reading improvements at the end of two terms receiving MiniLit Sage. As shown in Table 2, the students ($n = 62$) made statistically significant gains on all the assessed areas of literacy. Based on the large effect sizes (Cohen's $d > 0.8$), these gains were also substantial. The results in Table 2 provide evidence in support of the efficacy of MiniLit Sage, with respect to improving reading and spelling outcomes for young children with reading difficulties.

Table 2. Raw score means (and standard deviations) for pre- and post-test time points on all literacy skills measured.

Literacy variable	Pre-test Raw score (SD)	Post-test Raw score (SD)	Raw score (SD)	Gain		
				<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Letter-sound knowledge	26.60 (3.82)	30.65 (1.43)	4.05 (3.39)	9.404	<.001	1.19 (L)
Early word recognition	12.34 (7.80)	20.68 (6.07)	8.34 (4.62)	14.202	<.001	1.80 (L)
Phonological awareness	13.06 (4.45)	17.02 (3.81)	3.95 (3.45)	9.014	<.001	1.14 (L)
Nonword reading accuracy	8.40 (6.53)	18.65 (6.82)	10.24 (5.77)	13.968	<.001	1.77 (L)
Word reading fluency	14.85 (14.44)	35.34 (19.44)	20.48 (11.69)	13.799	<.001	1.75 (L)
Nonword reading fluency	3.81 (2.92)	11.13 (4.83)	7.32 (4.18)	13.796	<.001	1.75 (L)
Spelling accuracy	12.05 (6.87)	20.45 (6.16)	8.40 (4.82)	13.729	<.001	1.74 (L)
Nonword spelling accuracy	1.53 (1.48)	3.56 (2.29)	2.03 (1.75)	9.166	<.001	1.16 (L)

Note: Where data were non-normally distributed, a Wilcoxon Signed-Rank Test was performed to confirm the statistical difference of parametric t-test results. When interpreting Cohen's *d* effect sizes, a small (S) effect is 0.2; a medium (M) effect is 0.5; and a large (L) effect is 0.8 (although see Kraft, 2020, for less conservative interpretations based on educational interventions).

Did reading skills improve compared to standard reading scores?

The research trials from 2020 and 2021 involved only participants who were receiving MiniLit Sage (i.e., there were no comparison or control groups). As such, there is no experimental evidence to answer the question of how the cohort's progress compared with age-based expectations. However, standardised scores and percentile rank scores were available for the measures of nonword reading accuracy (Martin and Pratt Nonword Reading Test), letter-sound knowledge (YARC-ER), early word recognition (YARC-ER) and phonological awareness (YARC-ER). The standardised score results summarised in Table 3 give a good indication of how the students performed, relative to their same-aged peers.

Table 3. Standard score means (and standard deviations) for pre- and post-test time points on measures of letter-sound knowledge, early word recognition, phonological awareness and nonword reading accuracy.

Literacy variable	<i>n</i>	Pre-test Raw score (SD)	Post-test Raw score (SD)	Raw score (SD)	Gain		
					<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Letter-sound knowledge	58	97.67 (13.53)	112.38 (11.93)	14.71 (14.04)	7.976	<.001	1.05 (L)
Early word recognition	41	86.34 (9.07)	88.27 (10.57)	1.93 (8.87)	1.391	NS	0.22 (S)
Phonological awareness	50	89.22 (9.67)	97.44 (11.93)	8.22 (9.46)	6.145	<.001	0.87 (L)
Nonword reading accuracy	62	91.06 (11.90)	103.16 (9.53)	12.10 (10.32)	9.226	<.001	1.17 (L)

Note: NS = non-significant. Students were excluded from analyses if they were older than the test's normative sample ($n = 3$ for all YARC-ER subtests), or if their score fell below the YARC-ER's minimum standard score of 70 at pre- and/or post-test ($n = 1$ for letter-sound knowledge; $n = 18$ for early word recognition; $n = 9$ students for phonological awareness).

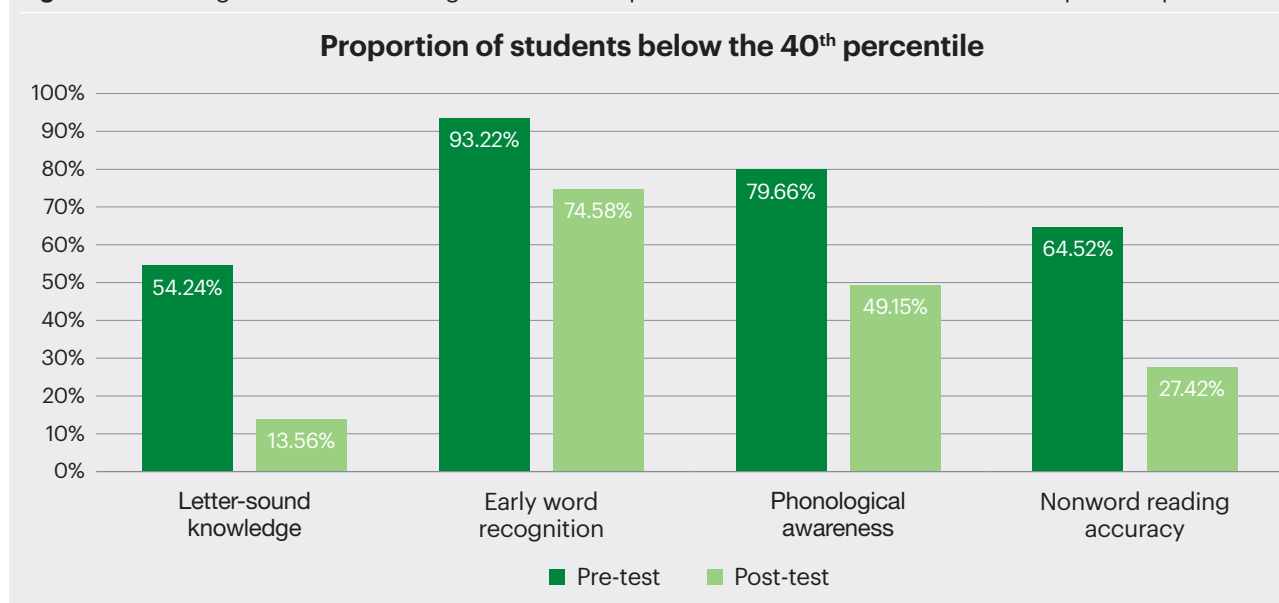
The results in Table 3 indicate that students made large improvements on measures of letter-sound knowledge, phonological awareness and nonword reading accuracy. Crucially, these gains were greater than the gains you would otherwise expect in a 5- to 6-month time period. In addition, the mean standard scores at post-test were close to average for phonological awareness and nonword reading accuracy variables, and almost above-average for letter-sound knowledge.

These improvements can be tied directly to the instructional content of MiniLit Sage. Over the course of the program, students are made aware of the phonemic structure of words, systematically and explicitly instructed on the usual correspondences between letters and phonemes, and taught to apply their phonics knowledge to decode unfamiliar words. Of course, these three skills should not be seen as goals in and of themselves. However, they are foundational in the development of word recognition, which in turn is critical for reading comprehension.

Relative to the standardised norms, the students showed a statistically non-significant gain on the assessment measure of early word recognition. As such, the students improved over time at a similar rate to their same-aged peers. Given that the cohort in this trial were entered into MiniLit Sage because of evidence that they were not progressing at the rate of their peers, this outcome is pleasing to see. Nevertheless, it is interesting to note that their learning on this variable did not appear to be accelerated over the course of the program, whereas it did for the other variables.

One key factor for consideration here is the timing at which we should expect word recognition skills to be affected by the type of systematic synthetic phonics instruction that MiniLit Sage offers. Half of the 30 words on the early word recognition subtest contain uncommon letter-sound correspondences (e.g., door, biscuit). Some of these types of words are targeted as 'tricky words' in the program, but a much greater focus is placed on learning common letter-sound conventions. The underlying assumption here is that, once this knowledge is in place, the student can apply it when decoding unfamiliar words in text. Then, as the student practises their decoding, the repeated exposure will help to bond the spelling of each word with its pronunciation and meaning, resulting in increasingly automatic recognition (Ehri, 2020). It is reasonable to suspect that there was not enough time in two school terms for the students to practise decoding to such an extent that their word recognition skills were significantly accelerated, relative to their peers. Indeed, within this two-term timeframe, the students did not have time to complete the full program. Here, it is important to note that, where resources were available in trial schools, the students continued to receive MiniLit Sage beyond the post-test assessment date. With this additional time, their word recognition skills may have improved more than what is recorded here, although there are no data to confirm this hypothesis.

Despite the results in Table 3, the proportion of students scoring below the 40th percentile on the early word recognition subtest did decrease from pre- to post-test. Figure 1 demonstrates this clearly. (The 40th percentile is quite an arbitrary cut-off, but it represents a reasonable minimum threshold for close-to-average performance.) At pre-test, more than 90% of students had scores on this measure that were below the 40th percentile. By post-test, this proportion had reduced to just under 75%. Hence, these data provide support for the conclusion that students were shifted closer to an average range of performance over the course of the program. The proportion of scores falling below the 40th percentile also decreased dramatically for the other literacy variables referred to in Figure 1, which strongly supports the view that students' foundational skills improved through exposure to MiniLit Sage.

Figure 1. Percentage of students scoring below the 40th percentile on standardised measures at pre- and post-test.

In addition to standard scores and percentile ranks, raw scores on the measures mentioned previously in this section, as well as those for spelling accuracy (SAST), may also be converted to age equivalent scores. According to the results presented in Table 4, the students made gains on most measures which were well beyond what may be expected based on the duration of instruction (i.e., between five and six months). The exception was the measure of early word recognition, where students made gains that were equivalent to the duration of instruction. Again, this is still a pleasing result, given that the students were originally screened into MiniLit Sage if they showed evidence of not progressing as quickly as their classroom peers.

Table 4. Gains in age equivalent scores.

Literacy variable	Age equivalent gain
Letter-sound knowledge	26 months (at least)
Early word recognition	5 months
Phonological awareness	9 months
Nonword reading accuracy	16 months
Spelling accuracy	7 months (at least)

Conclusion

This document provides an extended research summary of the collated results from trials into MiniLit Sage efficacy. These trials were conducted over 2020 and 2021, and, in each case, the program was implemented within schools by school staff. The findings reported here indicated that the young students with reading difficulties who were participants in the trials made excellent gains on their foundational literacy skills, following two school terms of MiniLit Sage instruction. Based on the improvements in standardised and age equivalent scores, the observed progress exceeded or – on one measure – matched what would be expected given the elapsed time. Overall, the results provide strong evidence in support of MiniLit Sage efficacy.

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