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Improving the reading skills of struggling secondary students in a real-world setting: issues of implementation and sustainability

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ABSTRACT

Reading difficulties have been associated with limited academic success and related social-emotional outcomes including anxiety and low motivation. Recent research on the educational impact of the COVID-19 pandemic indicates that children with poor reading skills were disproportionately disadvantaged. This growing number of students experiencing reading difficulties will require effective implementation of strategies to prevent long-term disadvantage, including in the challenging context of secondary schools where teachers are unfamiliar with reading instruction and constrained by timetabling of subjects and teachers. This research examined whether a Direct Instruction programme could be implemented with fidelity in the real world of a secondary school over a sustained period. Reading progress was monitored using a standardised assessment. Programme implementation was monitored via interviews with staff, classroom observations, and field notes. These data revealed that, whilst fidelity of programme implementation was challenging, programme delivery and student ability and confidence in reading improved over the three years.

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Reading difficulties among secondary school students

Reading instruction is often seen as the responsibility of primary school teachers in the early years of schooling. Yet Snow and Moje (2010) challenge the notion that reading instruction can end by the time a child reaches Grade 4, maintaining this does not protect students from experiencing reading difficulties in later years. Certainly, the substantial proportion of secondary school students who have reading difficulties that interfere with their academic performance (Benner, Nelson, Stage, & Ralston, 2011; Solis, Miciak, Vaughn, & Fletcher, 2014) and who are reading at or below Grade 5 level (Archer, Gleason, & Vachon, 2003) is evidence of this.

In their report of the 2021 literacy results for the *National Assessment Program Literacy and Numeracy* (NAPLAN), which all Australian students sit in Years 3, 5, 7 and 9, the Australian Curriculum, Assessment and Reporting Authority (2021) noted that the average

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trend in reading and spelling is upward, with writing levelling out from the decline of previous years. Despite this, NAPLAN data for 2021 indicates approximately 20% (23.6%) of Year 9 students are at or below national minimum standards. The discrepancy between NAPLAN levels and standardised reading tests means that these students are at least 3 years below grade level for reading (Edmonds et al., 2009; Goss, Sonnemann, Chisholm, & Nelson, 2016) and are likely to have difficulty comprehending texts at secondary school level.

Preliminary research suggests that students already experiencing reading difficulties may be further impacted by the COVID-19 pandemic and, while it has been suggested that the impact of the pandemic on Australian students is limited (Gore, Fray, Miller, Harris, & Taggart, 2021; Productivity Commission, 2022), recent changes in the approach to the public health crisis mean that this is yet to be fully understood. Reports from countries where the impact of the pandemic on face-to-face instruction in 2020 and 2021 was greater indicate that there have been notable changes in students' reading performance (Kuhfeld, Lewis, & Peltier, 2022; Kuhfeld, Soland, & Lewis, 2022; Lewis & Kuhfeld, 2021; Lewis, Kuhfeld, Ruzek, & McEachin, 2021; Renaissance Learning, 2021). A report by Dorn, Hancock, Sarakatsannia, and Viruleg (2021) found that the average learning rates in reading for students in Grades 1–6 were 4 months behind historical rates, while another study by Domingue, Hough, Lang, and Yeatman (2021), which used oral reading fluency as a measure of reading development, found that students in Grades 2 and 3 were approximately 30% behind expected proficiency. In both these studies, and previously cited reports, the impact on disadvantaged students was even greater.

Considering existing data on the reading performance of students in secondary schools and indications of additional declines in reading due to the current global situation, secondary schools may be facing increased numbers of students whose reading is not at age-appropriate levels. In schools where student disadvantage is higher, this is likely to be even greater. Hence, the present study is both timely and important in contributing to understanding of the effective implementation of literacy interventions in secondary schools.

Impact of reading difficulties

Morgan, Farkas, and Wu (2012) examined the relationship between reading difficulties and social emotional adjustment and found that children with poor reading skills were more likely to report being angry, distractible, sad, lonely, and unpopular than their peers without reading difficulties. Other research has found that children with reading difficulties exhibit anxiety (Nelson & Harwood, 2011), poor self-concept (Chapman, Tunmer, & Prochnow, 2000), social skills deficits (Miles & Stipek, 2006), internalising behaviours (Boyes, Tebbutt, Preece, & Badcock, 2018) and oppositional behaviours (Pierce, Wechsler-Zimring, Noam, Wolf, & Katzir, 2013). Research examining the long-term impacts of reading difficulties has identified a range of poor outcomes for adults in areas of education and employment (Smart et al., 2017), physical health and well-being (Australian Institute of Health and Welfare, 2011), and psychological wellbeing (Daniel et al., 2006; Galuschka & Schulte-Körne, 2016). Reading difficulties have also been identified as prevalent in prison populations (Measuring success: Using assessment and accountability to raise student achievement, 2001; Snowling, Adams, Bowyer-Crane, & Tobin, 2000).

The association between reading difficulties and negative social emotional outcomes is not always clear, and may be nonlinear (Sideridis, Simos, Mouzaki, Stamovlasis, & Georgiou, 2019); nevertheless, consistent failure in reading development may lead to challenging behaviours (Sideridis, Simos, Mouzaki, Stamovlasis, & Georgiou, 2019). A meta-analysis by Warmbold-Brann, Burns, Preast, Taylor, and Aguilar (2017) identified that positive academic and behavioural outcomes result from academic interventions. Motivation to read has also been identified as having a considerable impact on the development of reading skills and cognitive development, since the more children read the better their reading skills become, thus increasing their access to knowledge (Sparks, Patton, & Murdoch, 2014; Stanovich, 2008). As with behavioural difficulties, the relationship between achievement and motivation is complex and, while numerous studies have found a link between these constructs, the directionality is not clearly established (Vu et al., 2021). Vu et al. (2021) contend the research literature supports a reciprocal relationship between motivation and achievement. Toste, Didion, Peng, Filderman, and McClelland (2020) argue the relationship is bidirectional, with the results of their meta-analytic review suggesting “earlier reading is a stronger predictor of later motivation than motivation is of reading” (p. 420).

Reading instruction for secondary school students

Good initial reading instruction and early intervention for children with reading difficulties is crucial (King & Coughlin, 2016; Vaughn et al., 2015), as older students with reading difficulties have complex profiles making it more difficult to remediate (Calhoun & Petscher, 2013). However, studies indicate that reading interventions for secondary school students can be effective (Calhoun & Petscher, 2013; Scammacca, Roberts, Vaughn, & Stuebing, 2015). Teaching word reading skills to older students can have a positive effect on their reading outcomes, as evidenced by the Joseph and Schisler (2009) analysis of 23 studies representing more than 1,100 students from middle to high-school years. Even for secondary students, developing fluent decoding has been identified as a necessary precursor to reading comprehension (Stanley, Petscher, & Catts, 2018; Wang, Sabatini, O'Reilly, & Weeks, 2019). Archer, Gleason, and Vachon (2003) assert that “no comprehension strategies are powerful enough to compensate for not being able to read the words within the text” (p. 90). Approaches that successively and explicitly support the development of reading skills (decoding, vocabulary, spelling, fluency, and comprehension) provide the best learning environment for older children with reading difficulties (Calhoun & Petscher, 2013; Marchand-Martella, Martella, Modderman, Petersen, & Pan, 2013).

Multicomponent intensive intervention delivered in small groups has been identified as highly effective for this group of students (Donegan & Wanzek, 2021; Vaughn et al., 2010). These small group (Tier 2) interventions have been effective in supporting secondary students with reading difficulties to progress more rapidly than the average learning rate for their peers (Vaughn, Denton, & Fletcher, 2010), with some studies finding gains of at least 2 years after 1 year of instruction (Calhoun & Petscher, 2013). However, improvements in reading tend to be slower (Wanzek, Wexler, Vaughn, & Ciullo, 2010) and proportional to instructional time (Fielding, Kerr, & Rosier, 2007), and some students continue to read well below their peers despite intervention (Vaughn et al., 2015). de

Haan (2021) suggests the need for more research on what works in relation to teaching beginning reading skills, such as decoding and encoding, to secondary students.

Implementing reading instruction for secondary students

In their study of secondary teachers' implementation of a reading programme, Leko, Roberts, and Pek (2015) observed the challenges associated with teaching students who had emotional and behavioural characteristics developed from years of reading failure. The challenges are further compounded by the fact that secondary teachers typically do not have the requisite knowledge and skills to teach reading (Faggella-Luby, Ware, & Capozzoli, 2009). The ease of implementation and sustainability of reading interventions also needs to be feasible for teachers (Vaughn, Denton, & Fletcher, 2010). A systematic review of research into how best to implement these approaches indicated interventions that provided extensive professional development in applying specific instructional approaches had a greater impact on student outcomes than approaches that utilised only curricular changes (Slavin, Lake, Chambers, Cheung, & Davis, 2009).

Evaluating reading interventions

To improve reading instruction interventions, Petscher et al. (2020) argue that reading research should be directed towards answering more than simply "what works" and include "what works for whom under what conditions and what factors promote sustainability of implementation" (p. 14). That is, they recommend focussing on evaluation of *effectiveness* - whether an intervention works in the real world, rather than simply *efficacy* - whether the intervention works under carefully controlled conditions (Koutsouris, Norwich, & Stebbing, 2019). While it is ideal to control for confounding variables in research (Ferrari, Retico, & Bacciu, 2020), this can be challenging in educational settings (Conroy, Stichter, Daunic, & Haydon, 2008; Ewert & Sibthorp, 2009). Understanding the adoption, implementation and sustainability of reading interventions necessitates incorporating qualitative methodologies to explore the multitude of influencing factors in schools (Koutsouris, Norwich, & Stebbing, 2019; McKenney & Reeves, 2019). Failure to identify confounding or extraneous variables that influence student outcomes can render research findings invalid (Conroy, Stichter, Daunic, & Haydon, 2008). Thus, capitalising on research using multiple methodologies provides the best opportunity to understand what principles and practices are likely to provide the best outcomes for students learning to read (Petscher et al., 2020).

Koutsouris, Norwich, and Stebbing (2019) maintain that process evaluation is one such approach to understanding the implementation and outcomes of classroom-based interventions. While Randomised Control Trials (RCTs) are generally seen as the "gold standard", on their own they do not provide the information required to identify and understand the multitude of interacting factors impacting on implementation and outcomes of interventions in schools (Koutsouris, Norwich, & Stebbing, 2019; Moore et al., 2015). Koutsouris, Norwich, and Stebbing (2019) also caution that trying to implement design controls may create conditions that are not representative of real classroom contexts and, therefore, cannot be generalised to other classroom settings. Further,

these controls may influence schools' willingness to participate in intervention trials. Process evaluation incorporates multiple sources of data to examine the implementation and outcomes of the intervention (Koutsouris, Norwich, & Stebbing, 2019) as the link between evidence-based practices and student outcomes is not linear and involves multiple interacting factors (Leko, Roberts, & Pek, 2015).

Fidelity of implementation is one factor considered critical to achieving the desired outcomes when delivering an intervention programme (Benner, Nelson, Stage, & Ralston, 2011; Roberts, Vaughn, Beretvas, & Wong, 2017). Implementation fidelity refers to the extent to which an intervention is delivered in the form intended by the programme developer/s. Studies of implementation fidelity have demonstrated that teachers often adapt programmes based on their orientation to teaching and beliefs about student learning (Leko, Roberts, & Pek, 2015; Troyer, 2019). However, adherence to the intervention protocol is less important if the teacher is highly skilled (Capin, Roberts, Clemens, & Vaughn, 2021). Leko, Roberts, and Pek (2015) found highly skilled teachers used their professional judgement to support their effective delivery of programme content, while less skilled teachers adapted the materials to compensate for their lack of knowledge and to make delivery easier for themselves.

Direct Instruction programmes

It is also important to consider the differences between the content of reading interventions when examining implementation. For example, Benner, Nelson, Stage, and Ralston (2011) used the Direct Instruction (DI) *Corrective Reading* programme (Engelmann, Hanner, & Johnson, 2002) which has specific protocols in place for delivery and is highly scripted; whereas the Capin, Roberts, Clemens, and Vaughn (2021) study examined the PACT programme that uses a content-based approach to improving reading comprehension through discussions about text. The importance of teacher knowledge may have been more significant for the latter programme than it would be for the carefully structured and scripted DI programmes. It has been shown that DI programmes can be delivered effectively by education assistants and paraprofessionals (O'Connor & Vadasy, 2011; Vadasy, Jenkins, & Pool, 2000), suggesting that they do not rely as heavily on teacher knowledge as other programmes may.

Direct Instruction programmes (Carnine & Engelmann, 2016) have been subject to considerable research since their development in the 1960s. While DI materials have their detractors (Eppley & Dudley-Marling, 2019), meta-analyses and longitudinal studies provide compelling evidence for their efficacy (Hattie, 2021; Mason & Otero, 2021; Stockard, 2021). The instructional design of these programmes is supported by research into impactful teaching practices, including considered selection and sequencing of content, explicit teaching, activating prior knowledge, making the learning intentions and criteria for success clear to the learner, teaching generalisable strategies, and providing ample opportunities for practice and review so that mastery can be achieved (Hattie, 2021; Twyman, 2021).

In addition to developing skills and strategic knowledge for effective and efficient reading, DI curriculum materials are drawn from a range of content areas, including the sciences and social sciences. Using a range of reading materials as the basis for instruction develops students' vocabulary and general knowledge, which, in turn, contributes to reading comprehension (Perfetti & Stafura, 2014). DI programmes encourage motivation

through students tracking their own progress and teacher monitoring to provide appropriate feedback and support.

The current study

The purpose of this paper is to examine the implementation of a DI intervention in a mainstream secondary school, over a period of 3 years, including the impact on the reading ability of students from Years 7–10 who were reading at or below Grade 6 level. Consistent with recommendations by Koutsouris, Norwich, and Stebbing (2019) and Petscher et al. (2020), how the intervention was implemented and the perspectives of those involved in the implementation were explored to provide greater insights to the “real-world use” (Koutsouris, Norwich, & Stebbing, 2019, p. 31) of the DI programme in a secondary school context. Hence, the current study drew on different data sources to answer the following research questions:

RQ1. How effective was a Direct Instruction programme in improving the reading outcomes of students in a Western Australian secondary school?

RQ2. What factors impacted on the effective delivery of the Direct Instruction programme in a Western Australian secondary school?

Method

Key components of the process evaluation approach, as described by Koutsouris, Norwich, and Stebbing (2019), were applied to evaluate the reading intervention implemented in the school. Koutsouris, Norwich, and Stebbing (2019) identified three types of information used to facilitate this evaluation: details of how the programme was implemented; the outcomes of the implementation; and, to what the programme was being compared. It is important to note that Koutsouris, Norwich, and Stebbing (2019) were evaluating the implementation of a programme in 32 schools, whereas this is a multi-year, single-case evaluation, albeit of a programme that has been extensively researched previously. Therefore, the programme is compared to existing research on effective reading interventions for secondary students. The limitations of this are discussed later.

Under the first section, programme implementation, Koutsouris, Norwich, and Stebbing (2019, p. 18), included information on recruiting schools’ interest and how students were identified for inclusion in the programme. Staffing details and perceptions of the staff were also considered important. Such information is covered in the sections below on “*Research context*” and “*Establishing the intervention*”. Information on how the intervention was delivered is included under “*Programme delivery*”.

Research context

The students in the case study school were considerably less advantaged than those in other metropolitan schools based on the measure of socio-economic advantage used in

Australian schools: Index of Community Socio-educational Advantage (ICSEA). The ICSEA for a school is determined using student factors, including parents' occupation and education, and school factors like geographical location and the percentage of Indigenous students (ACARA, 2020). The ICSEA scale ranges from 500 to 1300 with a median of 1000 (ACARA, 2018). Typically, remote and very remote schools have an ICSEA lower than 850 (Bonnor & Shepherd, 2016). The ICSEA of the school in this research was <850.

School leadership requested the support of one of the researchers, who was on the school's board, to provide advice on how to improve the literacy outcomes of the school, specifically of those students not reaching the literacy benchmarks for NAPLAN. The impetus for this request was the school's concern about consistently low literacy rates and the introduction of national minimum standards for secondary school graduation in the areas of literacy and numeracy (School Curriculum and Standards Authority, 2014). To graduate from secondary school, students who do not achieve above the national minimum standard on the Year 9 NAPLAN test must sit another literacy and numeracy assessment in Year 10, 11 or 12 and achieve above national minimum standards.

Approval to conduct the research was granted by the Edith Cowan University Human Research Ethics Committee (No. 14546MAIN). Approval was also sought from the Western Australian Department of Education and granted (D 16/0251933). Participants provided written consent to be involved in the research.

Establishing the intervention

The lead author provided the school with information on a range of options that could be employed, including building teacher knowledge through professional learning, teacher designed intervention programmes and commercial literacy programmes. The school decided to use a commercial literacy programme based on cost, the support needed for teachers who were not trained to teach reading, and timely impact. Specifically, the school opted to use the *DI Reading Mastery (RM)* programme (Englemann & Bruner, 1988) since it provides scripted lessons that enable teachers unfamiliar with teaching reading to deliver appropriately sequenced and comprehensive instruction. The RM programme includes five different levels appropriate for beginning readers through to proficient readers and has an emphasis on the essential components of reading instruction including phonics, vocabulary development, fluency, comprehension, spelling, and writing (see Main, Backhouse, Jackson, & Hill, 2020) for details of the full scope and sequence).

Programme delivery

As illustrated in [Figure 1](#), the initial intentions for delivery of the programme changed several times over the course of the 3 years. These variations can be broadly attributed to changes in school leadership, financial constraints, and school structures.

Despite these changes, key features of the delivery remained. The RM programme is designed to scaffold delivery, but training is required to familiarise staff with the content and the delivery features. An in-school coordinator and the education assistants¹ (EAs) involved in the delivery of the programme were funded to attend

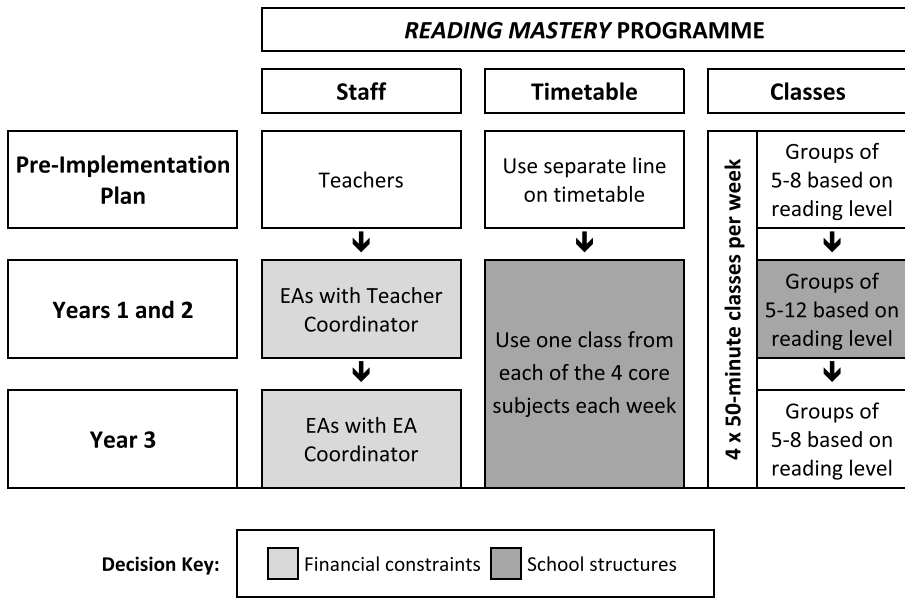


Figure 1. Changes to implementation across the three years of the RM programme.

one full-day and one half-day training session, with ongoing support provided through instructional coaching (Desimone & Pak, 2017). The sustainability of the programme was also a key consideration, and several measures were implemented to help ensure that the expertise remained in the school after the research concluded. These strategies included presenting information on the programme to all school staff, involving one of the deputy principals in the training sessions, and providing the school with all the training materials (PowerPoints with delivery notes, a narrated video modelling delivery and coaching checklists). In addition, to assist the in-school coordinator with ongoing coaching of staff delivering the program, collaborative coaching sessions were conducted with the lead author. After each lesson observation, the in-school coordinator and the lead author discussed their observations to ensure a shared understanding of the program’s features and consistency of feedback. The lead author’s involvement in the training and coaching sessions was originally only intended to take place in the first year of the programme; however, limited opportunities for collaborative coaching and changes in teaching staff meant that they continued into the second year.

The RM classes were scheduled so that students attended for one class period per core subject area, one class each of maths, science, humanities, and English per week. Teaching staff were consulted and agreed that improving reading skills was worth the time required to support students who missed one class per week.

The implementation was monitored over 3 years to determine its efficacy and sustainability. While the school acknowledged the importance of evaluating the efficacy of the programme, their primary focus was on improving the outcomes for their students. Consequently, they were unwilling to exclude any of the identified students from accessing the programme to establish a non-treatment group.

Table 1. Characteristics of students who participated in the RM programme ($n = 132$).

Student Characteristics	<i>n</i>	%
<i>Start Year (Cohort)</i>		
2016	59	44.7
2017	30	22.7
2018	43	32.6
<i>Grade/Year Level at Start</i>		
Year 7	91	68.9
Year 8	27	20.5
Year 9	14	10.6
<i>Gender</i>		
Male	88	66.7
Female	44	33.3
<i>No. School Years in RM Programme</i>		
1 year	94	71.2
2 years	33	25.0
3 years	5	3.8

Participants

Seven EAs and one teacher were involved in delivering the RM programme and all agreed to participate in the research. Students in Years 7 to 9 were screened in their English classes to identify anyone who appeared to be experiencing reading difficulties. These students were subsequently assessed using the *Woodcock Reading Mastery III* (WRMT-III) (Woodcock, 2011). Grade levels in the WRMT-III are equivalent to year levels and the nominal threshold of Grade 6 on overall reading was determined as the criterion for inclusion in the programme. This level was based on national minimum standards for Year 9 students being equivalent to, or less than, typical Year 5 students (Goss, Sonnemann, Chisholm, & Nelson, 2016). Setting the inclusion criterion as up to and including Year 6 provided the best opportunity for students to successfully complete the Year 9 NAPLAN test.

Table 1 summarises the student sample according to the year they joined the RM programme (i.e. 2016, 2017 or 2018), their year level on starting the RM programme, gender, and number of school years they participated in the programme. The latter categorisation reflects the fact that students who made slower progress than expected were given the opportunity to continue in the RM programme for a second or third year. Of the 38 “repeat” students who participated over 2 or 3 years, 23 had commenced the RM programme in 2016 and 15 commenced in 2017.

Data collection instruments and analyses

Woodcock Reading Mastery III assessment

As previously reported (Main, Backhouse, Jackson, & Hill, 2020) the WRMT-III Word Identification, Word Attack, Word Comprehension and Passage Comprehension subtests were used as both a screening tool to identify students for inclusion in the RM programme and for assessing the students’ progress throughout the school year. It was intended that students would be tested at three time-points during each school year: early March (screening/pre-test), early-September (1st re-test) and late November (2nd re-test). However, mid-year enrolments, student absences, and

the day-to-day operational complexity of the secondary school meant there was considerable variation in the timing of the testing across the 3 years of the programme. For the 2016 and 2018 cohorts, most (not all) students were tested at three time points. For the 2016 cohort, this was typically 1 April, 1 September, and 28 November while for the 2018 cohort the main dates were 7 March, 18 September, and 21–29 November. For the 2017 cohort, only four of the 43 students received the third test in November. Hence, most students who commenced in 2017 were only tested twice on 7 March and 18 September.

The WRMT-III provides a range of measures for each of the sub-tests and total reading ability, including standard scores, grade equivalents and Growth Scale Values (GSV). The latter are based on an equal-interval scale derived using Rasch analysis techniques and represent absolute performance. This means a given difference in GSV scores represents the same difference in ability whether it is at the low or high end of the scale. Grade equivalents, on the other hand, represent performance relative to normed groups based on school grade levels and are not based on equal intervals. Since many of the fundamental reading skills are acquired in the early years of schooling, much larger gains in GSV scores are needed to progress from Grades 1–4 than for subsequent grade levels. When measuring growth in reading ability, the WRMT-III Manual (Woodcock, 2011, pp. 35–36) notes that GSVs have a “significant advantage over norm-referenced scores” since they indicate whether the individual’s ability level “has changed relative to her or his own previous performance”. Because of their important mathematical properties, GSV scores have been used in this paper for all inferential statistics rather than grade equivalents or standard scores. However, to assist in understanding group-level changes, descriptive statistics (e.g. means and medians) based on grade equivalents are provided where appropriate, with the caveat that they do not represent absolute growth in students’ reading ability.

Assumption testing was conducted prior to conducting the inferential tests. Since the three cohorts were of uneven size (i.e. 59, 30, 43) and some of the dependent variables violated the normality assumption, non-parametric Wilcoxon signed-rank tests (rather than paired-samples t-tests) were used to compare students’ progress over time. To account for multiple comparisons, a Bonferroni correction was applied to the alpha level typically used in social sciences research (i.e. 0.05) by dividing alpha by the number of tests conducted.

Gain scores based on GSVs were also calculated for each student. Assumption testing showed that the distribution of gain scores did not violate the assumption of normality. Hence, analysis of variance (ANOVA) based on gain scores was used to test differences between the overall gains made by the 2016, 2017 and 2018 cohorts. A Bonferroni correction of the alpha level was applied to account for multiple comparisons.

Other data sources

Interviews, classroom observations, and field notes were used to evaluate the impact of the intervention, the fidelity of delivery and the sustainability of the programme. Interviews were conducted twice a year, at the end of the first term of implementation and mid-way through the final term of the year, with the in-school coordinator and the EAs who delivered the programme. The questions were informal and structured around three broad questions; “How are you finding it to deliver the programme”, “How are the

students going?”, “Have you had any feedback on the programme from other people?”. Where participants were unsure how to respond, additional prompting was provided, such as, “Are there things about the programme you like or find challenging?” “Do you think students are benefitting from the programme and, if so, how?” “Have any of the parents or other teachers at the school talked to you about the programme?”

Lesson observations are a valuable source of data on how an intervention is delivered and how closely it adheres to the designer’s intention (Troyer, 2019). Over the course of the intervention, each of the EAs were observed at least twice per year delivering an RM lesson to determine the fidelity of delivery and identify any need for further staff support. A total of 20 classroom observations were conducted (2016 = 9, 2017 = 5, 2018 = 6). As previously reported (Main, Backhouse, Jackson, & Hill, 2020), the observation tool targeted the key components of the RM programme, including lesson pacing, student response rate, fidelity of instruction and corrective feedback. A section for notes against each of these criteria was included, which was used to note specific aspects of delivery.

Field notes were recorded after each visit to the school and included general observations, information from conversations with teaching staff and the school leadership team and meeting notes. Garnering students’ perceptions of their involvement in the programme was deemed an unnecessary imposition by the school sector’s approval department and was, therefore, not included.

Findings

RQ1. Student reading outcomes

Table 2 provides summary statistics of the number of weeks between the first and final tests for each RM cohort. This shows that, on average, the 2017 cohort had received several fewer weeks of the RM programme than most students in the 2016 and 2018 cohorts on the final test for the year. This has implications for the test results subsequently presented below.

Figure 2 illustrates the absolute growth in reading performance made by individual students. Here, students’ initial total reading GSV scores are mapped to the overall gain in total reading GSV score made over the duration of their initial RM programme. To aid interpretation, grid lines depicting the grade equivalents are superimposed onto the initial GSV score (x-axis). The scatterplot indicates that the majority of students achieved growth in their initial year of the RM programme.

Table 2. Duration in weeks between students’ first and last WRMT-III test-date, by RM programme cohort (2016, 2017, 2018).

No. of weeks	2016 (n = 59)	2017 (n = 30)	2018 (n = 43)
Mean	33.32	27.70	35.40
Median	34.43	27.86	37.29
Std. Deviation	4.84	0.48	4.23
Minimum	12.6	26.3	27.9
Maximum	34.4	27.9	39.1

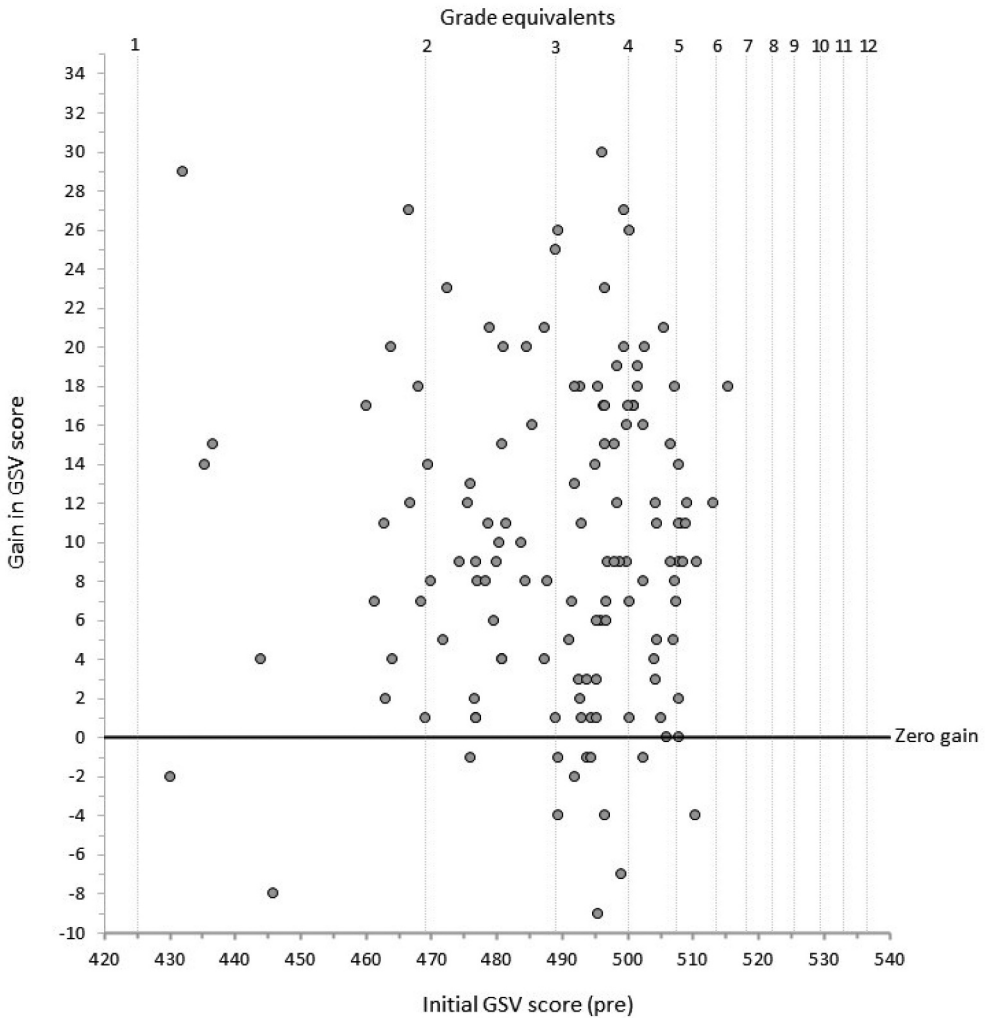


Figure 2. Scatterplot of students' initial total reading GSV score (with superimposed grade equivalent) and overall gain in GSV score during their initial year in the RM programme ($n = 132$).

The GSV gains made at the group level are depicted in [Table 3](#). This shows that, on average, students made significant gains ($p < 0.001$) in all four WRMT-III subtests from pre-test screening to post-test in their first year of the RM programme. (Unless otherwise stated, “post-test” results refer to the final WRMT-III test completed by each student, regardless of whether this was conducted in September or November.) The effect sizes (r) were moderate to large. To assist interpretation, the mean grade levels at pre and post are presented in [Table 4](#). On average, students made an overall improvement of more than one grade level – with larger gains in the WRMT-III subtests of Word Identification and Word Attack.

Table 3. Absolute progress of students in their initial year of the RM programme – mean WRMT-III GSV scores at baseline (pre) and final re-test (post).

	Word Identification		Word Attack		Word Comprehension		Passage Comprehension		Total Reading	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
GSV score										
Mean	485.66	501.58	491.68	500.63	491.70	497.17	487.73	496.42	489.19	498.95
Median	490.0	506.0	496.0	503.0	492.5	497.5	488.0	499.0	494.5	501.6
Std. Dev.	33.61	36.38	21.57	21.65	12.02	13.10	14.96	16.45	17.42	19.24
Minimum	381	388	421	418	444	453	425	440	430	428
Maximum	555	585	527	550	525	533	516	546	515.25	532.75
Wilcoxon signed ranks test	Z	-8.058	-6.230		-5.987		-6.460		-9.181	
	n	132	132		132		132		132	
	p	<0.001*	<0.001*		<0.001*		<0.001*		<0.001*	
	r	-0.496	-0.383		-0.368		-0.398		-0.565	

*Statistically significant. Alpha level adjusted to 0.01 (Bonferroni correction) to account for multiple testing.

Table 4. Relative progress^a of students in the initial year of the RM programme – mean WRMT-III sub-test and total reading grade equivalent^a at baseline (pre) and final re-test (post) (n = 132).

Grade Equivalent ^a	Word Identification		Word Attack		Word Comprehension		Passage Comprehension		Total Reading	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	3.73	5.10	4.31	5.77	3.20	3.95	3.06	3.99	3.38	4.60
Median	3.30	4.40	3.35	4.50	2.95	3.60	2.90	3.90	3.50	4.20
Std. Deviation	2.06	3.06	3.28	4.00	1.30	1.74	1.09	1.73	1.16	2.11
Minimum	1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	1.0	1.0
Maximum	12.7	13.0	13.0	13.0	9.1	12.1	6.3	13.0	6.3	11.0
Average gain	1.37		1.45		0.75		0.92		1.23	

^aAs previously stated, grade equivalents are non-linear in nature. Hence, two students who achieve gains of one grade level may have made quite different levels of absolute improvement in reading ability, depending on their initial grade level.

Table 5. Absolute progress of students in their initial year of the RM programme – mean WRMT-III GSV scores at baseline (pre) and final re-test (post), by cohort.

	2016		2017		2018	
	Pre	Post	Pre	Post	Pre	Post
GSV score						
Mean	488.96	498.10	487.96	495.16	490.38	502.75
Median	492.5	496.3	493.4	498.9	497.0	509.5
Std. Dev.	17.12	18.22	17.72	19.50	17.96	20.18
Minimum	435.25	448.75	444.00	437.75	430.00	428.00
Maximum	515.25	532.75	508.75	519.50	507.25	526.25
Wilcoxon signed-ranks test	Z	-6.126		-4.186		-5.421
	n	59		30		43
	p	<0.001*		<0.001*		<0.001*
	r	-0.564		-0.540		-0.585

*Statistically significant. Alpha level adjusted to 0.017 (Bonferroni correction) to account for multiple testing.

Comparison of RM programme cohorts

Tables 5 and 6 show the mean GSV scores and mean grade equivalents, respectively, for each cohort (2016, 2017, 2018). Wilcoxon signed-ranks tests indicate the observed improvements from pre- to post-test were statistically significant ($p < 0.001$) for each cohort. Since smaller absolute and relative gains were evident for the 2017 cohort, analysis of variance (ANOVA) was conducted using GSV gain scores to determine whether there was a significant effect of cohort year. Results of the ANOVA indicated a small but statistically significant difference between cohorts ($F = 4.049, p = 0.020, \eta^2 = 0.059$), with

Table 6. Relative progress^a of students in their initial year of the RM programme – mean WRMT-III grade equivalents^a at baseline (pre) and final re-test (post), by cohort.

Grade equivalent ^a	2016 (n = 59)		2017 (n = 30)		2018 (n = 43)	
	Pre	Post	Pre	Post	Pre	Post
Mean	3.38	4.48	3.28	4.08	3.45	5.14
Median	3.30	3.60	3.35	3.90	3.70	5.40
Std. Dev.	1.27	2.20	1.14	1.68	1.04	2.18
Minimum	1.1	1.4	1.3	1.2	1.0	1.0
Maximum	6.3	11.0	5.2	7.5	4.9	9.1
Average gain	1.1		0.80		1.69	

^aAs previously stated, grade equivalents are non-linear in nature. Hence, two students who achieve gains of one grade level may have made quite different levels of absolute improvement in reading ability, depending on their initial grade level.

post hoc comparisons revealing a significant difference between 2017 and 2018 ($p = 0.021$, with Bonferroni correction). We noted earlier that the 2017 cohort received their final re-test much earlier than most students in the 2016 and 2018 cohorts. It is possible that the shorter average time between WRMT-III tests for the 2017 cohort may account for some of the variation. However, it was not appropriate to conduct an analysis of covariance in order to statistically control for this time variation, since the data violated the assumption of homogeneity of regression slopes (i.e. the regression lines for the individual cohorts were not parallel).

'Repeat' versus 'single year' students

As noted earlier, students who made less progress than expected in the RM programme were given the opportunity to continue for a second year or third year. Comparison of pre-test WRMT-III GSV scores using the Mann–Whitney U-test showed that, on average, the “repeat” students started from a significantly lower base of reading ability than their “single year” peers.² Table 7 provides a comparison of the average relative gains in reading grade equivalent made by the “single year” and “repeat” students after their initial year in the RM programme and the total gain of the “repeat” students after 2 years in the programme. Wilcoxon signed-ranks tests based on GSV scores conducted with the

Table 7. Absolute and relative^a progress of “single year” students compared to “repeat” students after 1 year and 2 years in the RM programme – mean gains in WRMT-III GSV scores and grade equivalents.

Student groups ^b	Mean Gains									
	Word Identification		Word Attack		Word Comprehension		Passage Comprehension		Total Reading	
	Grade equiv ^a	GSV score	Grade equiv ^a	GSV score	Grade equiv ^a	GSV score	Grade equiv ^a	GSV score	Grade equiv ^a	GSV score
Single year students (1 year of RM only)	1.67	16.70	1.94	10.47	0.90	6.23	1.16	10.64	1.55	11.01
Repeat students - initial year of RM	0.63	14.00	0.24	5.18	0.38	3.61	0.33	3.84	0.43	6.64
Repeat students - after 2 years of RM	1.24	22.87	1.11	9.47	1.11	10.08	0.95	11.63	1.06	13.51

^aAs previously indicated, grade equivalents are non-linear in nature. Hence, two students who achieve gains of one grade level may have made quite different levels of absolute improvement in reading ability, depending on their initial grade level.

^bSingle year students: $n = 94$; Repeat students: $n = 38$.

Table 8. Coding frequencies.

Codes	2016 <i>n</i>	2017 <i>n</i>	2018 <i>n</i>	Total <i>n</i>
<i>Challenges to Fidelity of Implementation</i>				
Delivery	50	32	35	117
Preparation	28	3	1	32
Support	17	7	3	27
Student Behaviour	8	2	0	10
Placement	7	1	0	8
Programme	3	0	0	3
<i>Positive Outcomes from Implementation</i>				
Student outcomes	30	5	0	35
EA perceptions	9	1	0	10
School acceptance	5	2	0	7
Parent perceptions	1	0	0	1

sub-group of “repeat” students showed that only the gains observed for Word Identification and Total Reading were statistically significant after applying a Bonferroni correction ($p < 0.001$). The effect sizes ($r = -0.509$ and -0.571 , respectively) were medium to large. However, the gains in GSV scores made over two years of the RM programme were statistically significant ($p < 0.001$) for each WRMT-III test with medium to large effect sizes (Word Identification: $r = -0.593$; Word Attack: $r = -0.407$; Word Comprehension: $r = -0.570$; Passage Comprehension: $r = -0.446$, Total Reading: $r = -0.606$).

RQ2. Factors affecting delivery of the intervention

Interview data, field notes, and lesson observations were analysed using conventional content analysis (Hsieh & Shannon, 2005). Interviews were transcribed and the notes from the observation schedule were extracted. All three forms of data were subjected to repeated reading to obtain an overall impression of what occurred. Two key categories were evident in the data: challenges to the fidelity of implementation and positive outcomes from the implementation. Data were then entered into the NVivo 12 qualitative data analysis software and the text was re-read to develop codes representative of the different components within these broad categories. Overall, there were 197 comments related to challenges to implementation fidelity and 53 on the positive outcomes of the programme from which 10 codes were developed (see Table 8).

Challenges to fidelity

Under the broad category of “challenges to implementation fidelity”, 100 references to “delivery”, two references to “preparation” and one reference to “placement” were drawn from the lesson observation notes. The remaining responses came from the interviews and field notes. The most noted difficulty with delivery in the lesson observations was the slow pace of delivery. In part, the strength of the programme is in the pace of delivery, which maintains students’ engagement. A slow pace of delivery was significant as it resulted in less-than-optimal classroom engagement. The EAs also reported concern about their pace and ability to complete a lesson in the 60-minute lesson block. While the frequency of these comments reduced in the second and third year, pace remained a challenge for most of the EAs. Complementary to lesson pace is the effective use of

signals to keep students on task and frequently responding. This is also linked to effective behaviour management. The in-school coordinator noted this as a weakness of using EAs who have limited experience teaching groups of students and are not trained to manage challenging behaviour.

“Preparation” was the second most common code with 29 references identified in the interview data and three in the field notes. This was most prevalent in the first year, with EAs reporting that they needed more training to deliver the programme effectively. Field notes indicated that not all teaching staff delivering the programme were able to attend all the initial training sessions. Changes in staffing each year also meant that new staff needed to be trained and this was not always feasible before they started teaching. One hour of preparation time each week was agreed on for the EAs, so that they could familiarise themselves with the programme, but they were often required to take on other duties during this time. Four of the EAs commented that lack of preparation time impacted on the quality of their delivery.

“Support” related to the resources the school was able to allocate to the programme. Participants noted the in-school coordinator did not receive the time allocation originally agreed upon and this limited the support they were able to provide to the EAs. The EAs were not utilising all aspects of the programme as they were waiting on time to meet with the in-school coordinator. This is closely linked to “preparation” since limitation in knowledge of the programme could have been alleviated with additional training and preparation time. There were three personnel changes in the principal role across the three years of the research and the field notes identified changes to the resources allocated to the programme and the resultant impact on implementation. One participant reported that, by the second year of the programme, some staff were not as supportive of the programme and, therefore, not as diligent at sending students to the RM classes if they went to their subject class first. In a conversation with the lead author, a senior staff member from one curriculum area expressed concern that students were missing important subject content, including assessments and, consequently, would not send students to the RM classes.

“Placement” of students in the incorrect level of the programme also presented problems for EAs in terms of delivery; for example, where students were in a level too high or low for them to maintain engagement. Issues of placement were also linked to resourcing, such as release time for staff and suitable room allocations to test students. EAs were also not familiar with the in-programme progress monitoring resources and, therefore, relied on the in-school coordinator to assist with this process. As such, this is also linked to “preparation”.

Concerns about the “programme” itself were limited, with all three comments related to the American content and the need to explain to students the differences in spelling and measurement.

Positive outcomes

All staff participants reported they enjoyed delivering the programme and that it resulted in good outcomes for the students that were not just limited to increased reading ability. They noted that students were more confident in their reading and were willing to take corrective feedback as they understood it was part of the programme. One participant reported they had positive feedback from parents including a desire to have subsequent

children included in the programme. Teaching staff in other subject areas also provided positive feedback on the performance of students in the programme including improved performance in humanities and maths subjects due to increased reading ability, and confidence in reading.

Discussion and conclusion

The range of information gathered to assess the efficacy of implementing the DI programme *Reading Mastery* provides an insight into the challenges and compromises that are required in real-world settings when managing Tier 2 interventions in secondary schools. Implementation fidelity was compromised by staff changes, financial constraints, and inflexible school structures. Despite these challenges, there were positive outcomes in reading performance for most students involved in the programme. Even in the second year of the intervention, when the external support reduced but the agreed time allocation for the in-school coordinator did not eventuate, students still made similar progress to the other years.

When students' reading difficulties persist beyond primary school, the time and intensity needed to remediate these difficulties is challenging to manage in secondary schools. However, this research supports previous studies indicating that when these students receive instruction in skills ranging from phonemic awareness to comprehension in a structured Tier 2 intervention, improvement can be made (Calhoun & Petscher, 2013; Donegan & Wanzek, 2021; Scammacca, Roberts, Vaughn, & Stuebing, 2015). If reports identifying reduced reading achievement during 2020 and 2021 are accurate, preparedness to provide additional support for students to attain the necessary skills to be successful in secondary school may be required.

Despite the progress of most students in this study, some students required more intensive support. The school made the decision to enrol students who failed to make progress in the *Reading Mastery* classes into aspirational and motivational programmes running in the school. It was not within the scope of this research to determine whether these students made progress in their reading.

There are several limitations to this research emanating from the environment in which the research took place. As the school did not want to exclude any students from receiving support with their reading development, and indeed this would have been unethical, it was not possible to establish comparison groups. It would have been beneficial to determine how the students in the programme viewed their involvement and outcomes, but the state education department did not provide approval to speak to the students. At times, the researchers' intention to collect data at certain points during the delivery of the intervention conflicted with the school's organisation. Students for whom a full set of data was not available were excluded from the analysis of results. The data from interviews, field notes and lesson observations were used to provide the researchers with confidence that these students were representative of the overall cohort of students. In the first year of the programme, data on attendance in RM classes and the demographic profile of the students was collected by the researcher and was able to form part of the data analysis (Main, Backhouse, Jackson, & Hill, 2020). In the second and third year of the research this information was provided by the school and was incomplete and, therefore, could not be used.

The key objectives of this project were to implement a sustainable programme that would result in improved reading outcomes for students. The data presented here, and the fact that the programme continues to be delivered in the school in 2022, without the support of the researchers, indicate that these objectives were achieved.

Notes

1. Education Assistants (EAs) work in collaboration with the classroom teacher to support positive student outcomes, including the delivering of pre-determined education programmes.
2. The pre-test mean GSV scores for “repeat” and “single year” students (in parentheses) were as follows: Word Identification 467.9 (492.8); Word Attack 482.6 (495.3); Word Comprehension 486.6 (493.8); Passage Comprehension 484.2 (489.2); and Total Reading 480.3 (492.8).

Disclosure statement

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