



**QUEEN'S
UNIVERSITY
BELFAST**

A Phase 3 Definitive RCT of Reciprocal Reading in high schools in England

Cockerill, M., Thurston, A., O'Keeffe, J., & Taylor, A. (2021). A Phase 3 Definitive RCT of Reciprocal Reading in high schools in England. *International Journal of Educational Research*, 109, Article 101854. Advance online publication. <https://doi.org/10.1016/j.ijer.2021.101854>

Published in:

International Journal of Educational Research

Document Version:

Peer reviewed version

Queen's University Belfast - Research Portal:

[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights

Copyright 2021 Elsevier.

This manuscript is distributed under a Creative Commons Attribution-NonCommercial-NoDerivs License

(<https://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits distribution and reproduction for non-commercial purposes, provided the author and source are cited.

General rights

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

Open Access

This research has been made openly available by Queen's academics and its Open Research team. We would love to hear how access to this research benefits you. – Share your feedback with us: <http://go.qub.ac.uk/oa-feedback>

A Phase 3 definitive RCT of Reciprocal Reading in high schools in England

Abstract

A Phase 3 definitive RCT research design is proposed to determine whether the Reciprocal Reading Secondary program can improve reading outcomes for students aged 11-12. This targeted reading comprehension program is designed to support school staff who will deliver the program to the selected students. The proposed sample will be up to 800 students from 20 schools in England from high socio-economically disadvantaged areas. The program will be delivered to the targeted students over a period of 6 months.

Key Words

Reading; Comprehension; High School; Teacher Training; Literacy; RCT

1. Introduction

Although reading ability is an important skill for academic success, only 27% of students in England have reading difficulties by age 11. The situation of disadvantaged students is particularly concerning, as only 51% of disadvantaged students achieve the expected reading standards at age 11, compared to 71% of all other students (Department for Education, 2019). At age 16 in England in 2019, only 70% of students achieved the required standard in English Language (Ofqual, 2019). Beyond England, we note that in OECD countries, about 20% of students do not reach the baseline level of reading proficiency by the time they are age 15. This baseline is the level where it is claimed that students start to develop the reading skills that will give them the opportunity to effectively participate in life and become productive individuals (Organisation for Economic Co-operation and Development, 2017). Poor Reading ability is identified as a global issue resulting in 'learning poverty' and there is an international commitment to improve standards across the world given that 53% of children in low to middle income countries are unable to read by age 11 (World Bank, 2019).

The strategy of using comprehension instruction in classrooms was developed to help improve reading, one such intervention is reciprocal reading (Palincsar, 1982). This program was largely used in the US and New Zealand (Palincsar, 1982; Palincsar & Brown, 1984) until recently when it was tested in the UK (Crawford & Skipp, 2014). In 2017 reciprocal reading was adapted by and was used in an efficacy RCT in elementary schools **[Removed for Review]** and in a Phase 2 trial in high schools using a further adaptation of this approach for use with older students . This study will use the high school version named Reciprocal Reading Secondary, which is designed for delivery as a targeted intervention. The study will use a Phase 3 definitive RCT design.

2. Reciprocal reading and its effectiveness

The main objective of the program is to improve reading comprehension ability and overall reading capability of young people. The program outcomes depend upon a number of components. Staff training needed to improve teacher knowledge, also contributes to changing the professional pedagogies of reading instruction. Using this approach teachers learn to support students during learning whilst promoting student collaboration during the reciprocal reading session.

Students use the reciprocal reading strategies and work collaboratively, to interrogate text and read with greater understanding. There are four strategies used as follows: predict (to make and explore inferences); clarify (to evaluate critically); question (to focus on the main ideas); and summarize (to monitor understanding). The reciprocal element in the program is demonstrated by student interactions taking place amongst the students in the group. The students cooperatively construct meaning whilst reading texts (Palincsar & Brown 1986). Cooperative learning occurs where two or more students work together towards a common goal and during this process they learn together. The most common way in which this is achieved, is through group work learning activities where the students interact with their peers. The teachers involved in the program usually facilitate the group work activities. Cooperative learning can create an opportunity to instil an environment where effective learning can take place. This is particularly useful when there is disequilibrium in the social exchanges and cognitive challenges amongst the group (Palincsar, 1998).

The Reciprocal Reading Secondary program takes the format of cooperative learning where the students are cognitively challenged by their peers and by their adult teacher. The program promotes post-interactive reflection and restructuring.

Reciprocal Reading uses four strategies (predict, clarify, question, summarize), which the group members must use in order to interpret the text and to complete the allocated tasks.

Within the groups of students, the program strategies promote social interdependence whereby individual success is associated with the group's common goal. In the group there is mutual dependence on each other to achieve the reciprocal reading goals.

If the group are not working towards the common goal according to the prescribed patterns for interaction, then the individuals in the group may not benefit fully from the interaction.

Social Interdependence Theory can be used to describe the social interactions that occur during cooperative learning (Johnson, Johnson & Roseth, 2010; Johnson & Johnson 2012). Social Interdependence theory infers that there must be certain conditions present for co-operative learning to occur during reciprocal reading. These conditions are: (1) Goal structure (by working together students can read and understand the selected text); (2) Positive interdependence (during group work the students take turns to lead and there is clear interaction by using the four strategies (predict, clarify, question, summarize); (3) Individual accountability (by using the four strategies, each group member has an individual responsibility. The students reflect on their own performance as well as that of the group whilst undertaking the reading task); and (4) Interaction patterns (the group work is organized in a way that is conducive to promoting interaction, and in doing so promotes and enhances individual social skills).

Previous studies have shown that cooperative learning can be effective with students of all ages, however, the activities must be structured in a way that is suitable for learners' capabilities. Studies have found positive evidence across the curriculum. A meta-analysis of collaborative learning reported positive effects (ES +0.19 - +0.91) Johnson, Johnson & Stanne (2000), and collaborative learning is recommended by the Education Endowment Foundation (EEF) toolkit (which is based on extensive evidence) and is reported as a very low-cost approach with moderate impact (ES +0.5).

During Reciprocal Reading Secondary it is essential that the four key strategies are used correctly and are applied flexibly in a way that promotes student autonomy. It is anticipated that in time, adult involvement will be minimal and participating students will eventually lead the sessions themselves. The approach is designed to encourage a slower pace of reading to encourage thinking about the text at hand and to enable a more in-depth understanding of the text (Palincsar, David, & Brown, 1989).

Supporting the students through scaffolding is a key element of the modelling process in the Reciprocal Reading Secondary program. This approach is supported by Vygotsky's theory (1978) of learning within the 'zone of proximal development'. In this theory, Vygotsky infers that to make scaffolded learning possible there must be evidence of mediation and carefully directed support amongst the student groups who are working collaboratively. In reciprocal reading, the teaching approach requires students to complex skills through social modelling and scaffolding, which require explicit teaching (Palincsar, Ranson, & Derber, 1989). Using the scaffolded approach teacher's pass on the responsibility for active strategy-use to the learners (Van de Pol et al., 2010).

Whilst reading text, the students are encouraged to monitor their understanding through using the strategies, particularly, summarizing and questioning (Higgins et al., 2014). Conversations around the process of reading, and strategies practiced begin to take place. The shared dialogues continue amongst the students themselves and the students are then more able to

assess their own understanding of text. They are also able to identify when they do not understand a text and become more familiar with which strategies to use to overcome this (Pressley, 2000). During this process the students learn how to approach the designated tasks whilst also acquiring knowledge on the task (Kucan & Palincsar, 2011). It is reported that the reciprocal reading process leads to an improvement in reading comprehension. It is also reported that the process can improve scores in standardized assessments of academic attainment (Crawford & Skipp, 2014).

Research studies on reciprocal reading training programs have reported positive outcomes, however, these studies have mostly been located in the US and New Zealand where reciprocal reading has been used most widely to date (Palincsar, 1982; Palincsar & Brown, 1984; Rosenshine & Meister, 1994; Sporer, Brunstein & Kieschke, 2009; Crawford & Skipp, 2014). In a study conducted across 16 studies with standardized tests, using various research designs, an effect size of +0.32 was reported (Rosenshine and Meister, 1994). A more modest effect size of +0.09 was reported by Crawford & Skipp (2014) from a randomized controlled trial in 41 schools in the UK.

In 2017-18, the EEF provided funding for a large efficacy trial of Reciprocal Reading in 100 elementary schools in England, which found positive effects in reading outcomes of ES +0.14-0.18 when used as a targeted intervention with students aged 9-11 twice per week over 6 months (O'Hare et al, 2019). This program was then adapted for use with an older population of students aged 11-13 in high schools, delivered as a targeted intervention once per week over 6 months. A Phase 2 trial funded by the Department for Education tested the program in high schools and found positive effects of ES +0.13-0.25 in improved reading in this older population. Criteria were met for the recommendation of the program in high schools to be tested using a Phase 3 definitive RCT (Thurston, Cockerill, Chiang, Taylor & O'Keeffe, 2020a).

3. The Intervention

The FFTL Reciprocal Reading Secondary program was created in 2018. The version of the program used in this trial for 11-12 year olds is adapted from a previous version used in primary which was aimed at 8-11 year olds (O'Hare et al, 2019). The key adaptation from the version used with 8-11 year olds which was delivered twice per week for 20 minutes per session, is the delivery dosage and reading material used with the older students. The version designed for 11-12 year olds was adapted to be implemented using one 30 minute session per week and the books for use during delivery were age appropriately selected by the trainer for this older group of students.

Teachers and teaching assistants deliver the program to students aged 11 to 12 years in mainstream UK high Schools. The focus on professional development is a key element of the program. The training consists of two days focused on the delivery of the program, with two half days of support visits to the school whilst the program is being delivered.

The professional training aims to provide knowledge, skills and understanding required for practitioners to deliver the program in a targeted manner:

The training consists of ensuring that the teachers and teaching assistants have a clear understanding of the nature of reading comprehension. The training will also offer a selection of strategies that are based on existing evidence and some instructional elements regarding the delivery design. The training aims to cover any associated issues such as choices of texts and the use of planning and recording sheets.

By collaboratively reading the texts, the adult teacher facilitates the task of reading comprehension instruction to the participating students. The task is to use the evidence-based strategies - predict, clarify, question, and summarize. Demonstrated by the instructor, the strategies will be used collaboratively between the students, and also between the student and the instructor, and in doing so students will understand the allocated text.

The participating students will be aged 11 to 12, in a Year 7 class (equivalent to US Grade 6). The targeted program will consist of the following: a) A set of strategies – used to strategically process text; b) An instructional dialogue; c) Materials – texts; and, d) Book journal activities.

The Teachers and Teaching Assistants will deliver one weekly 30 minute session to small groups of 5-6 students who have been previously identified as having weaker reading comprehension skills in comparison to their reading accuracy ('good readers but poor comprehenders'). The program will be delivered over approximately 6 months.

The Reciprocal Reading Secondary program is outlined in Table 1. The treatment group students (up to 20 per school) will receive the intervention outside of English instruction time. The control group students (up to 20 per school) in each of the 20 schools will continue with business as usual, comprising of their normal literacy and specific comprehension instruction practices for students aged 11 to 12 years.

[Insert Table 1 here]

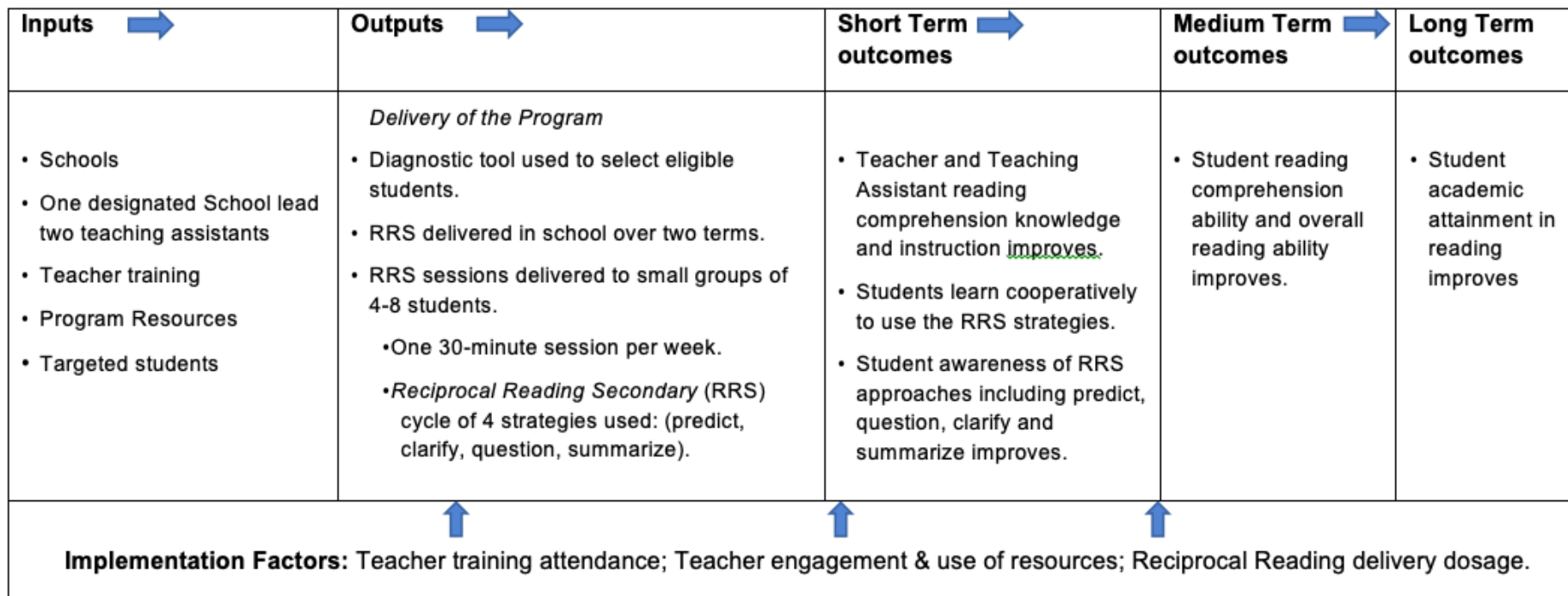
4. Program Theory of Change (ToC)

A model outlining the Theory of Change is outlined in Figure 1. It is proposed that improvements in the processes that underpin the effective use of the Reciprocal Reading Secondary technique by using a structured delivery of the program and the associated teachers/teaching assistant training. It is assumed that the reciprocal reading training and the use of these alternative reciprocal reading pedagogies will have an impact on the pedagogies of the participating teachers and teaching assistants.

It is then assumed that students who are systematically shown how to use the four strategies (predict, question, clarify, summarise) in the designed format to

interrogate text working collaboratively they will develop their skills and strengthen their ability to read with greater understanding resulting in improved reading outcomes.

Figure 1: Reciprocal Reading Secondary program Logic Model



5. Success Criteria for progression to a Phase 4 Long Term Intervention

The following success criteria will help assess whether Reciprocal Reading Secondary can progress to a Phase 4 Long Term Intervention (Medical Research Council, 2000):

- High school teachers successfully receive the appropriate training according to program specification (professional development) and this is effectively delivered according to program specification.
- That Reciprocal Reading Secondary can be delivered at a larger scale to the Phase 2 trial previously undertaken.
- Staff feedback positively on their experience of using the Reciprocal Reading Secondary program, such as to conclude that the intervention can move to a Phase 4 Long Term Implementation Trial in accordance with MRC guidelines (2000).
- The use of the program can result in significant gains in reading comprehension ability measured using NGRT reading comprehension test for students using the technique (when compared to the control group).

6. Research questions

This study will be a Phase 3 definitive RCT, where students will be randomized to condition at the individual student level. This will involve using both pairing and minimisation during randomization to ensure equal numbers of students in each arm of the trial within each of the 20 schools that will be participating.

The primary aim of the study is to look at the effect of the Reciprocal Reading Secondary program on the reading comprehension and reading ability of students in high schools. The study will test the students in the 20 schools, using standardized measures at both pre and post implementation. This will assess the effectiveness of the Reciprocal Reading Secondary program in ideal conditions on a larger scale than previously used in high schools in England.

The study will seek to answer the following research questions:

- a) Is it possible to deliver the program in high schools at greater scale than previously?
- b) What was the impact of the Reciprocal Reading Secondary targeted intervention program at post-test on:
 - Student's reading comprehension ability?
 - Student's reading accuracy?
 - Student's overall reading?
- c) Does the impact of the program differ significantly according to variations in implementation fidelity? (Process evaluation)

Answers to the above questions, and the success criteria set out above will provide evidence as to whether the program can move towards a Phase 4 Long Term Implementation (MRC 2000).

7. Methods

7.1 Logic Model

A detailed logic model has been compiled for the program intervention (Fig. 1). The steps outlined within the model will ensure that all elements of the process evaluation have been addressed and will support the interpretation of the findings of this trial. This protocol is structured using the SPIRIT guidelines to ensure all elements of the trial have been noted for protocol publication (SPIRIT, 2015).

7.2 Process evaluation

In order to measure the fidelity to implementation of the intervention, a thorough process evaluation will be conducted, and this will support the RCT. The process evaluation will be guided by the MRC Framework (Moore et al., 2015) and will look at a number of key indicators. The process evaluation will gather and analyse data on training attendance, teacher engagement and dosage. The program trainer will gather this data, and it is anticipated that this data will provide information on training attendance, and data from support sessions to schools. After the program has been implemented the staff involved in the program will complete an online survey. The survey will also ask questions in relation to learning within the control group. This information will be followed up with in-depth staff interviews in a sample of at least 25% of the participating schools in the study.

7.2.1 Process evaluation instruments

- Dosage record:

To help measure the Reciprocal Reading Secondary program implementation fidelity, the teachers will use a Reciprocal Reading Secondary program customised teacher implementation delivery plan. This will collect data on the delivery of the program and will be collected by the researchers at post-test.

- Teacher online questionnaire:

To obtain feedback on the program and the implementation process, teachers and teaching assistants will be sent an online questionnaire towards the end of the program.

- In-depth teacher interviews:

Teacher interviews using open ended questions based on the themes arising from the results of the teacher online questionnaire will be undertaken in a sample of schools.

- Reciprocal Reading Secondary observations using an adapted version of the S-TOP measure (Howe, Tolmie, Thurston, Topping, Christie, Linvingston, Jessiman & Donaldson, 2007) .
The S-TOP scales cover group structure, teacher input and student interaction, while the observation grids focus upon student interaction alone. Observation data will be collected by teachers in the sample schools using guidance provided.
- Training delivery naturally occurring data:
 - The FFT Literacy training delivery team will collect data in relation to training attendance records.
 - Information about implementation and perception of student behaviours will be collected by program trainers during school support sessions using a standardised template in conversation with school staff.

7.3 Assessment procedures for RCT

Testing will take place pre and post program implementation with the participating students in both the control and intervention group. The schools will be asked to select up to 40 students from Year 7/Grade 6 who can decode but who are poor comprehenders, they will do this by using the criteria and guidelines set out by the trainers.

7.3.1 Measures

Students selected for the trial will be tested before the teachers are trained and before the program commences. They will then be tested again at the end of the program following approximately 6 months of intervention delivery. The participating students from each school will complete two standardized online reading tests and these will be completed under exam conditions.

- Primary outcome measure: New Group Reading Test (NGRT digital version) from GL-Assessment. This is an adaptive test which has high reliability (Alpha values 0.9) (GL-Assessment, 2018). This test has two sub-scales, sentence completion and passage comprehension. Performance on each of these sub-scales is combined to report an assessment of reading comprehension ability, both as a raw score and as an age-standardized score. Analysis will be undertaken on raw scores.
- Secondary outcome measure: Access Reading Test (ART digital version) from RS Assessment, Hodder Education. This is an adaptive test which has high reliability (Alpha values 0.94) (McCarty & Crumpler, 2018). ART has four sub-scales: vocabulary, literal comprehension, inference, and analysis. These combine to give a reading raw score, which is standardized into a reading age. Analysis will be undertaken on the four sub-scales and the combined reading raw score.

A full list of the instruments and measures are outlined in Table 2.

[Insert Table 2 here]

7.4. Sample

Up to 800 students in Year 7/ Grade 6 (11-12 year olds), from 20 state funded non selective English high schools (equivalent to US middle schools which includes Grade 6), will be recruited for this trial.

The sample will comprise of up to 40 students from each school. The school will select those students that are eligible to participate in the trial. The selection of students will be guided by the carefully developed selection criteria included in the guidance. The guidance is provided to the schools so they can identify students who are able to read with relative accuracy but who struggle with comprehending what they read.

The sample will be drawn from schools in areas of socio-economic disadvantage identified using the proxy indicator of Free School Meas (FSM Ever), with the overall sample of schools being above the national average of 14.1% of students who are eligible for Free School Meals (FSM Ever). This method is used to gain an indication of poverty in England (DfE, 2019a). The sample will be composed of state funded, schools, who identify as comprehensive or high schools. We will recruit up to 40 students from each school. The school will select the students who are eligible, given the targeted nature of the intervention. Recruiting 20 schools will ensure that the sample required is achieved and estimating approximately up to 40 students per school, will result in a sample of approximately 800 students providing ample latitude for potential attrition as the power analyses indicates a minimum of 468 is required to detect effects (see below). Students who are wrongly selected by the school as eligible, will be excluded from the sample following the pre-test, prior to randomization. The criteria for exclusion will be low reading levels, as measured by their completion of the Phonics section of the NGRT adaptive reading test, which prevents them from completing the passage comprehension section of the test.

7.5. Randomization

The individual students participating in the study will be randomized to condition. This will happen by rank ordering the students from highest attaining in reading comprehension, to lowest attaining in reading comprehension on the pre-test NGRT measure. Then a random number generator (Random Number Generator for iPhone version 5.0 by Nicolas Dean) will generate a number to assign the first student into control=0 or reciprocal reading group=1. Then all students will be sequentially assigned to condition alternately until the whole list within a school is assigned to condition.

7.6. Sample size calculation

Sample size:

Using (QFAB Bioformatics, 2019) it was possible to use an observed effect size from a previous Phase 2 trial of Reciprocal Reading Secondary to calculate a minimum sample size for a scaled trial. For a trial that assigns participants to intervention and control groups from the same school, but does not account for clustering, then a minimum sample size of 468 would be needed to detect an Effect Size of +0.13, with ANCOVA, with $p > 0.05$, and 80% power **[Removed for Review]**. Pre-test reading scores will be used as a co-variant in the ANCOVA. The test scores at pre and post-test will be compared in order to determine the risk of sampling error due to randomization (between sample ANCOVA).

Missing data: For this trial it is assumed that if there is an even distribution of sample attrition between control and intervention groups and there is reduction in the sample due to attrition at <5% (QFAB Bioformatics, 2019) then this missing data will be treated as MCAR (missing completely at random) and will be omitted from analysis. If attrition is >5% then analysis will be undertaken to determine if data is missing at random or missing not at random. This will be confirmed by partitioning the data into missing and non-missing and undertaking t-test to determine if there are significant differences. If data is missing not at random, multiple imputation will be used in any analysis.

7.7. Analysis plan

The analysis of the outcomes will include a comparison of the intervention group and the control group students. ANCOVA has been selected as the most appropriate analysis method to use. The analysis will not include English as a Second Language, Special Educational Need or Free School Meal status or gender. There is no indication within the theory of change that any of these variables will influence the outcomes noted in this trial.

Primary outcome: The primary outcome will be raw score of the reading comprehension ability at post-test measured using the New Group Reading Test from GL-Assessment (described above). An ANCOVA analysis will also use pre-test scores as a covariant to model outcomes. Results will be presented as both *Effect Sizes* on outcomes (as Cohen's d plus 95% confidence intervals) of the intervention group when compared to the control group. Outcomes of the intervention versus the control will be modelled using ANCOVA. In addition, a further ANCOVA analyses will be conducted in order to assess the sub scales of the NGRT. These analyses will include Passage Comprehension and Sentence Completion.

Secondary outcome: Secondary outcomes will be overall reading ability using the overall raw score of the Access Reading Test (ART digital version) from RS Assessment, Hodder Education, and its four subscales: vocabulary, literal comprehension, inference and analysis (described above). Again ANCOVA will be used to model effects using pre-test data from these outcomes as a co-variant.

8. Personnel

- Dr Maria Cockerill, Queen's University Belfast
- Professor Allen Thurston, Queen's University Belfast
- Dr Joanne O'Keeffe, Queen's University Belfast
- Andy Taylor, Fischer Family Trust Literacy (program developer and trainer).

9. Timescales

This research will take place over 24 months. Table 3 below details the key milestones of the study.

[INSERT TABLE 3 HERE]

10. Cost

The program cost will include all the resources and personnel involved in implementing the intervention. The cost will be calculated on a per student basis over a one-year period. The Program team have anticipated that the school may continue to implement RRS beyond this research study. The cost of the program includes: the two day teacher training sessions and support sessions which take place over two half days. The costs also cover the teaching resources, the RRS teacher manual and the student resources and books.

11. Ethical Approval

Ethical approval is obtained in two ways. The research project was approved by Social Sciences, Education and Social Work Ethics Committee from Queen's University Belfast, prior to the start of the trial. Approval for participation in the study is granted by the Headteachers during the recruitment process. The approval includes both participation in the trial and the subsequent testing.

Competing Interests Statement

The authors confirm that there are no conflicts of interest.

Acknowledgement

The study was funded by a grant from the Nuffield Foundation [Grant reference number EDO /FR-000000363].

References

Crawford, C. & Skipp, A. (2014) LIT Programme Evaluation Report and Executive Summary October 2014. London: Educational Endowment Foundation

Department for Education (2019) National curriculum assessments at key stage 2 in England, 2019 (provisional). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/830285/KS2_Provisional_publication_text_2019.pdf (accessed 15 February, 2021)

Department for Education (2019a) Schools, pupils and their characteristics: January 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/812539/Schools_Pupils_and_their_Characteristics_2019_Main_Text.pdf (accessed 16 February, 2021)

Higgins, S., Katsipataki, M., Kokotsaki, D., Coleman, R., Major, L.E., and Coe, R. (2014). *The Sutton Trust-Education Endowment Foundation Teaching and Learning Toolkit*. London: Education Endowment Foundation.

Howe, C., Tolmie, A., Thurston, A., Topping, K., Christie, D., Livingston, K., Jessiman, E., & Donaldson, C., (2007). Group work in elementary science: Towards organisational principles for supporting pupil learning. *Learning and Instruction* 17 (2007) 549e563, Elsevier. doi:10.1016/j.learninstruc.2007.09.004

Johnson, D.W., and Johnson, R.T. (2012). Restorative Justice in the Classroom: Necessary Roles of Cooperative Context, Constructive Conflict, and Civic Values. *Negotiation and Conflict Management Research*, 5, (1), 4–28.

Johnson, D.W., Johnson, R.T., and Roseth, C. (2010). Cooperative learning in middle schools: interrelationship of relationships and achievement. *Middle Grades Research Journal*, 5(1), 1-18.

Johnson, D. W., Johnson, R. T., and Stanne, M B. (2000). *Cooperative learning methods: A metaanalysis*. Minneapolis: University of Minnesota.

Kucan, L. and Palincsar, A.S. (2011). Locating struggling readers in a reconfigured landscape: A conceptual review. In M.L. Kamil, P. D. Pearson, E.B. Moje & P.P. Afflerbach (Eds.), *Handbook of reading research*. (Vol 4, pp. 341–358). New York: Routledge

McCarty, C. & Crumpler, M. (2018) *Access Reading Tests (ART) 3ED Manual, Forms A, B, C & D*. RS Assessment from Hodder Education. ISBN: 978 1 510 41689 5. [https://www.hoddereducation.co.uk/subjects/general/products/general/access-reading-tests-\(art\)-3ed-manual](https://www.hoddereducation.co.uk/subjects/general/products/general/access-reading-tests-(art)-3ed-manual)

Medical Research Council (2000) A framework for development and evaluation of RCTs for complex interventions to improve health. Retrieved from: <https://mrc.ukri.org/documents/pdf/rcts-for-complex-interventions-to-improve-health/> (11 April 2019)

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., et al. (2015). Process evaluation of complex interventions: Medical Research Council guidance. *BMJ*, 350, 1258.

Ofqual (2019) GCSEs in 2019, all entries in all subjects, England only, 16-year-olds. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/826795/GCSE_infographic_17_1_.pdf (last accessed 21 February, 2021).

O'Hare, L., Stark, P., Cockerill, M., Lloyd, K., McConnellogue, S., Gildea, A., Biggart, A., Connolly, P. & Bower, C. (2019) Reciprocal Reading: Evaluation Report. Education Endowment Foundation. https://educationendowmentfoundation.org.uk/public/files/Projects/Evaluation_Reports/Reciprocal_Reading.pdf (Accessed 14/10/20).

Organisation for Economic Co-operation and Development (2016) Programme for International Student Assessment (PISA): Results from PISA 2015, United Kingdom. <https://www.oecd.org/pisa/PISA-2015-United-Kingdom.pdf>

Palincsar, A.S. (1982) Improving the reading comprehension of junior high school students through the reciprocal reaching of comprehension-monitoring strategies. Unpublished Doctoral Dissertation, University of Illinois

Palincsar, A.S. and Brown, A.L., (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and instruction*, 1(2), pp.117-175.

Palincsar, A.S., and Brown, A.L. (1986). Interactive Teaching to Promote Independent Learning from Text. *Reading Teacher*, 39(8), 771–77.

Palincsar, A. S., Ransom, K., and Derber, S. (1988). Collaborative research and development of reciprocal teaching. *Educational Leadership*, 46, 4, 37.

Palincsar, A. S., David, Y., & Brown, A. L. (1989). *Using reciprocal teaching in the classroom: A guide for teachers*. Unpublished manuscript.

Palincsar, A. S. (1998). Social constructivist perspectives on teaching and learning. *Annual Review of Psychology*, 49, 345-375.

Pressley, M. (2000). What should comprehension be the instruction of? In M.L. Kamil, P.B. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of Reading Research* (Vol. 3, pp. 545-561). Mahwah, NJ: Erlbaum.

Rosenshine, B. and Meister, C., (1994). Reciprocal teaching: A review of the

research. Review of educational research, 64(4), pp.479-530.

Thurston, A., Cockerill, M., Chiang, T-H., Taylor, A. & O'Keeffe, J. (2020a) An efficacy randomized controlled trial of Reciprocal Reading in secondary schools, In : International Journal of Educational Research. p.1-27.
[10.1016/j.ijer.2020.101626](https://doi.org/10.1016/j.ijer.2020.101626)

Thurston, A., Cockerill, M., Taylor, A., Chiang, T-H., & O'Keeffe, J. (2020b) An efficacy randomized controlled trial of Reciprocal Reading in secondary schools: Scientific Report. Queen's University Belfast, 2020.
<https://pure.qub.ac.uk/en/publications/an-efficacy-randomized-controlled-trial-of-reciprocal-reading-in--2> (assessed 16.02.21)

Soper, D. (2019). A-priori sample size calculator for multiple regression. Retrieved from: <https://www.danielsoper.com/statcalc/calculator.aspx?id=1> (31 Jan 2019).

SPIRIT (2015). SPIRIT [ONLINE]. Available at: <http://www.spirit-statement.org/spirit-statement/>. Retrieved 1st February 2019.

Sporer, N., Brunstein, J. & Kieschke, U. (2009) Improving Students' reading comprehension skills: Effects of strategy instruction and reciprocal teacher. Learning and Instruction, 19, 3, 272-286

World Bank, (2019)
<https://www.worldbank.org/en/topic/education/brief/learning-poverty> (accessed 21 February, 2021).

Van de Pol, J., Volman, M. & Beishuizen, J. (2010) Scaffolding in Teacher–Student Interaction: A Decade of Research. Educational Psychology Review, 22, 271-296

Vygotsky L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge M.A.: Harvard University Press.

Table 1: Reciprocal Reading Secondary Program TIDieR checklist (Hoffman et al.,2014).

ITEM No.	Item
Brief Name	Reciprocal Reading Secondary program (Targeted intervention)
Why	To improve student reading comprehension ability and overall reading ability
What	Training program for teachers aimed at improving reading comprehension ability of students aged 11 to 12 years
	<i>Materials:</i> A teacher training program delivered by the Fischer Family Trust Literacy, which includes external school training (for teachers and teaching assistants) interspersed with follow up school support/training. <i>Resources:</i> including teacher manual, student tools and reading books.
	<i>Procedures:</i> External school training for the program teacher lead, and teaching assistants. Internal follow up training/support sessions have overarching themes of comprehension behaviours and awareness. A diagnostic tool is provided for school professionals to select eligible students.
Who Provided	Reciprocal Reading Secondary trainer provides teacher and teaching assistant internal and external training. Teachers and teaching assistants provide Reciprocal Reading Secondary instructional activities to students based on their training
How	Initial training sessions provided to groups of teachers by FFTL
Where	External training provided out of school setting. Internal training provided in school setting. 2 x 1 day external and 2 half day internal training.
When and how much	There are two external training sessions and two internal follow up session over the six-month period. Teachers and Teaching Assistants plan and deliver the reading intervention sessions to small groups of 4-8 students One 30-minute session is delivered per week over approximately 6 months (two terms).
Tailoring	The program logic model was not changed during the research and is included in Figure 1.
Modifications	No program modifications are being made during the trial.
How well	Planned: This will be assessed through the research process evaluation
	Actual: This will be assessed through the program Phase 3 Randomized Controlled Trial evaluation.

Table 2: Measurement tools

Outcome	Instrument	Completed by	Alpha values
Overall reading comprehension	New Group Reading Test – Overall reading	Student	0.9 (GL Assessment, 2018)
Passage Comprehension	New Group Reading Test – Passage Comprehension subtest	Student	0.9 (GL Assessment, 2018)
Reading accuracy with comprehension	New Group Reading Test – Sentence completion subtest	Student	0.9 (GL Assessment, 2018)
Overall reading	Access Reading Test	Student	0.94 (McCarty & Crumpler, 2018)

Vocabulary	ART - subscale	Student	0.94 (McCarty & Crumpler, 2018)
Literal Comprehension	ART - subscale	Student	0.94 (McCarty & Crumpler, 2018)
Inference	ART - subscale	Student	0.94 (McCarty & Crumpler, 2018)
Analysis	ART - subscale	Student	0.94 (McCarty & Crumpler, 2018)
Implementation factors			
Dosage	Up to 6 months implementation plan	Teacher	n/a
Teacher engagement	Training attendance	Trainer	n/a
Teacher engagement & student behaviours	Support session data (template used by trainer)	Trainer	n/a
Teacher engagement	Teacher survey	Teacher	n/a
Teacher engagement	Teacher interviews in a minimum sample of 25% of schools	Researcher	n/a
Teacher and Student behaviours	Lesson observations in schools	Teacher leads in schools	Adapted version of <i>S-TOP</i> (Howe, Tolmie, Thurston, Topping, Christie, Linvingston, Jessiman & Donaldson, 2007)

Table 3. Gantt Chart of timescales

Activities	Month 1-3	Month 4-6	Month 7-9	Month 10-12	Month 13-15	Month 16-18	Month 19-21	Month 22-24
Develop logic model								
Recruit schools								
Reading pre-test								
Develop survey measures								
Training day 1 (1.0)								
Program delivery in schools (Treatment group)								
In-school support visits 1 & 2 (0.5)								
Training day 2 (1.0)								
Reading post test								
Teacher survey								
Sample teacher interviews and session observations								
Session delivery data								
Analysis of data								
Write-up (include process evaluation)								
Final report								