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Allen Thurston, Maria Cockerill,
Andy Taylor, Tien-Hui Chiang & Joanne O’Keeffe



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Scientific Report

**Allen Thurston¹, Maria Cockerill¹, Andy
Taylor², Tien-Hui Chiang³ & Joanne
O’Keeffe¹**

¹Queen’s University Belfast

²Fischer Family Trust Literacy

³Zhengzhou University, China

For further details contact:

**Allen Thurston
School of Social Sciences, Education & Social Work
College Green
Queen’s University Belfast
Belfast
BT7 1LN
United Kingdom**

Email: a.thurston@qub.ac.uk

Tel: +442890245133

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An efficacy randomized controlled trial of Reciprocal Reading in secondary schools

Executive Summary

This report presents results of an efficacy randomized controlled trial of the Reciprocal Reading programme in secondary schools. The programme is a workforce development programme that supports teachers and teaching assistants develop and deliver targeted reading comprehension instruction to secondary school students aged 11-13. The paper outlines a Level 2 exploratory randomized controlled trial research design to assess whether the programme could be delivered in secondary school settings and explore whether it improves reading outcomes in this context.

The Reciprocal Reading programme was delivered successfully over approximately 6 months in a sample of 315 students from 14 schools in five English districts with high socio-economic disadvantage. As noted in Table ES1, positive *Effect Sizes* were observed in the primary outcome measure for analysis (reading comprehension) and the secondary outcomes of overall literacy and reading accuracy, and the overall reading performance of the students.

Table ES1: *Effect Sizes* on reading performance of Reciprocal Reading intervention students over the control students

	NGRT Sentence Completion	NGRT Passage Comprehension	NGRT Overall Reading Score
Mean change as <i>Effect Size of</i> Reciprocal reading intervention group change in reading score vs control group change in reading score	+0.25	+0.13	+0.19

Teachers and teaching assistants reported that they found the programme acceptable and they evaluated the success of the programme to be universally successful. The programme proved easy to implement in secondary schools and was received with overwhelmingly positive attitudes by teachers and teaching assistants. It showed ability to be universally implemented and had good adherence to planned implementation in all, but one school.

Whilst a larger study is warranted to ascertain whether effects generalise to a larger population, even this small exploratory study was able to detect significant beneficial effects of Reciprocal Reading on student decoding of sentences, and positive effects on student comprehension.

1. Background

Reading is recognized as a key skill for success. However, statistics from 2014 show that one in five students in England cannot read well by age 11 (Department for Education, 2015). By age 15, a mean of about 20% of students in OECD countries do not attain the baseline level of proficiency in reading, considered the level of proficiency at which students begin to demonstrate the reading skills that will enable them to participate effectively and productively in life. In England in 2018, 25% of students did not reach the expected standard in the Reading tests at age 11 and 72% did not achieve a high standard. There is therefore both national and international interest in improving reading comprehension levels (Organisation for Economic Co- operation and Development, 2017; The United Nations Educational, Scientific and Cultural Organization, 2009).

There is extensive research in respect of interventions to improve reading skills, specifically at word level, although the quality of the studies in this body of work varies (Snowling & Hulme, 2012). Comprehension instruction in classrooms is a further strategy for improvement in reading and existing interventions include Inference Training (Kispal, 2008) and reciprocal reading (Palincsar, 1982). Forms of reciprocal reading have been implemented most widely in the USA and New Zealand, with a range of studies reporting positive outcomes from reciprocal reading training programs (Palincsar, 1982; Palincsar & Brown, 1984; Rosenshine & Meister, 1994; Sporer, Brunstein & Kieschke, 2009; Crawford & Skipp, 2014). Rosenshine and Meister (1994) found an *Effect Size (ES)* of +0.32 when standardized tests were used across sixteen studies with varying designs, and a more recent randomized controlled study in 41 schools in the UK showed a more modest positive *ES* of +0.09 (Crawford & Skipp, 2014). The Education Endowment Foundation in 2017-18 funded a large RCT of 100 primary schools in England to test the impact of Reciprocal Reading delivered by Fischer Family Trust Literacy. Results from this trial are pending at the time of writing.

The following paper describes a Medical Research Council Level 2 efficacy/exploratory randomized controlled trial (Medical Research Council, 2000) study aimed at evaluating the impact of the Reciprocal Reading programme on students' attainment in reading comprehension on a targeted basis, when used at the secondary school stage in education.

2. The Intervention

The Fischer Family Trust Literacy (FFTL) Reciprocal Reading programme for secondary age students aged 11-13 was developed in 2018, adapted from the previously existing programme for 8-11 year-old students in primary schools. The intervention is delivered by practising teachers and teaching assistants in

mainstream UK school settings. It is delivered to students aged 11 to 13 years during the first two years of secondary school education whilst the students are working in small groups (normally a group of 5/6 students). Workforce professional development is an essential part of the program. All teachers and teaching assistants involved in delivering the programme receive two days off-site training from FFTL, who also provide on-site advisory support during delivery of the programme (half day in schools). The training covers the knowledge, skills and understanding that practitioners need to deliver the FFTL Reciprocal Reading programme in a targeted format (meaning that students are selected for the programme based on pre-defined criteria). The training covers an understanding of the nature of reading comprehension and an evidence-based package of strategies as well as instructional components, such as how to conduct reciprocal reading sessions and associated issues such as choices of texts and the use of planning and recording sheets.

Reading comprehension instruction to the identified small group of students is teacher-facilitated using collaborative reading of texts. The task is the use of evidence-based strategies - predicting, clarifying questioning and summarising - modelled by the teacher and used collaboratively between teacher and students and students and students, to derive meaning from the text. The participants are students in mixed-ability Year 7 classes who continue to receive the programme when in Year 8 (making the overall age of the students between 11 to 13 years). The programme is delivered during weekly sessions of 20-30 minutes duration, to small groups of targeted students. Students eligible to receive the programme are those who have been identified as having reading comprehension skills which are relatively weaker than their reading accuracy ('good readers but poor comprehenders'). The programme is delivered over approximately 6 months.

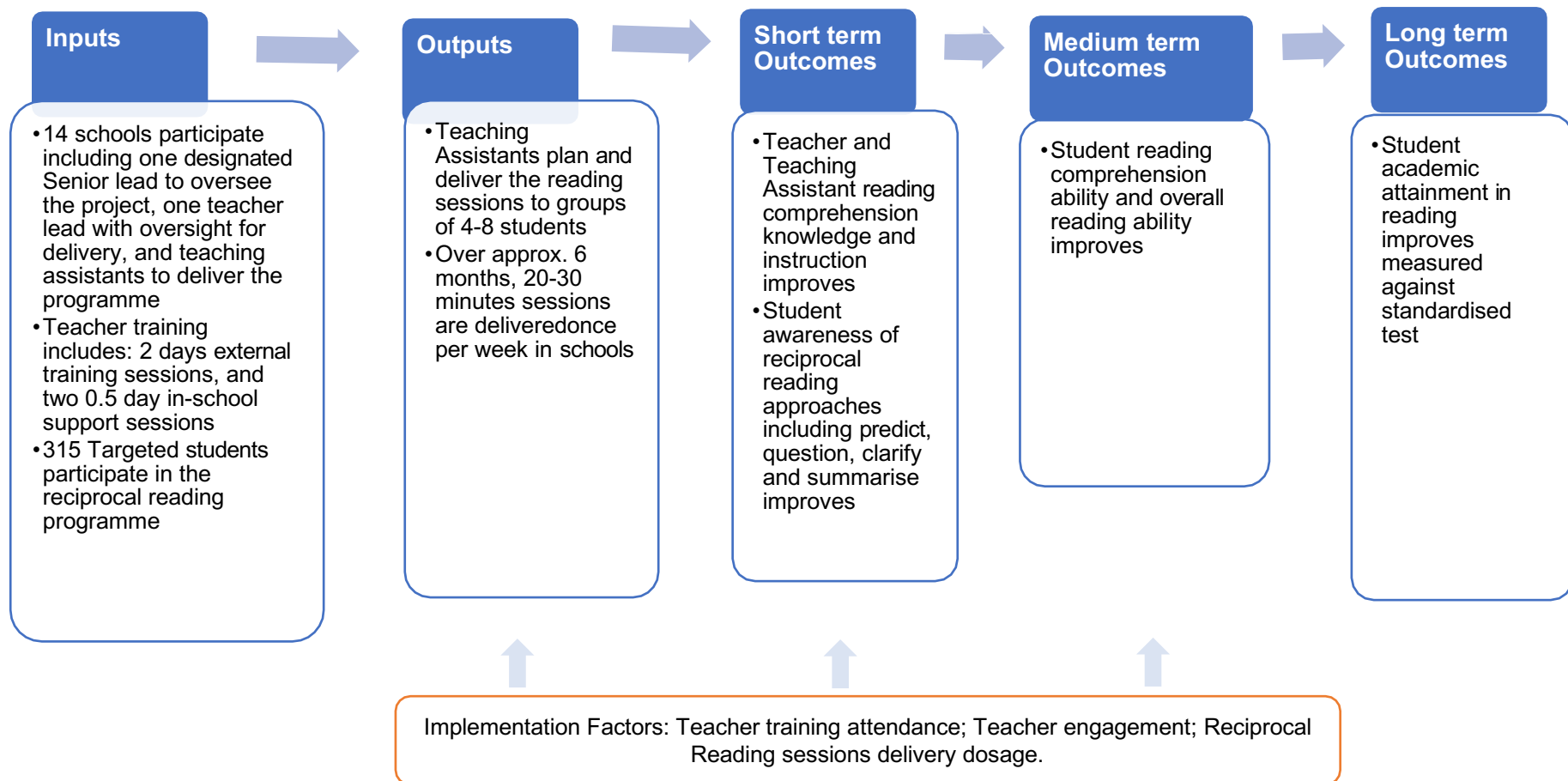
This targeted FFTL Reciprocal Reading programme also comprises:

- a) A set of strategies – used to strategically process text;
- b) An instructional dialogue;
- c) Materials – texts;
- d) Book journal activities;

3. Programme Theory of Change (ToC)

The logic model (Figure 1) describes the programme components (Inputs, outputs, outcomes), including the theory of change, and how implementation factors relate to programme outcomes.

Figure 1: Reciprocal Reading programme logic model



3.1 Underpinning theory of intervention

The underpinning Theory of Intervention is as follows. As shown in logic model (Figure 1), the overall aim of the Reciprocal Reading programme is to increase the reading comprehension ability of young people, resulting in improved overall reading ability. In order to achieve these outcomes teacher training is necessary to improve teacher knowledge, change professional practice of reading instruction, learn to scaffold student learning, and promote student collaboration during Reciprocal Reading. Students need to be exposed to using the Reciprocal Reading strategies (predict, question, clarify, summarise), to interrogate text working collaboratively, to develop their metacognitive ability and enable them to read with greater understanding. Training and materials for this programme are based on the following underpinning theories and evidence.

Reciprocal Reading, or in prior iterations developed as Reciprocal Teaching (Palincsar & Brown, 1984) is a metacognitive, instructional approach aimed to improve reading comprehension for poor comprehenders. The Reciprocal Reading programme involves a multi-strategy approach composed of four strategies to engage particular processes: predicting (making and exploring inferences), clarifying (critical evaluation), questioning (focusing on main ideas) and summarising (allocate attention and monitor understanding). This multi-strategy approach is underpinned by theories about metacognitive development which in reading comprehension is suggested could result in a higher standard of coherence (Perfetti, Landi & Oakhill, 2005).

Metacognitive skills develop when children are aged five to six and increase rapidly from the age of eight (Veenman, 2016). Skills are demonstrated through young children's emerging awareness of their memory (metamemory) and self-monitoring of understanding. Development of these skills is crucial in fostering independent learning and enables children to become active learners. A review of the impact of metacognitive strategies by the Education Endowment Foundation (EEF) suggests it has positive effects ($ES +0.7$) and that metacognitive development is most effective when instruction involves adult scaffolding and collaborative group work (Higgins, Katsipataki, Kokotsaki, Coleman, Major, & Coe, 2014).

The reciprocal element in Reciprocal Reading refers to the interactions that take place between student members of the group that enable collaborative co-construction of meaning whilst reading a text (Palincsar & Brown 1986). Collaborative, or cooperative, learning can be defined as a learning situation in which two or more students learn together to achieve a common goal or solve the task at hand, commonly through peer directed interactions where learners actively participate in group activities, while teachers and teaching assistants

usually serve as facilitators. Research shows that collaborative learning can work well for all ages if activities are suitably structured for learners' capabilities, and positive evidence has been found across the curriculum. Theories underpinning social interaction during collaborative learning have been substantively developed and described by Social Interdependence Theory (Johnson, Johnson & Roseth, 2010; Johnson & Johnson 2012). A meta-analysis undertaken some years ago by Johnson, Johnson & Stanne (2000) finds positive effects (*ES* +0.19 to +0.91) and more recently the EEF toolkit recommends collaborative learning as a low-cost approach with moderate impact (*ES* +0.5) based on extensive evidence.

Cooperative learning can provide the right balance between the disequilibrium caused through cognitive challenge and social exchanges between peers for effective learning to take place (Palinscar, 1998). Reciprocal Reading is a form of cooperative learning. It involves cognitive challenge from peers and post-interactive reflection and restructuring. All members of a group have to fulfil their tasks effectively. This creates a social interdependence between the group. Their individual success is linked through common goals and mutual dependence on each other for gains in the Reciprocal Reading process to accrue. Without all group members performing their tasks in accordance with prescribed patterns for interaction, none can gain benefit from the interaction. Theories underpinning social interaction during cooperative learning have been substantively developed and described by Social Interdependence Theory (Johnson, Johnson & Roseth, 2010; Johnson & Johnson 2012). For cooperative learning to be present during peer tutoring then social interdependence must be present in the form of:

- Goal structure (the pair work together with the aim of reading and understanding a piece of text)
- Positive interdependence (in the tutoring process clear patterns for interaction are defined in the roles of tutor and tutee)
- Individual accountability (both the tutor and tutee have responsibilities, in the form of tutoring used each must reflect in their own performance and the performance of their peer partner)
- Interaction patterns (the tutoring process is structured to stimulate promotive interaction, group processing and enhance social skills).

The four key strategies in Reciprocal Reading should be modelled explicitly and applied flexibly in a scaffolded manner to promote student proficiency as it is expected that all students contribute fully in the session, apply the strategies independently to understand the text and lead the group towards deeper understanding. The approach promotes a slow pace of reading for deeper understanding and thinking about the text (Palinscar, David, & Brown, 1989). The need for scaffolding during the modelling process in the Reciprocal

Reading programme is underpinned by Vygotsky's theory (1978) of learning within the 'zone of proximal development' which requires mediation and carefully directed modelling/support in small groups of learners working together to make this scaffolded learning possible. This approach is in line with research which suggests scaffolding is effective (Van de Pol, Volman & Beishuizen, 2010).

The Reciprocal Reading programme aims to improve students' reading ability including with understanding through instruction in small groups using the Reciprocal Reading strategies. Social-cognitive theory, indicates that the development of higher order thinking skills inherent in reading comprehension, require a social dimension (Vygotsky, 1978; Collins, Brown & Newman, 1988). The teaching approach of Reciprocal Reading, underpinned by this theory requires students to acquire complex skills through social modelling and scaffolding which require explicit teaching (Palincsar, Ranson, & Derber, 1989). Through scaffolded dialogue teachers transfer of responsibility for active strategy-use to students (Van de Pol et al., 2010). The strategies, particularly summarizing and questioning, encourage students' own ability to monitor their understanding whilst reading text (Higgins, Katsipataki and Coleman, 2014: 13). Shared dialogues between teachers and teaching assistants and students and subsequently between students themselves, include language to talk about the process of reading and the success or otherwise of the strategies practiced. This enables students to acquire the ability to monitor their understanding of the text, identify when they do not understand and know which of the strategies to use to address any deficiencies in current knowledge and learning (Pressley, 2000). This process helps students self-regulate their approach to the reading tasks as they acquire both knowledge about the task and how to carry it out (Kucan & Palincsar, 2011). This process during Reciprocal Reading is hypothesised to result in improved reading comprehension increased scores in standardised assessments of academic attainments (Crawford & Skipp, 2014).

In order to deliver this approach in the classroom, the Reciprocal Reading intervention must include high quality professional development based on evidence-informed theory, as recommended by research (Coe et al., 2014). Reading comprehension involves constructively responsive reading where the reader works to identify the overall meaning of the text by actively searching, reflecting on and responding to the text in pursuit of its main ideas (Pressley and Afflerback, 1995). Research supports the need for a firm understanding of the component skills of reading comprehension for effective instruction (Oakhill, Cain & Elbro, 2015) and warns of difficulties in teaching reading without explicit comprehension instruction (Pressley, 2000). The training for the Reciprocal Reading programme therefore includes external training days where groups of teachers and teaching assistants come together from different schools to learn together about the approach and its underpinning theory and evidence.

Teachers and teaching assistants are trained to deliver the programme, and to identify students who may have reading comprehension difficulties. Reciprocal Reading training explains the simple view of reading (Gough & Tunmer, 1986) to teachers and teaching assistants and how to identify the students who may fit within the 'good decoders/poor comprehenders' quadrant (Nation & Snowling, 1997). In addition, external training is combined with in-school support visits by programme trainers to work alongside teachers and teaching assistants during instruction delivery.

3.2 Theory of change (ToC)

Figure 1 also illustrates the ToC. It is proposed that by providing a structured reading comprehension programme and appropriate training to teachers and teaching assistants, that the processes underpinning the teaching of reading comprehension can be changed. This assumes that the training will impact on the professional action of teachers and teaching assistants, resulting in use of alternative pedagogies. As a result, it is projected that students' use of reading comprehension strategies such as predicting, questioning, clarifying and summarising will improve their comprehension skills and lead to improved reading attainment. Teacher surveys and attendance at training, in addition to Reciprocal Reading teacher instruction dosage, will be analysed in order to assess the extent that teachers/teaching assistants, have been able to embed the required components of Reciprocal Reading into their professional practice. as implementation factors/mediators for.

3.3 Success criteria for recommendation that Reciprocal Reading is ready for a Stage 3 'Definitive RCT'

The following criteria were developed to determine whether Reciprocal Reading is ready for a Stage 3 'Definitive RCT':

- That professional development in use of Reciprocal Reading is able to be delivered in line with specification to secondary school teachers and teaching assistants
- That Reciprocal Reading is able to be delivered in line with specification to students in secondary school (note that it has only previously been delivered to students in elementary/primary school)
- That secondary school teachers and teaching assistants evaluate their use of Reciprocal Reading positively enough to conclude that it could be scaled up
- That use of Reciprocal Reading, when compared to a control group not using the technique, can result in a positive *Effect Size* for students using the technique.

4. Research Plan

4.1 Research questions

The reciprocal reading programme study was a Level 2 efficacy/exploratory trial (randomized at the individual pupil level, using block randomization to ensure even numbers of intervention and control students in each arm of the trial, within each of the 14 classes/schools) complemented by a process evaluation. The study primarily looked at the effect of the FFTL Reciprocal Reading programme on the reading comprehension and reading ability of students in secondary schools. Pre and post-test measures of the students in 14 schools assessed the efficacy of the reading comprehension programme in optimal conditions on a small scale, with a control group of students providing a comparison group to determine what may have happened in the absence of Reciprocal reading..

The study addressed the following research questions:

- a) Could the programme be delivered in secondary schools?
- b) What was the impact of the Reciprocal Reading programme at post-test on:
 - Student's reading comprehension ability?
 - Student's decoding ability?
 - Student's overall reading ability?
- c) Did the impact of the programme differ significantly according to variations in implementation fidelity? (Process evaluation)
- d) Was the adapted version of the Reciprocal Reading programme for secondary age students scalable?

Answers to the above questions, and the success criteria (previously stated in section 3.3), will inform decisions as to whether the programme is ready to be scaled to an effectiveness/definitive randomized controlled trial.

5. Design Summary of the Randomized Controlled Trial (RCT) and Process Evaluation

5.1.1 Design: The treatment group students (n=up to 15 per school) received the intervention, whilst the control group students (n=up to 15 per school) in each of the 14 schools continued with business as usual, comprising of their normal literacy and specific comprehension instruction practices for students aged 11 to 13 years.

5.1.2 Logic model: A logic model was developed for the Reciprocal Reading programme intervention (Fig. 1). The logic model helped guide the process evaluation and enabled us to interpret the findings of the RCT. The SPIRIT guidelines were consulted to help structure the protocol for this trial (SPIRIT,

2015), which was submitted for publication prior to undertaking the work (Cockerill, Thurston & Taylor, 2019)

5.1.3 RCT evaluation: The main outcomes were evaluated using ANCOVA analysis. The RCT tested for changes in both students reading comprehension, decoding, and overall reading abilities. Any changes in the intervention group receiving the Reciprocal Reading comprehension programme were compared against the control group who do not receive the treatment during this time. It was calculated that a sample in excess of 300 students would have been large enough to detect a significant *Effect Size* of 0.28 (roughly in-line with previous reported *Effect Sizes* for the intervention), with $p > 0.05$, and 80% power (Soper, 2019). It was proposed that ANCOVA was an appropriate analysis for this intervention as randomization was at the individual level, took place within school (thus having both control and intervention students from the same classes) and so any clustering effects should influence intervention and control groups were distributed evenly between control and intervention grounds (Connolly *et al.*, 2018). Results will also be presented as *Effect Sizes* and Cohen's *d* will be calculated for each of the main outcome measures.

5.1.4 Process evaluation: A process evaluation will supplement the RCT to measure the fidelity to implementation for the programme. Guided by the MRC Framework (Moore, Audrey, Barker, Bond, Bonell, Hardeman, Moore, O'Cathcain, Tinati, Wight & Bair, 2015) the process evaluation will seek to assess whether the reciprocal reading training was attended, teacher engagement, and dosage of implementation. To help assess this, the trainer will provide naturally occurring training attendance data, and teacher leads, teaching assistants will complete student attendance records during session delivery, and a post-programme teacher survey.

6. Assessment Procedures

All students in both intervention and control groups were tested before and after the intervention. Schools were provided with guidance to select up to 30 students from year 7 who were judged as having reading comprehension skills which are relatively weaker than their reading accuracy (i.e. they are 'good readers but poor comprehenders'), in line with the inclusion criteria for the Reciprocal Reading targeted secondary school intervention.

6.1.1 Pre-test measures: The selected students, up to 30 from year 7, were tested prior to teacher training and programme intervention. The New Group Reading Test (NGRT) pre-test was used. All the students in the study ($n=315$) completed a standardized NGRT test, in digital version, from GL-Assessment. This was an adaptive test which had high reliability (Alpha values > 0.9) (GL-Assessment, 2018). All students were tested in exam conditions by schools

prior to teacher training and programme intervention. This outcome measure assessed students reading comprehension and overall reading ability prior to the intervention.

6.1.2 Post-test measures: The reading testing was repeated with all treatment and control students after the completion of the Reciprocal Reading programme delivery. The same online standardized reading test, the New Group Reading Test (digital version) from GL-Assessment was used as the post-test measure. Again this was an adaptive test which had high reliability (Alpha values > 0.9) (GL-Assessment, 2018). As with the pre-test the outcome measures assessed students' reading ability, including sentence completion and reading comprehension. From the pre and post-test measure it was anticipated that post-test differences could be calculated, taking into account any pre-test differences in the sample.

6.1.3 Dosage record: A teacher implementation session delivery plan was used by teachers and teaching assistants to record weekly delivery data (in minutes delivery) and was collected at post-test to help measure the programme's implementation fidelity.

6.1.4 Teacher questionnaire at post-test: The teachers and teaching assistants were asked to fill in a questionnaire at post-test for their feedback regarding the Reciprocal Reading programme and the implementation process. All questionnaires were completed online using Lime Survey. The teacher questionnaire consisted of 19 questions including 11 questions measured on a 4-point scale ranging from 'strongly agree', 'agree', 'disagree' to 'strongly disagree'. In addition, the questionnaire included 5 open questions and three closed questions with menu of options about session delivery.

6.1.5 Training delivery attendance.

Training attendance records were collected by schools and provided to Queen's University Belfast as part of the process evaluation

Instruments and measures are summarized in Table 1.

Table 1: Measurement tools

Outcome	Instrument
Reading Passage Comprehension	New Group Reading Test for students – Passage Comprehension subtest
Overall reading	New Group Reading Test for students
Reading accuracy	New Group Reading Test for students – Sentence completion subtest
Implementation factors	
Dosage	Up to 6 months implementation plan recorded as minutes per week by teachers and teaching assistants
Teacher engagement	Training attendance at Reciprocal reading training
Teacher engagement	Teacher survey completed at the end of the project

7. Sample

315 students in Grade 7 (students aged 11 to 13 years), from 14 schools in the North East of England were recruited to the trial. The trial included up to 30 students from each school selected by the school as eligible to take part in this trial. Schools selected students using the guidance provided to them by the trainers to identify students who are good readers but poor comprehenders. Teacher professional opinion was used to determine which students fitted with these selection criteria.

7.1.1 Randomization: Students were individually randomized to condition. This was undertaken by listing the students according to the time when they completed the NGRT pre-test, grouped by school. A random number generator (Random Number Generator for iPhone version 5.0 by Nicolas Dean) was used to generate a whole number between 0 (control) and 1 (Reciprocal Reading intervention). Once the first student from a class was assigned to condition the other students from that class were randomized sequentially to condition. This ensured even numbers of intervention and control students in each arm of the trial from each class/school.

7.1.2 Sample size calculation and analysis: The primary outcome measure was reading ability and measured using the New Group Reading Test. The protocol reported that this would be presented as both *Effect Sizes* of the intervention, compared to the control, and as ANCOVA using pre-test as a co-variate in the model to determine whether pre/post differences between intervention and control groups reached statistical significance. Secondary to this further analysis was undertaken looking at the Passage Comprehension and Sentence

Completion sub-scales of the New Group Reading Test. As students are individually randomized to condition and this is a Level 2 efficacy/exploratory trial, analysis using ANCOVA to determine the main effects of the trial is appropriate. It is not anticipated that gender, English as a Second Language, Special Educational Need or Free School Meal status will be looked at in this analysis. None of these variables were taken into account when randomization took place and there is nothing in the theory of intervention or theory of change to suggest that they will influence outcome. This is why multiple regression was not used as a means of analysis.

8. Results

8.1 Effect of the reciprocal reading on sentence completion, reading comprehension and overall reading score

314 students were randomised to condition. 3 students were missing at post-test (the students having left the school). This missing data was below 5% of the sample and was assumed to be missing at random (due to the low nature of the sample). This left 158 students in the control group and 153 students in the Reciprocal Reading intervention group. The Reciprocal Reading intervention provided evidence that it improved reading compared to control or 'treatment as usual'. Pre/post test results in NGRT reading tests are presented in Table 1.

Table 1: Pre/post test results in NGRT reading tests

	Mean NGRT Sentence Completion		Mean NGRT Passage Comprehension		Mean NGRT Overall Reading Score	
	Pre-test Score (SD)	Post-test Score (SD)	Pre-test Score (SD)	Post-test Score (SD)	Pre-test (SD)	Post-test (SD)
Control (n=158)	329.81 (46.66)	335.98 (52.63)	308.93 (59.43)	323.4 (66.78)	316.94 (49.08)	326.56 (57.99)
Reciprocal Reading (n=153)	324.21 (48.94)	342.12 (55.46)	302.96 (65.43)	325.47 (61.56)	310.82 (54.24)	330.54 (58.59)
Mean change in raw scores Reciprocal reading vs control	+11.74		+8.04		+10.1	
Mean change as Effect Size Reciprocal reading vs control	+0.25		+0.13		+0.19	

number of students = 315; number of secondary schools = 14

Improvements were observed for the Reciprocal Reading group on both NGRT reading sub-scales, Sentence Completion and Passage Comprehension. In addition the Overall NGRT Reading Score showed positive effects for the Reciprocal Reading intervention over the control. ANCOVA analysis of post-test reading test scores, using pre-test data as a co-variate (to take account of any pre-test differences), indicated that there was a significant gain on Sentence Completion scale ($F(1,310)=4.05$, $p<0.05$). Gain was not significant for Passage Comprehension ($F(1, 310)=1.75$, $p=0.19$) with observed power at 51.5%, and did not reach significance on the Overall reading Scale ($F(1, 310)=3.84$, $p=0.06$) with observed power at 46%. The observed power is important in interpreting these data. It indicated that although there were positive effects a larger sample size would be required in order to show a significant difference between conditions. Analysing mean gain scores on the Overall reading Scale for students using Reciprocal Reading by school indicated that students in all, but one school made positive gains on the NGRT test.

8.2 Relationship between dose of Reciprocal Reading and gains in reading

The mean time teachers and teaching assistants reported was spent on implementing reciprocal reading in the intervention schools was 435.97 minutes (SD 157.95). This was compared to a target time of 20-30 minutes per week, per school, which would have been 280-420 minutes. In fact 11 schools met or exceeded the target implementation time, with 1 failing to meet the target by about 40 minutes and the remaining 2 schools being within 3 minutes of meeting the target.

Correlation analysis of mean overall reading gain scores against the total time spent on the intervention per school (undertaken using mean time spent in school against mean gain in reading for Reciprocal Reading intervention students per school) indicated that there was no significant correlational relationship between the total time Reciprocal Reading was used for, and the reading benefits measured by NGRT Overall Reading Score that accrued for the intervention sample ($r = -0.03$, $p=0.93$, not significant). Neither were there significant correlations between mean NGRT Sentence Completion scores against the total time spent on the intervention per school ($r = -0.23$, $p=0.52$, not significant), nor mean NGRT Passage Comprehension scores against the total time spent on the intervention per school ($r = -0.01$, $p=0.97$, not significant).

8.3 Process evaluation and teacher views on Reciprocal Reading

A survey was used to gather data on teacher behaviours identified in the logic model and also to examine teacher attitudes towards implementing Reciprocal Reading. The survey was provided online to all Senior leaders, Teacher leads

and Teaching assistants involved on the programme. 24 valid responses were returned from the 3 Senior leaders, 12 teacher leads and 9 Teaching assistants.

The behaviours identified in the logic model included:

- Predicting what would happen next in the text being read
- Using questioning to check understanding
- Clarifying what has been read
- Summarises what has been read.

8.3.1 Predicting what would happen next in the text being read: After using the Reciprocal Reading programme teachers and teaching assistants were asked whether they explicitly taught students to anticipate what may happen next to aid understanding. Of the responses 12 teachers and teaching assistants strongly agreed they did this, 11 agreed they did it, and only 1 disagreed that they did it.

8.3.2 Using questioning to check understanding: After using the Reciprocal Reading programme teachers and teaching assistants were asked whether they explicitly taught students how to ask questions about the text to help them understand what they are reading. 15 teachers and teaching assistants strongly agreed that they did this, with 9 responding that they agreed they did it.

8.3.3 Clarifying what has been read: After using the Reciprocal Reading programme teachers and teaching assistants were asked whether they explicitly taught students how to seek out the meaning of words and phrases they are unsure about when reading text. 14 teachers and teaching assistants strongly agreed that they did this, with 10 responding that they agreed they did it.

8.3.4 Summarises what has been read: After using the Reciprocal Reading programme teachers and teaching assistants were asked whether they explicitly taught students how to sum up what they have read to check how well they have understood the text. 11 teachers and teaching assistants strongly agreed that they did this, with 12 responding that they agreed they did it, and only 1 disagreed that they did it.

8.3.5 Teacher views on implementation of Reciprocal Reading: Data was also collected in the survey on teacher views on their implementation of Reciprocal reading. In terms of responses to the question as to whether they followed the guidance on how to deliver Reciprocal Reading closely, 15 teachers and teaching assistants said they strongly agreed that they did and the 9 remaining teachers and teaching assistants reported that they agreed that they did. In terms of responses to the question as to whether the teachers and teaching assistants felt engaged when they were delivering the Reciprocal Reading sessions, 19 teachers and teaching assistants said they strongly agreed that they did and the 5 remaining teachers and teaching assistants reported that

they agreed that they did. In terms of responses to the question as to whether the teachers and teaching assistants enjoyed doing the Reciprocal Reading sessions with the students, 18 teachers and teaching assistants said they strongly agreed that they did and the 6 remaining teachers and teaching assistants reported that they agreed that they did. All teachers and teaching assistants reported that they would be happy to continue undertaking Reciprocal reading in the school.

As a targeted intervention, when asked whether Reciprocal Reading was easy to implement, the teachers and teaching assistants indicated that 16 strongly agreed it was, 7 agreed it was with only 1 disagreeing with this statement. Similarly when asked whether the paperwork did not take too long the teachers and teaching assistants indicated that 12 strongly agreed it was, 11 agreed it was with only 1 disagreeing with this statement. Finally, when asked whether their school had a working environment that was conducive to implementing Reciprocal reading, 12 strongly agreed it did and 12 agreed. When asked whether overall they were happy with Reciprocal Reading, 15 responded that they strongly agreed that they were, with 9 responding that they agreed they were. This showed universal positive satisfaction with the programme.

8.4 Cost

The programme cost £4527 per school to implement with an overall sample of 315 students across the 14 schools (this included the fact that there was a wait-treatment for the control group). This equated to a cost of £201.20 per student. This would equate as being low to moderate costs using the rubric from EEF's Toolkit (EEF, 2019). Note that these costs include teacher cover and all training, but exclude the cost of the evaluation and testing (as these would not normally be undertaken when engaging with the programme).

8.5 Counterfactual

The survey asked teachers and teaching assistants to report what they felt that students in the control group were doing instead of Reciprocal Reading. 17 teachers and teaching assistants reported that the control group received no additional intervention beyond treatment as usual, 6 teachers and teaching assistants reported that their control group students received Accelerated Reader (a literacy scheme that includes use of a graduated reading scheme and comprehension test materials), and 1 teacher reported that their control group students received Fresh Start (a phonics-based intervention provided by Ruth Miskin Training).

9. Discussion

This was a well-conducted properly scaled RCT of a cooperative learning technique that had been previously successful in elementary school. Gains on the Passage Comprehension sub-scale and the Overall Reading Score on the NGRT test did not reach significance. The reason for this may have been two-fold. The intervention period was only 16 weeks. In previous trials in elementary school the intervention has been allowed to mature, with time between testing being stretched to about 30 weeks. This was a development trial and had shorter timescales. Secondly the observed power was low. This means that although positive effect sizes were observed on both sub-scales and the overall reading scale they did not make significance when pre-test differences were taken into account in the Passage Comprehension sub-scale, nor the overall Reading Scale. This is because the sample size was probably too low to detect the observed effect. Using the observed *Effect Size* from this study it is possible to calculate that in a scaled trial a sample size of 468 students would be required to detect an *Effect Size* of +0.13 at 80% power using ANCOVA (QFAB Bioinformatics, 2019) for a trial that does not take account of clustering or a sample of 200 schools (assuming 30 students per school) to detect an *Effect Size* of +0.13 at 80% power using an assumed ICC of 0.07 and alpha at 0.05. It should also be noted that at least two schools were using interventions for the control group that have previously shown positive effects. As Accelerated Reader has been shown to be affective as a literacy intervention with reported Effect Sizes as high as +0.38 (for free school meals students) (Gorrard, Siddiqui & Huat See, 2015a), and Fresh Start has shown modest Effect Sizes in a small scale trial of about +0.24 (Gorrard, Siddiqui & Huat See, 2015b), it might be concluded that the potential benefits of Reciprocal Reading over 'treatment as usual' may be underestimated in this study in about one quarter of the control sample.

All, but one school were able to implement the Reciprocal Reading intervention into their existing timetable and meet (or very nearly meet) target implementation times. However, there was no clear correlation between implementation time and mean gain scores at the school level. This indicated that the gains accrued from Reciprocal Reading are more about the integrity of implementation, rather than the time spent on the intervention. This will be determined by the ability of the teacher/teaching assistant to coach appropriate behaviours in the students to ensure adequate implementation. Evidence from the survey indicated that teachers and teaching assistants were able to embed the steps required to use Reciprocal Reading effectively into their professional practice. This was evidenced by the positive responses regarding teachers and teaching assistants self-reporting that they were using essential components of Reciprocal Reading in their professional practice. Teachers and teaching assistants reported that they were able to implement the Reciprocal reading

programme effectively and they would consider continuing using it in the future. This would lead to conclude that Reciprocal Reading can be implemented in secondary school settings and embedded within school and timetable planning.

The technique was shown to be possible to use in to secondary school settings. Teachers and teaching assistants responded with near unanimously positive feelings about the ease of implementation, the negligible effect on workload and the suitability of Reciprocal Reading to their school setting. Although from a sample of only 14 schools, these views came from across the spectrum of teachers, teaching assistants and senior managers. Therefore, the programme shows excellent promise in terms of scalability beyond the current sample.

The Reciprocal Reading had more generalisable effects than more basic forms of cooperative learning in reading such as peer tutoring (Thurston & Cockerill, 2016), whilst maintaining low to moderate costs per student. It is recommended that the trial now move to an effectiveness/scalability trial and use a larger sample to give higher power in analysis, and allow any clustering effects to be modelled (generated, not by randomisation to condition, which was done at the individual level, but by the fact that the intervention is delivered by teachers/teaching assistants to groups of students once randomised). Nonetheless, it was observed that this form of cooperative learning shows promise. As with other forms of cooperative learning, it provides a transformative pedagogy with weak framing that allows students to stop resisting, and start engaging in the classroom (Bernstein, 1971, 1973 & 1999). The technique resulted in overall positive effects for Reciprocal Reading intervention, with only one school not showing positive progress in Overall Reading Score. Therefore, we could also recommend that schools use this technique and carefully observe effects in their own context.

10. Ethics

The trial was approved through two ethics procedures. The intervention of the trial and testing was approved by the Headteachers who took part in the trial. The subsequent matching, combining and analysis of data was approved by School of Social Sciences, Education & Social Work Ethics Review Board, Queen's University Belfast.

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