**Further Appendices: Randomised controlled trial evaluation of the
White Rose Maths Reception Jigsaw**
Evaluation Report

October 2023

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NFER

**National Foundation for
Educational Research**

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Appendix D: Evidence base for Reception Jigsaw modules

Session content	Research evidence
Developing Early Number Sense • What is number sense? • The counting principles • Subitising • Composition of number • Comparison and number relationships	*Andrews, P., Sayers, J. & Back, J. (2013) *The development of foundational number sense in England and Hungary: a case study comparison.* *Sayers, Andrews & Björklund Boistrup (2016) *The Role Of Conceptual Subitising in the Development of Foundational Number Sense*, Stockholm University EEF (2020) *Improving Mathematics in the Early Years and KS1* Early Intervention Foundation (EIF, 2018) key competencies report: https://www.eif.org.uk/report/key-competencies-in-early-cognitive-development-things-people-numbers-and-words *Nicholas C. Johnson, Angela C. Turrou, Brandon G. McMillan, Mary C. Raygoza & Megan L. Franke (2019) "*Can you help me count these pennies?": Surfacing preschoolers' understandings of counting, Mathematical Thinking and Learning*, 21:4, 237-264, DOI: 10.1080/10986065.2019.1588206) *Sarama, J. S., & Clements, D. H. (2009). *Early childhood Mathematics Education Research*. London: Routledge. The Early Math Collaborative Erikson Institute (2014) *The big ideas of Early mathematics* WW Clearing House (2013) *Teaching Math to Young Children*
Creating a Mathematical Classroom • The 2021 educational programme and ELGs • Everyday maths through classroom routines • Opportunities for maths through continuous provision • Role of the adult in supporting learning	Bennett & Weidner (2012) *Everyday Maths through Everyday Provision* Clements and Sarama (2009) *Learning and Teaching Early Math: The Learning Trajectories Approach.* Bottrill, G. (2018) *Can I Go and Play now?* DCSF (2009) *Children thinking mathematically: PSRN essential knowledge for Early Years practitioners* DCSF (2009) *Learning. Playing and Interacting*, National Strategies Education Endowment Foundation (2019) *Early years foundation stage reforms: pilot report* EEF (2020) *Improving Mathematics in the Early Years and KS1* Early math Collaborative (2014) *Big Ideas of Early Maths* Gifford, S (2005) *Teaching Mathematics 3-5* Mohammed, R (2015) *Characteristics of Effective Learning: Play and Exploration in Action.* EY Foundation Stage Forum Article July 18 2015 National Strategies (2009) *Numbers and Patterns: Laying Foundations in mathematics* DCSF *Laevers, F (2015) *Making care and education more effective through wellbeing and involvement*. The Research Centre for Experiential Education, Belgium WW Clearing House (2013) *Teaching Math to Young Children*
Mathematical Talk and Questioning • Why is talk important? • Developing sustained shared thinking • Creating opportunities for talk • Open ended questions • Using examples and non-examples • Exploring addition and	Greg Bottrill (2018) *Can I go and Play now?* Kathy Brodie (2014) *Sustained Shared Thinking: Linking Theory to Practice* Clements and Sarama (2009) *Learning and Teaching Early Math: The Learning Trajectories Approach.* Early Math Collaborative (2014) *Big Ideas of Early Mathematics* EEF (2020) *Improving Mathematics in the Early Years and KS1* Julie Fisher (2016) *Interacting or Interfering* McCray et al (2019) *Growing Mathematical Minds.* *Siraj-Blatchford, I., Sylva, K., Muttock, S., Gilden, R. and Bell, D. (2002) *Researching Effective Pedagogy in the Early Years, (REPEY) Research Report 356* *Siraj-Blatchford (2007) *Creativity, Communication and Collaboration: The identification of Pegagogic Progression in Sustained Shared Thinking* *Sylva, Melhuish, Sammons, Siaj-Blatchford, Taggart. (2004) *The Effective Provision of Pre-School Education Project, funded by DFES* Anne Trafton (2018) *Back-and-forth exchanges boost children's brain response to language MIT News Office* Sir Peter Williams (2008) *Independent Review of Mathematics Teaching in Early Years Settings and Primary Schools Final Report.*

Session content	Research evidence
subtraction structures • Developing an understanding of position	
Reasoning and Problem Solving • Start with provision • Start with a question • Start with a story • Start with a game	Early Math Collaborative (2014) *Big Ideas of Early Mathematics* Clements and Sarama (2009) *Learning and Teaching Early Math: The Learning Trajectories Approach.* DfES EYFS card (2007b) *'Learning and Development 4.1, Play and exploration'* Woodham, L & Pennant, J (2014) *Mathematical Problem Solving in the Early Years*
Exploring Pattern and Shape • Exploring pattern and shape all around us • Repeating patterns • Exploring shape • Solving problems involving shape	Clements and Sarama (2009) *Learning and Teaching Early Math: The Learning Trajectories Approach.* Borthwick, Gifford & Thouless (2021) *The Power of Pattern* Erikson Early Math Collaborative (2014*) Big Ideas of Early Mathematics* Gifford, S (2019) *The Case for Space in the Early Years* British Society for Research into Learning Mathematics *Gunderson, E., Ramirez, G., Beilock, S.L. & Levine, S.C. (2012). *The relation between spatial skill and early number knowledge: The role of the linear number line. Developmental Psychology, 48*(5) Haylock, D and Cockburn, A ((2017) *Understanding Mathematics for Young Children* NCETM (2018) *Early Years Typical Progression Chart with additional guidance for practitioners – Pattern* NCETM (2018) *Early Years Typical Progression Chart with additional guidance for practitioners – Shape and Space* Montague-Smith, A, Cotton, T, Hansen, A & Price, A (2018) *Mathematics in early years Education* *Moss, J., Bruce, C.D., Caswell, B., Flynn, T. & Hawes, Z. (2016) Taking shape: activities to develop geometric and spatial thinking.* *Rittle-Johnson B, Zippert E, Boice K (2018) *The Roles of Patterning and Spatial Skills in Early Mathematics Development*

r* indicates that a paper tests theory of learning (information provided by WRM)

Appendix E: Information sheet and Memorandum of Understanding

THE WHITE ROSE MATHS

RECEPTION JIGSAW TRIAL

School Information Sheet

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Foundation

White
Rose
Maths

WHAT IS THE PURPOSE OF THIS RESEARCH STUDY?

Research suggests that high quality early numeracy education can have long-lasting effects and can be a major predictor of later success in school and in work. Research also suggests that too few early years teachers receive the specialist training they require to deliver this high quality mathematics education.

White Rose Maths (WRM) in conjunction with the Education Endowment Foundation (EEF) are looking to recruit schools from Yorkshire and the surrounding areas and Essex to participate in a large-scale trial of our Reception Jigsaw Package. The trial aims to measure the impact of the WRM Reception Jigsaw on pupils' early mathematical understanding. The trial will be independently evaluated by the National Foundation for Educational Research (NFER) and the results will be used to inform future guidance for school leaders.

WHAT IS THE WHITE ROSE MATHS RECEPTION JIGSAW?

► High quality CPD for Reception and Year 1 staff delivered by White Rose Maths early years specialists. This consists of 5 in-depth CPD sessions (2 hour twilights) which build up over the year to provide a coherent picture of effective teaching and learning in early maths. These sessions will be based in your school. The training comes to you.

► Based on extensive research, these sessions will provide Early Years Practitioners with a thorough understanding of the pedagogy and subject knowledge required to support children's early mathematical development. The sessions are:

1. Developing Early Number Sense
2. Creating a Mathematical Classroom
3. Mathematical Talk and Questioning
4. Reasoning and Problem Solving in the Early Years
5. Exploring Pattern and Shape

► 5 half-day visits from an Early Years SLE to support Reception Teachers in developing effective practice in their own setting.

► Gap tasks for the practitioners to complete.

► Journal to record reflections and progress.

► Access to WRM videos and materials to support practitioners.

WHO CAN TAKE PART?

Schools which meet **all** of the following criteria are invited to register their interest in taking part in the trial:

► Schools in Yorkshire and surrounding areas (up to 75 miles from Halifax), schools in Essex or schools in Outer London, close to the Essex border.

► Schools who have not previously had more than 2 sessions of the WRM Primary Jigsaw training.

► Schools who are not participating in any other EEF early years trials in 2021. If taking part in the DfE Early years Professional Development Programme, schools will commit to Reception teachers not being sent on the maths training.

► Schools who have stand-alone Reception classes (i.e. not mixed Reception/Y1).

HOW WILL THE TRIAL WORK?

Schools who agree to participate in the trial will be asked to provide WRM with a key contact in their school for the duration of the project. At the end of the summer term 2021 schools will be asked to provide a list of all children who will be starting in Reception in September 2021 along with the names and email addresses of all Reception teachers. NFER will then sample twenty children from this list who will then take part in the trial (please note that the intervention will include all children within the cohort but only twenty will be measured).

In autumn 2021 Reception teachers will complete a short observational baseline measure for the 20 sampled children and participating staff will also complete a short survey about their maths teaching. Once these activities are complete, schools will be randomly allocated to be part of either the **intervention group** or the **control group**.

Intervention schools will be asked to pay a subsidised rate of £1000+ VAT to access the training of which £250 will be returned on completion of all testing and data requirements.

Control schools will not receive the WRM Reception Jigsaw at this time, however these schools are essential for us to understand the impact of the intervention and will receive £750 on completion of the testing and data requirements. They will also have the opportunity to access the training package at a later date at a discounted rate.

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WHAT ARE THE POTENTIAL BENEFITS FOR MY SCHOOL?

Intervention schools

- ► Specialist training and support in teaching early mathematics at a heavily subsidised rate.
- ► Access to WRM videos and materials.
- ► Potential to improve Early Years Practitioners' subject knowledge and confidence in teaching early years mathematics.
- ► Potential to improve learning outcomes for pupils in Reception and beyond.
- ► Opportunity to contribute to educational research and become a certified EEF Project Partner School.

Control schools

- ► Opportunity to contribute to educational research to help inform future guidance for school leaders.
- ► Become a certified EEF Project Partner School.
- ► Receive £750 on completion of all testing and data requirements.
- ► Opportunity for discounted access to the WRM Reception Jigsaw package once any longitudinal data has been collected. (This is likely to be after June 2023)

WHAT DOES TAKING PART INVOLVE?

All schools will agree to:

- ► Provide pupil data in summer 2021 for those children who will be in Reception for the 2021/2022 academic year (pupil's first name, surname, date of birth, FSM status and UPN), along with the names and email addresses of all Reception teachers.
- ► Complete a short observational baseline measure in autumn 2021 for the sampled children (NFER will sample 20 children per school) before school randomisation. The observational measure will be a checklist, to be completed for each selected pupil. It will be based on the early learning goals and as such we hope that once schools have completed the Reception Baseline Assessment, teachers will find the checklist straightforward to fill in.
- ► Complete a short practitioner survey in September 2021 and again in June 2022. Some schools will be invited to take part in interviews.
- ► Allow NFER Test Administrators to come into school and carry out a post-test on the 20 sampled children in June/July 2022 (a short maths measure).
- ► Potentially provide access for evaluators to conduct an additional assessment as the Reception pupils reach the end of Year 1, this will depend on the outcomes of the trial.

Intervention groups will agree to:

- ► Pay a subsidised rate of £1000+ VAT to access the training of which £250 will be returned on completion of all testing and data requirements.
- ► Organise for all Reception staff (including support staff), Year 1 practitioners and the Maths Lead to attend the 5 twilight training sessions at their school.
- ► Release one Reception teacher and the Maths Lead to work with the SLE during the 5 half-day coaching visits.
- ► Complete gap tasks between the training sessions.
- ► Complete the journal to record reflections and progress.

It is important that you only agree to take part if you are committed to taking part in either of the two groups and are prepared to undertake all of the related evaluation activities.

HOW WILL OUR DATA BE USED AND WILL IT BE SAFE?

The data collected by the NFER will be stored confidentially and securely on password protected computers and will be held in compliance with the Data Protection Act 2018 and the General Data Protection Regulations (GDPR) guidelines. NFER, the data controller, has identified the legal basis for processing the general (legitimate interests) and special (research purposes) data. NFER's legitimate interest for processing personal data is to administer the research. Further information is available in our privacy notices (details below). The data will be treated in the strictest confidence by NFER and named data will only be used for the purposes of this research. No school, teacher or pupil will be named in any report arising from this work.

The data collected will only be used for the purposes of this trial. The overall findings from this research will be included in a report published by the EEF and used to influence practice nationally. For the purpose of research, the responses will be linked with information about the pupils from the National Pupil Database (NPD) and shared with the Department for Education, the EEF's archive manager and, in an anonymised form, with the Office for National Statistics and potentially other research teams. Further matching to NPD and other administrative data may take place during subsequent research. For further information see our privacy notices here:

https://www.nfer.ac.uk/eeyj-schools-privacy-notice
https://www.nfer.ac.uk/eeyj-pupils-privacy-notice

TIMELINE OF KEY ACTIVITIES:

November 2020 – April 2021	► Schools register interest, attend an information event and, if they choose to go ahead, sign a memorandum of understanding to commit to the trial.
June – July 2021	► Pupil information is collected from schools by the NFER. ► Reception teacher names and email addresses are collected by the NFER.
September 2021	► NFER sample twenty children per school and inform schools of selection. ► A short observational measure is collected for the sampled Reception pupils that will be provided by NFER through the secure school portal. ► Reception teachers complete the baseline practitioner survey.
October 2021	► Schools are randomly allocated to control or intervention group by NFER. ► NFER informs schools of their group allocation.
November 2021	► Schools allocated to the Intervention group start participating in the White Rose Maths Reception Jigsaw. ► Schools allocated to the Control group continue with business as usual.
June – July 2022	► NFER Test Administrators visit schools to complete post-testing. ► Reception teachers complete the endpoint practitioner survey.
June 2023	► Test administrators to potentially complete longitudinal testing at end of Y1 depending on the outcomes of the trial.

WANT TO FIND OUT MORE?

To find out more and register your interest, please contact:
eeftrial@whiterosemaths.com or give us a call on 01422 433323
There is no obligation to commit at this time and our team will be
happy to answer any questions you may have.

White Rose Maths

White Rose Maths are a small group of teachers and
mathematicians based in Halifax, Yorkshire as part of
the Trinity Multi-Academy Trust.

Influenced, inspired and informed by the work of
leading maths researchers and practitioners across
the world, White Rose Maths brings together a
team of highly experienced and passionate maths
teaching experts dedicated to developing maths
education for everyone.

EEF

The Education Endowment Foundation (EEF) was
founded in 2011 by The Sutton Trust, as lead charity
in partnership with Impetus-PEF, with a £125m
grant from the Department for Education. The EEF
is an independent charity which aims to raise the
attainment of 3-18 year-olds, particularly those
facing disadvantage; develop their essential life skills;
and prepare young people for the world of work and
further study. It does this by generating evidence
of what works to improve teaching and learning,
funding robust trials of high-potential programmes
and approaches which have yet to be tested. The
EEF then supports schools, nurseries and colleges
across the country in using evidence so that it has
the maximum possible benefit for young people.

NFER

NFER's widely respected evaluations have
informed education policy and practice for over
70 years, providing sound evidence in education
debates and national reviews. In particular, we
have delivered many high-profile evaluations of
government initiatives and practice interventions for
the Department for Education and the Education
Endowment Foundation (EEF). Our researchers,
economists, statisticians, assessment specialists,
psychometricians and operations specialists have
extensive knowledge of the education system.

Contact us via email or keep in touch on social media

✉ eeftrial@whiterosemaths.com 🐦 @whiterosemaths f www.facebook.com/whiterosemaths

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THE WHITE ROSE MATHS
RECEPTION JIGSAW:
MEMORANDUM OF UNDERSTANDING

If you would like to participate in The White Rose Maths Reception Jigsaw trial, please read and sign the Memorandum of Understanding (MOU) below, and scan and email to eeftrial@whiterosemaths.com Once we have received your MOU we will send you a confirmation email acknowledging receipt and outlining the next steps.

The following outlines our expectations of schools and teachers taking part in the trial. Participation in this research should be agreed by the Headteacher in consultation with the reception teachers who will then be taking part. Please read and sign the following document. **Please also sign and keep this copy for your reference**.

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Maths

White Rose Maths (WRM) is the developer for the trial (implementing organisation). WRM will be responsible for the training and support involved in the implementation of the Reception Jigsaw programme in schools. The National Foundation for Educational Research (NFER) is the independent evaluator for the trial. NFER is responsible for the collection and analysis of data, including administrative and assessment data, required for the evaluation of the programme.

OUR OVERALL EXPECTATIONS OF THE SCHOOL:

- The school is prepared to be allocated to either of the two groups – i.e. Intervention group or Control group.

- The school must allocate a named contact to the project (e.g. school's maths coordinator) to work with NFER and the WRM team. They should have sufficient capacity to be able to respond promptly to requests and facilitate requirements as appropriate. If the named contact leaves the school or are no longer able to meet the requirements for the role, NFER and WRM must be informed of this with details of a replacement contact.

- The school will be a point of contact for parents/carers, providing them with full information about the evaluation and their right to withdraw their child from the data sharing (NFER will provide the school all necessary documentation including a letter to be shared with parents).

- The school must inform NFER about any pupil withdrawals from the project; and of any decisions made by the school to stop participating in the intervention and/or the trial.

- Provide pupil data to NFER in summer 2021 (Pupil's first name, surname, date of birth, Free School Meals (FSM) Status and Unique Pupil Number (UPN)) for all pupils who will be in Reception in 2021/22, using our secure portal. We will ask schools to confirm this list in September in the event of any changes.

- Provide the names and email addresses of all those staff teaching in Reception and Year 1 in 2021/22.

- Complete observational measure for 20 sampled children in September 2021. The observational measure will be a checklist, to be completed for each selected pupil. It will be based on the early learning goals and as such we hope that once schools have completed the Reception Baseline Assessment, teachers will find the checklist straightforward to fill in.

- Reception teachers, reception teaching assistants and the maths coordinator to complete a practitioner survey in autumn 2021 and again in summer 2022.

- The school will allow NFER test administrators to administer the PUMA test to pupils in July 2022 and potentially again in July 2023 (depending on the outcomes of the trial).

- The schools will provide NFER with monitoring and research data by way of fidelity logs, short questionnaires and interviews (if required) as requested.

SPECIFIC EXPECTATIONS OF INTERVENTION SCHOOLS:

- Schools should be willing to pay the subsidised rate of £1000+ VAT to access the training of which £250 will be returned on completion of all testing and data requirements.

- The school should organise for all Reception staff (including support staff), Year 1 practitioners and the maths coordinator to attend the 5 twilight training sessions at their school.

- The school to release one Reception teacher and the Maths Lead to work with the SLE during each of the 5 half-day coaching visits.

- Reception teachers to complete gap tasks between the training sessions.

- Reception teachers to complete a journal to record activity and progress throughout the intervention.

- In a small number of schools, key members of staff to take part in interviews.

NFER AND WRM WILL ENSURE THE FOLLOWING:

- That a key project contact is available to support schools with the project.

- That each school has access to its own secure school portal to allow for the transfer of any data. A template will be provided to schools for all requested data.

- That control schools receive a payment of £750, and intervention schools receive a payment of £250 upon completion of post-testing requirements, by autumn 2022.

- That interviews are conducted with key staff in some schools.

- That schools are provided with results from the assessments in autumn 2022.

- That all data is analysed using secure systems.

- That schools are provided with a summary report in spring 2024.

WHEN WILL MY SCHOOL NEED TO GET INVOLVED?

Date	Research task	Further information
November 2020 to April 2021	Schools register interest, attend an information event and, if they choose to go ahead, sign the following Memorandum of Understanding to commit to the trial.	All schools commit to honouring the condition they are placed in: intervention or control
June to July 2021	Schools to send out a letter to parents informing them of the study and the data sharing. Schools will provide pupil lists for all children who will be in Reception in September 2021. Data requested will be: first name, surname, date of birth, FSM status and UPN. The NFER will provide an excel template for schools to share the data via a secure school portal. School provides a list of name and email addresses for all practitioners who will be teaching in Reception and Year 1 for the 2021/2022 academic year.	NFER will provide schools with a letter for parents that explains the research and gives them the opportunity to withdraw their child from any data sharing. This should be shared with all parents in the relevant year group ahead of data collection. Pupil data and teacher information will be collected in same template.
September 2021	NFER samples twenty children to be measured as part of the trial and inform schools of which twenty children have been selected. Reception teachers complete a short observational measure for each of the sampled children. All Reception teachers complete the baseline Teacher Questionnaire.	NFER will provide Reception teachers with detailed information on how to complete the observational measure which will be based on the early learning goals. The teacher questionnaire will be online and a link will be sent directly to each of the Reception teachers.
October 2021	Schools are randomly allocated to the intervention or control group by the NFER. The allocation is communicated to all schools.	
October 2021 to May 2022	Schools allocated to the Intervention group start participating in the White Rose Maths Reception Jigsaw. WRM will request payment of £1,000 + VAT once the first session has been delivered. Schools allocated to the Control group continue with business as usual.	Intervention schools will receive the Reception Jigsaw training and 5 school visits from White Rose Maths
November 2021 to June 2022	NFER researchers will conduct interviews with key members of staff in some of the intervention schools.	
June to July 2022	NFER Test Administrators visit schools to complete post-testing (PUMA) with the sampled 20 students. Reception teachers complete the endpoint Teacher Questionnaire.	The post-testing will be carried out by an NFER Test Administrator who will visit the school on a convenient date of your choosing within the testing period. The NFER Test Administrators are experienced, DBS checked ex-teachers who will work with schools to accommodate their needs.
September 2022	Payment of £750 to Control schools and £250 to Intervention schools	Payment will be made to control schools and intervention schools on completion of both the Teacher questionnaire and the pupil assessment.
June to July 2023	Potential visit of NFER Test Administrators to schools (depending on the outcomes of the trial), to complete further follow-up maths assessments (PUMA) at the end of Year 1 with the sampled 20 students.	

USE OF DATA

The data collected by the NFER will be stored confidentially and securely on password protected computers and will be held in compliance with the Data Protection Act 2018 and the General Data Protection Regulations (GDPR) guidelines. NFER and WRM, as joint data controllers, have identified the legal basis for processing the general data (legitimate interests). NFER's legitimate interest for processing personal data is to administer the research. Further information is available in our privacy notices (details below). The data will be treated in the strictest confidence by NFER and named data will only be used for the purposes of this research. No school, teacher or pupil will be named in any report arising from this work. NFER will delete any personal data after one year from the publication of the final report.

The overall findings from this research will be included in a report published by the EEF and used to influence practice nationally. For the purpose of research, the responses will be linked with information about the pupils from the National Pupil Database (NPD) and shared with the Department for Education, the EEF's archive manager and, in an anonymised form, with the Office for National Statistics and potentially other research teams. Further matching to NPD and other administrative data may take place during subsequent research. For further information see our privacy notice.

Privacy Notices for the study are available at:
https://www.nfer.ac.uk/eeyj-schools-privacy-notice
https://www.nfer.ac.uk/eeyj-pupils-privacy-notice

Who to contact at WRM

To find out more and register your interest, please contact:
eeftrial@whiterosemaths.com or give us a call on **01422 433323**

CONFIRMATION

☐ I confirm that I have read and understand the information provided about the project and I have passed a copy of the School Information Sheet to my designated named contact. I have had the opportunity to ask questions, and have had these answered satisfactorily.

☐ I understand that my school's participation is voluntary and that I am free to withdraw my school at any time. I will let NFER know if I choose to withdraw from the research.

☐ I agree to facilitate the activities involved in the research project as described above and in the School Information Sheet.

☐ I know whom I can contact if I have any concerns or complaints about the project.

☐ My school **will** take part in this research and agrees to the conditions stated in the Memorandum of Understanding (MOU).

School name: _____   School address: _____

Headteacher's signature: _____   Date: _____

Please provide details of a contact person for this project, recommended to be the Maths Lead:

Contact person's name:	
Contact person's job title:	
Contact person's phone number:	
Contact person's email:	

Thank you for completing this Memorandum of Understanding. We will be in touch near the end of term, by email to the designated contact person, with details of the next steps for the project.

Appendix F: Privacy notices

Evaluation of "White Rose Maths Reception Jigsaw" Privacy notice - Pupils

Why are we collecting this data?

The National Foundation for Educational Research (NFER) is collecting personal data to enable the evaluation of the 'White Rose Maths Reception Jigsaw' programme, using a randomised controlled trial. The White Rose Maths Reception Jigsaw is a teacher training programme with a focus on early years maths. The programme objective is to provide a thorough understanding of teaching methodology and subject knowledge required to support children's early mathematical development, in order to strengthen Reception teachers' confidence in their teaching. The trial aims to ascertain the impact of the intervention on pupils' mathematical attainment.

The Education Endowment Foundation (EEF) have funded this research with NFER and White Rose Maths being the joint data controllers for the trial.

What is the legal basis for processing activities?

The legal basis for processing personal data is covered by GDPR Article 6 (1) (f):

> *Legitimate interests: the processing is necessary for your (or a third party's) legitimate interests unless there is a good reason to protect the individual's personal data which overrides those legitimate interests.*

The evaluation fulfils one of NFER's core business purposes (undertaking research, evaluation and information activities) and is therefore in our legitimate interest.

How will personal data be obtained?

NFER will contact the schools participating in the project to ask them to provide pupil data via a secure online portal. The data will be for all pupils enrolled in Reception in 2021/22.

NFER will sample twenty pupils for each schools from the lists provided. The attainment of these pupils will be measured as part of the trial. NFER will inform schools of which twenty pupils have been selected. An observational baseline measure will be completed by reception teachers for each of the twenty sampled pupils in September 2021. The data will be transferred to NFER via a secure online portal, practitioners will complete the measure in an excel or word document.

Sampled pupils will take a maths test (called PUMA) in June/July 2022 and potentially in June/July 2023 (depending on the outcomes of the trial). Completed test booklets will be returned to NFER using a secure courier.

Further pupil personal and special data will be obtained indirectly from the National Pupil Database (NPD), via the Office for National Statitiscs (ONS) Secure Research Service.

What personal data is being collected by this project?

We will collect the following **personal data** about **each child** enrolled in Reception in 2021/22 directly from the school:

- Names
- date of birth,
- Unique Pupil Number (UPN),
- Free School Meal eligibility (FSM) (used to sample).

We will collect the following **personal data** about each **sampled child**, either from the school or the National Pupil Database (NPD):

- Reception Observational Checklist (from the school),
- Maths test (PUMA) score (potentially at two points in time) (from the school),
- Early Years Foundation Stage Profile outcome (EYFSP) (from NPD)

We will also check the NPD for updated FSM information at the end of the Reception year (as it may be incomplete at the start of the year).

To obtain the information from NPD, NFER will provide the Data Sharing Team at the DFE with the names of the sampled pupils, their dates of birth and UPNs, allowing a match to the National Pupil database (NPD). After the matching process has taken place, NFER will then analyse this data using the Secure Research Service (SRS) based at the ONS. NFER will access the data for analysis through the SRS secure online system. The SRS system does not allow users to remove or copy data from its servers.

Who will personal data be shared with?

Only NFER and White Rose Maths will see your child's data during the evaluation.

For the purposes of the research, pupils' names, dates of birth, UPNs, Free School Meal eligibility (FSM) and test scores will be linked with information about the pupils from the National Pupil Database (NPD). This will be done using secure data portals, and the data will be encrypted and saved to secure servers (also see section 4, above). After three months from the completion of the study, all of the matched data (i.e. to NPD) will be added to the EEF archive and then 'de-identified'[1]. This data is archived to allow for further secondary analysis. At this point, EEF becomes the data controller and NFER and WRM are no longer responsible for the data and are no longer data controllers.

At the time of writing, a process is being agreed with the DfE and the ONS for transferring the EEF archive to the ONS. The EEF archive is hosted by the Office for National Statistics (ONS) and managed by the EEF archive manager. Other research teams may use the de-identified data as part of subsequent research through the Approved Researcher Scheme[2]. The Approved Researcher Scheme is used by the Office for National Statistics (ONS) to grant secure access to data that cannot be published openly, for statistical research purposes, as permitted by the Statistics and Registration Service Act 2007 (SRSA).

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[1] De-identified means that direct and known indirect identifiers have been removed or manipulated to break the linkage to real world identities. For this research, names, dates of birth and unique pupil number (UPN) are removed from data before it is made available to researchers accessing the archive.
[2] https://www.ons.gov.uk/aboutus/whatwedo/statistics/requestingstatistics/approvedresearcherscheme

Is personal data being transferred outside of the European Economic Areas (EEA)?

No personal data is stored or transferred outside of the EEA.

How long will personal data be retained?

NFER will share all the data with EEF's data archive processor within three months of the trial completion. NFER and White Rose Maths will delete any personal and special data after one year from the publication of the final report (due for publication in 2023). Once NFER delete the data, EEF will retain sole data controller responsibility for the archived data.

Data is not kept longer than is necessary and is deleted in accordance with NFER's internal policy.

Can I stop my personal data being used?

A school, teacher or pupil can withdraw from the trial and/or from their data being used in the trial at any time. Parents will be provided with a parent letter about the project and explaining how their child's data will be collected, used and how they can withdraw from data collection. NFER appreciates schools' and participants' support in collecting the data since it is very important for the validity of the results. Should you/your school withdraw from the evaluation (i.e. decide not to engage in Reception Jigsaw if in the intervention group or complete the endpoint assessment), NFER will still use the evaluation data you have provided and access NPD data for your school unless you indicate otherwise.

NFER handles personal data in accordance with the rights given to individuals under data protection legislation. If at any time you wish us to withdraw your child's data or correct errors in it, please contact jigsawRCT@nfer.ac.uk .

In certain circumstances, data subjects have the right to restrict or object to processing. They also have the right to make a subject access request to see all the information held about them. NFER and White Rose will cooperate fully when a subject access request (SAR) is made. To exercise these rights, please contact our Compliance Officers (NFER: compliance@nfer.ac.uk White Rose: dataprotection@whiterosemaths.com)

Who can I contact about this project?

NFER is responsible for the day-to-day management of the trial. For any queries please contact jigsawRCT@nfer.ac.uk or call 01753 637252.

If you have a concern about the way this project processes personal data, we request that you raise your concern with us or White Rose Maths (EEFTrial@whiterosemaths.com) in the first instance. Alternatively, you can contact the Information Commissioner's Office, the body responsible for enforcing data protection legislation in the UK, at https://ico.org.uk/concerns/.

Last updated

We may need to update this privacy notice periodically so we recommend that you revisit this information from time to time. This version was last updated on 16th July 2020.

Evaluation of "White Rose Maths Reception Jigsaw" Privacy notice for teachers and schools

Why are we collecting this data?

The National Foundation for Educational Research (NFER) is collecting personal data to enable the evaluation of the 'White Rose Maths Reception Jigsaw' programme, using a randomised controlled trial. The White Rose Maths Reception Jigsaw is a teacher training programme with a focus on early years maths. The programme objective is to provide a thorough understanding of the pedagogy and subject knowledge required to support children's early mathematical development, in order to strengthen Reception teachers' confidence in their teaching. The trial aims to ascertain the impact of the intervention on pupils' mathematical attainment.

The Education Endowment Foundation (EEF) have funded this research with NFER and White Rose Maths being the joint data controllers for the trial.

What is the legal basis for processing activities?

The legal basis for processing personal data is covered by GDPR Article 6 (1) (f):

Legitimate interests: the processing is necessary for your (or a third party's) legitimate interests unless there is a good reason to protect the individual's personal data which overrides those legitimate interests.

The evaluation fulfils one of NFER's core business purposes (undertaking research, evaluation and information activities) and is therefore in our legitimate interest.

How will personal data be obtained?

Personal data will be collected directly from participating schools.

White Rose Maths will collect expressions of interest from schools interested in participating in the trial, in person or by email. They will collect school names, and contact details. The headteacher of participating schools will then sign a Memorandum of Understanding (MoU) which collects the details of the member of staff who becomes the key contact for the trial. This information will be transferred to NFER via a secure portal. It will be used by NFER to carry out the randomisation and proceed with the trial and evaluation.

During the trial the school will provide details for all Reception staff (including support staff), Year 1 practitioners and for the Maths Lead. The school will also provide the details of all pupils enrolled in Reception in 2021/22 (where parents have not withdrawn their child).

NFER uses a secure online portal to collect data electronically. Teacher surveys and pupil assessments (completed on paper) will be returned to NFER using a secure courier. Online activity logs and teachers' resources will be collected via the secure portal. Interviews will also be used to collect teachers' views about the trial.

Further personal data about teachers will be collected throughout the trial (see section 4 for full details).

What personal data is being collected by this project?

White Rose Maths is collecting expressions of interest; schools who express their interest to participate in the trial are asked to sign a MoU, providing name and contact details for the identified Contact person. The MoUs will then be transferred to NFER. NFER will collect the remaining personal data required for the evaluation directly from participating schools.

Personal data for the main evaluation will include data about staff from the participating schools as described below.

For the headteacher and the contact person the personal data collected is:

- names,
- contact details,
- job role.

For the Reception staff (including support staff), Year 1 practitioners and for the Maths Lead the personal data collected is:

- names,
- contact details,
- job role,
- sessions attendance information.

For the Reception teachers, teaching assistants and Maths Leads, in addition to the personal data listed above, the following is collected:

- information regarding their confidence in teaching maths
- views about the intervention.

NFER will collect this data to evaluate the outcomes of the trial and to liaise with the individuals about the evaluation. For example, names and email addresses will be collected so that NFER can send the link to online questionnaires directly to individual members of staff.

Who will personal data be shared with?

Following recruitment, White Rose Maths will share staff personal details with NFER via a secure portal.

At the end of the trial, for each school NFER will share Reception teacher, reception support staff and Maths Lead data (job role, session attendance information, information regarding their confidence in teaching maths) with EEF's data archive processor through secure data portals, where it will be encrypted and saved to secure servers. This data is archived to allow for further secondary analysis. At that point, EEF will become the data controller and NFER and WRM will no longer hold responsibility for the data and will no longer be the data controllers.

At the time of writing, a process is being agreed with the DfE and the ONS for transferring the EEF archive to the ONS. The de-identified[3] datasets from this project will, in time, be added to the EEF archive. The EEF archive is hosted by the Office for National Statistics (ONS) and managed by the EEF archive manager. Other research teams may use the de-identified data as part of subsequent research through the Approved Researcher Scheme[4]. The Approved Researcher Scheme is used by the Office for National Statistics (ONS) to grant secure access to data that cannot be published openly, for statistical research purposes, as permitted by the Statistics and Registration Service Act 2007 (SRSA).

We will not share personal data collected through telephone interviews with other organisations.

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[3] De-identified means that direct and known indirect identifiers have been removed or manipulated to break the linkage to real world identities. For this research, names are removed from data before it is made available to researchers accessing the archive.
[4] https://www.ons.gov.uk/aboutus/whatwedo/statistics/requestingstatistics/approvedresearcherscheme

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If you have a concern about the way this project processes personal data, we request that you raise your concern with us or White Rose Maths in the first instance (see the details above). Alternatively, you can contact the Information Commissioner's Office, the body responsible for enforcing data protection legislation in the UK, at https://ico.org.uk/concerns/.

10   Last updated

We may need to update this privacy notice periodically so we recommend that you revisit this information from time to time. This version was last updated on 16th July 2020.

Appendix G: School-level pupil sampling syntax

library(tidyr)

setwd("…/01.Sampling")

master corresponds to the document used by NFER's research and operations group to record the collected information on reception pupils attending the participating schools

```
master=dir()[grep("Masterfile",dir())]
master=read.csv(master,skip=1,stringsAsFactors = FALSE)
```

checking if the reported FSM eligibility (Y,N, U) was reported for all the pupils and setting missing cases to unknown (U)

```
table(master$FSM..Y.N.,useNA = "ifany")
aux=nchar(master$FSM..Y.N.)==0
master$FSM..Y.N.[aux]="U"
table(master$FSM..Y.N.,useNA = "ifany")
master$FSM..Y.N.=factor(master$FSM..Y.N.,levels=c("Y","N","U"))
```

checking that there are no duplicated unique pupil ids (Pupil.ID)

```
sum(duplicated(master$Pupil.ID))==0
```

counting the number of reported FSM eligible and non-eligible pupils in each school and also the total number of pupils per school
(NFERNO is an internal unique school identifier)

```
dist=as.data.frame(table(master[,c("NFERNO","FSM..Y.N.")]))
dist=pivot_wider(dist, values_from="Freq",names_from="FSM..Y.N.")
aux=as.data.frame(table(master$NFERNO))
colnames(aux)=c("NFERNO","total")
dist=merge(dist,aux)
```

calculating the number of reported FSM eligible pupils that should be sampled in each school
in schools where no pupil in the cohort is FSM eligible or non-eligible we will just randomly draw a sample of participants and replacements

```
dist$FSM_cases=dist$Y+dist$N
dist$aux=dist$Y*dist$N
dist$FSM_cases=ifelse(dist$aux==0,0,dist$Y/dist$FSM_cases)
```

The number of FSM-eligible pupils to be sampled needs to be adjusted for schools with less than   ### 28 reception pupils

```
aux=dist$total
aux[aux>28]=28
dist$FSM_cases=aux*dist$FSM_cases
dist$aux=dist$FSM_cases
dist$FSM_cases=round(dist$FSM_cases,0)
```

All the schools with at least 1-FSM eligible pupil amongst non-eligible will include at least one FSM-pupil in the sample
```
dist$FSM_cases[dist$FSM_cases==0 & dist$aux>0]=1
```

We will try to include at least 5 FSM-eligible pupils in each school sample

```
dist$FSM_cases[dist$FSM_cases>0 & dist$FSM_cases<5]=5
table(dist$FSM_cases,useNA ="ifany")
```

In schools with less than 20 pupils the full cohort is to be included in the sample as selected to take part in the trial

```
dist$aux=dist$total<21
table(dist$aux,dist$total)
```

dist will be divided into 2 data frames, one containing the schools with less than 20 pupils (dist) ### and the other containing the schools with 21 or more pupils (dist0)

```
dist0=dist[!dist$aux,]
dist=dist[dist$aux,]
dist$FSM_sample=dist$Y
dist$sample=dist$total
```

the select data frame will contain the info of the children selected to participate in the trial and the replacements

```
select=master[master$NFERNO %in%dist$NFERNO,]
```

confirming all the cases were accounted for

```
nrow(select)==sum(dist$sample)
```

```
select=select[,c(1:10,17)]
select$Selected_for_testing..Yes.No.Reserve.="Y"
```

Separate schools where a we will just draw a random sample of selected + replacement pupils ### (dist0) from schools where we will be drawing a stratified random sample (dist00)

```
dist0$aux=dist0$FSM_cases
dist0$aux=dist0$FSM_cases==0
table(dist0$aux,dist0$FSM_cases)
dist0$FSM_sample=NA
dist0$sample=NA
```

```
dist00=dist0[!dist0$aux,]
dist0=dist0[dist0$aux,]
```

setting random seeds to ensure replicability

```
set.seed(20210916)
aux=nrow(dist0)+2*nrow(dist00)
seeds=sample.int(n=1000000,size=aux)
```

generating the selection labels (20x "Y, R1 to R8)

```
selection=1:8
selection=paste("R",selection, sep="")
selection=c(rep("Y",times=20),selection)
```

drawing the random participant +replacement sample for each school in dist0
(the first 20 elements of the random sample are assigned to participate in the trial and the remaining ones as replacements)

```
for (i in 1:nrow(dist0)){

set.seed(seeds[1])
seeds=seeds[-1]
aux=master[master$NFERNO==dist0$NFERNO[i],]
n=min(28,nrow(aux))
aux1=sample(1:nrow(aux),n)
aux=aux[aux1,]
```

```
aux$Selected_for_testing..Yes.No.Reserve.=selection[1:nrow(aux)]
aux=aux[colnames(select)]
select=rbind(select,aux)
dist0[i,"FSM_sample"]=sum(aux$FSM..Y.N.=="Y")
dist0[i,"sample"]=nrow(aux)


}


dist=rbind(dist,dist0)
remove(dist0)


## drawing the stratified participant +replacement sample for each school in dist00
### (all the FSM eligible pupils are included in the assigned to participate in the trial group  and the remaining ones
complete the assigned to participate group and replacement group)




for (i in 1:nrow(dist00)){

set.seed(seeds[1])
seeds=seeds[-1]
aux=master[master$NFERNO==dist00$NFERNO[i],]
aux0=aux[aux$FSM..Y.N.=="Y",]
aux=aux[aux$FSM..Y.N.!="Y",]
n=min(dist00$FSM_cases[i],nrow(aux0))
aux1=sample(1:nrow(aux0),n)
aux0=aux0[aux1,]
set.seed(seeds[1])
seeds=seeds[-1]
n=28-n
n=min(n,nrow(aux))
aux1=sample(1:nrow(aux),n)
aux=aux[aux1,]
aux=rbind(aux0,aux)
aux$Selected_for_testing..Yes.No.Reserve.=selection[1:nrow(aux)]
aux=aux[colnames(select)]
select=rbind(select,aux)
dist00[i,"FSM_sample"]=sum(aux$FSM..Y.N.=="Y")
dist00[i,"sample"]=nrow(aux)


}


dist=rbind(dist,dist00)
remove(dist00)

dist=dist[order(dist$NFERNO),]


### Exclude the withdrawn pupils form the selected to participate and replacement groups
### (record the withdrawn pupils Pupil.ID)

aux=master$Withdrawn.Pupil..Y.N.=="Y"
aux=master$Pupil.ID[aux]


### Merge the sampling information to master

master=master[,colnames(select)]
master=master[,-11]
select=select[,c(3,11)]
table(select$Selected_for_testing..Yes.No.Reserve.)
master=merge(master,select,all.x=TRUE)
```

```
table(master$Selected_for_testing..Yes.No.Reserve.,useNA="ifany")
master$Selected_for_testing..Yes.No.Reserve.[is.na(master$Selected_for_testing..Yes.No.Reserve.)]="N"
table(master$Selected_for_testing..Yes.No.Reserve.,useNA = "ifany")
```

Check if all the withdrawn-pupil are not in the selected to participate+ replacement sample.
(In this specific case there was only one pupil that was not selected as a participant or replacement)

```
master[master$Pupil.ID==aux,"Selected_for_testing..Yes.No.Reserve."]=="N"
```

Appendix H: Emerging Numeracy checklist

Please indicate for [insert pupil's name] whether, based on what you have observed since they started Reception, they can do each of the following tasks with support or independently.	cannot do with support	can do with support	can do independently
1. Recognises numerals 1 to 5			
2. Counts up to 3 or 4 objects by saying one number for each item in order			
3. Subitises (recognises quantities without counting) up to 5			
4. Counts objects up to 10			
5. Count objects beyond 10			
6. Counts out a smaller number of objects (up to 6) from a larger group - e.g. "give me four of the…"			
7. Selects the correct numeral to represent 1 to 5 objects			
8. Selects the correct numeral to represent 6 to 10 objects			
9. Estimates how many objects they can see and checks by counting them (up to 10)			
10. Uses the language of 'more than' and 'less than/fewer' to compare two sets of objects			
11. Finds the total number of items in two groups by counting all of them (up to 10)			
12. Finds one more or one less from a group of up to 5 objects			
13. Finds one more or one less from a group of up to 10 objects			
14. Records mathematical ideas using marks or objects they can interpret and explain			
15. Selects a particular named shape			
16. Can describe the relative position of objects or shapes such as 'behind' or 'next to'			
17. Uses familiar objects and common shapes to create and build models			
18. Continues, copies and creates repeating patterns			
19. Uses everyday language related to time			
20. Orders and sequences familiar events			

Appendix J: Randomisation syntax

setwd("…/03.Randomisation")

master corresponds to the document used by NFER's research and operations group to record the collected information on reception pupils attending the participating schools

###load data

data=dir()[grep("Masterfile",dir())]

data=read.csv(data,skip=1,stringsAsFactors =FALSE)

data=data[!is.na(data$Sample),]

We will be drawing a sample of 55 intervention schools, the remaining ones are by default ### control. We are considering strata by region Essex/Yorkshire and Sign up to MN (yes/no): we want the representativeness of each stratum in the control/intervention group to be similar to that of the sample

Determine how many intervention schools in each stratum

data$Yorkshire.Essex=trimws(data$Yorkshire.Essex)

table(data$Yorkshire.Essex)

data$Signed.up.to.MN.programme.=trimws(data$Signed.up.to.MN.programme.)

table(data$Signed.up.to.MN.programme.)

data$Signed.up.to.MN.programme.[data$Signed.up.to.MN.programme.=="Unknown"]="No"

table(data$Signed.up.to.MN.programme.)

data$block=paste(data$Yorkshire.Essex,data$Signed.up.to.MN.programme.,sep="_")

table(data$block,useNA="ifany")

table(data$Yorkshire.Essex,data$Signed.up.to.MN.programme.,useNA="ifany")

##Find out how many intervention cases to draw from each stratum (start from the smaller ones)

aux=as.data.frame(table(data$block))

aux=aux[order(aux$Freq),]

aux$Freq=round(55*aux$Freq/nrow(data),digits=0)

sum(aux$Freq)

###In this case it's irrelevant, as the total adds up to 55, but just to be extra sure we will still have 55 schools in case we need to review the randomisation at a later stage (re-using the code already written)

aux$Freq[nrow(aux)]=55-sum(aux$Freq[-nrow(aux)])

###to make the code more legible, I'll change the names of the columns in aux

```
colnames(aux)=c("block","ncases")

data=data[,c(1:7,15,51)]

data=data[,c(1:5,7,6,8:9)]
```

#*This will allow us to bring back the rows to their original order and also draw the samples*

```
data$rand="control"

data=data[order(data$NFER_No),]

data$aux=1:nrow(data)
```

Setting the seed

```
set.seed(20211025)

intervention=NULL



for (i in 1:nrow(aux)){

aux1=data$aux[data$block==aux[i,"block"]]

aux1=sort(aux1)

intervention=c(intervention,sample(aux1,size=aux[i,"ncases"]))

}
remove(aux1)



data$rand[intervention]="intervention"
```
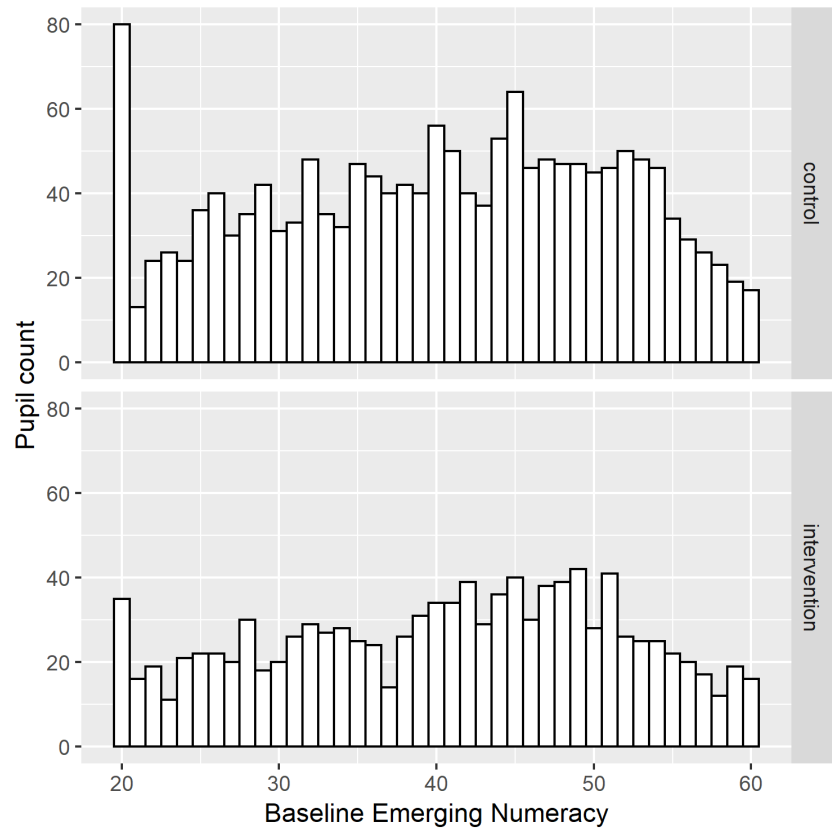
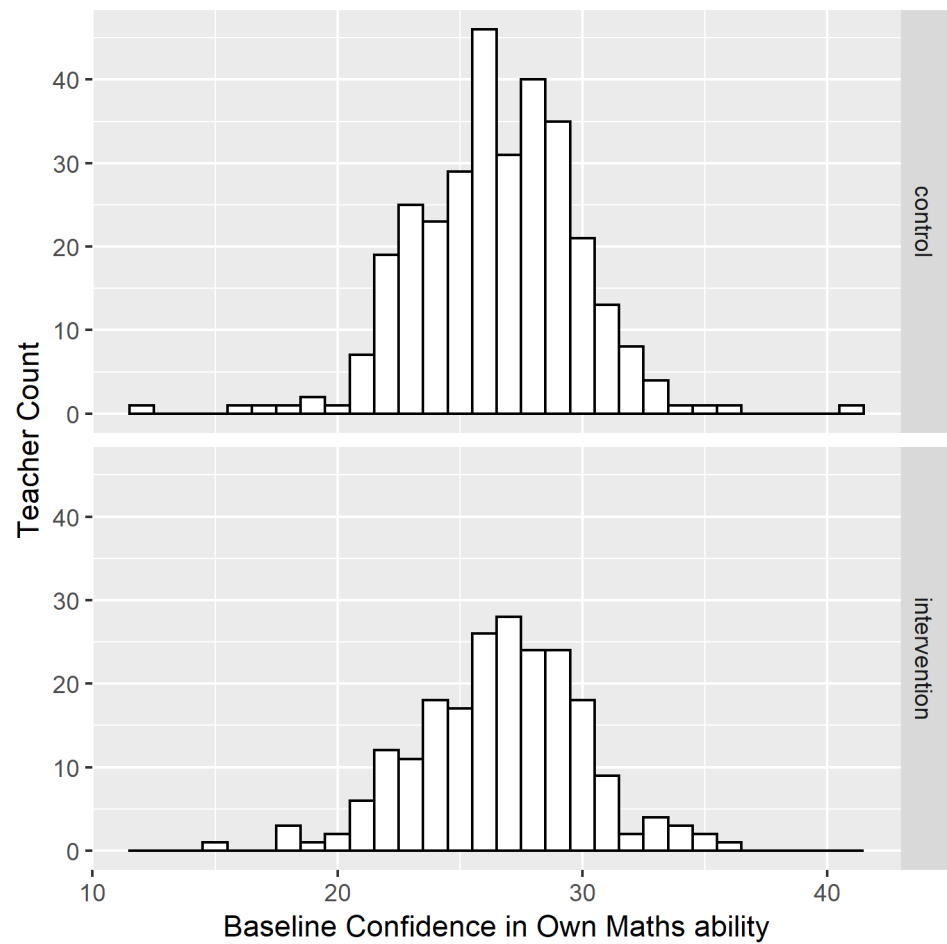# Appendix K: Histograms of baseline scores

Histogram 1 – Baseline Emerging Numeracy, split by grouping

Histogram 2 – Baseline Confidence Teaching Maths, split by grouping
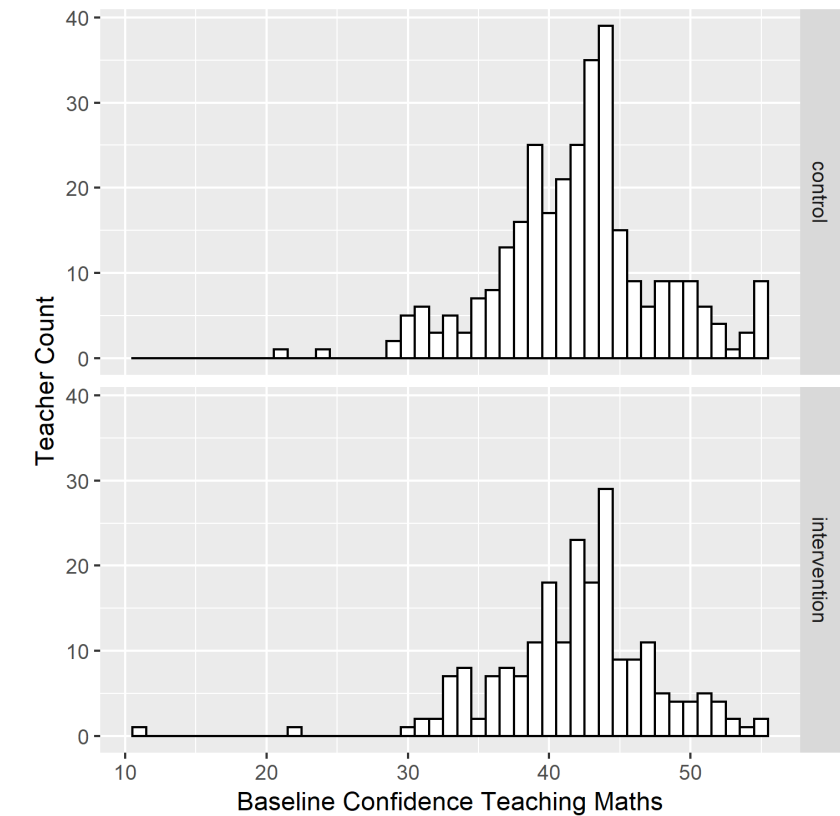
Histogram 3 – Baseline Confidence in Own Maths ability, split by grouping

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