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Effectiveness trial of Mathematical Reasoning

Submission date
10/07/2024

Recruitment status
No longer recruiting

Registration date
25/07/2024

Overall study status
Completed

Last Edited
16/06/2025

Condition category
Other

[_] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
Mathematical Reasoning is a programme developed by Oxford University for pupils in Year 2 that aims to improve mathematical attainment for all pupils by developing their understanding of the logical principles underlying mathematics. The programme focuses on quantitative reasoning and number sense and replaces one maths lesson per week for 12 weeks with a programme session. Previous studies suggest that the programme is effective at improving maths attainment when teachers are trained directly by the Oxford team, but less effective when implemented at scale with a 'train-the-trainer' approach. For the current study, Mathematical Reasoning will be implemented at scale, with training delivered via an online course, which may result in larger treatment effects than when the intervention is delivered using a 'train-the-trainer' approach. This study aims to investigate the impact of participation in Mathematical Reasoning on maths attainment for Year 2 pupils.

Who can participate?
Any state primary school in England can participate that is not already taking part in maths interventions similar to Mathematical Reasoning. Participating schools then select one or more classes of Year 2 pupils to take part. All pupils in these classes(es) can participate in the programme. Mixed classes (e.g. Year 1 and 2 pupils) can participate: all pupils in mixed classes will receive Mathematical Reasoning but only the Year 2 pupils will be included in the trial data and final analysis.

What does the study involve?
Approximately 240 primary schools will be recruited to the trial; each school will select at least one class of Year 2 pupils to take part. Schools are then randomly assigned to the intervention (Mathematical Reasoning) or control ('business as usual') so that there are 120 schools in each group. At intervention schools, a teacher and teaching assistant for the selected Year 2 class is trained in Mathematical Reasoning, via a series of online modules and webinars. They then deliver the programme to their Year 2 class, in the form of 12 units taught over 12-15 weeks, that are scheduled during normal maths lesson time. Pupils at control schools continue to be taught as usual and will not be eligible to receive the Mathematical Reasoning programme until after the trial ends.
Pupils will sit a maths test in September 2024 (before intervention delivery commences) and

again in June 2025 (after it has ended). The effectiveness of the Mathematical Reasoning programme will be measured by how much intervention pupils have improved their maths score, compared to control pupils.

What are the possible benefits and risks of participating?
The potential benefit to pupils taking part in Mathematical Reasoning is an improved understanding of maths and consequently improved exam attainment. No risks of participating are anticipated.

Where is the study run from?
The study is being run by the National Foundation for Educational Research (NFER) in England. Teachers and TAs at intervention schools access the Mathematical Reasoning training online and deliver the lessons to pupils at their school.

When is the study starting and how long is it expected to run for?
October 2023 to March 2026

Who is funding the study?
Education Endowment Foundation (UK)

Who is the main contact?
Helen Poet, h.poet@nfer.ac.uk

Study website
https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/mathematical-reasoning-2023-24-trial

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Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number

ClinicalTrials.gov number
Nil known

Secondary identifying numbers
Nil known

Study information

Scientific Title
Randomised controlled effectiveness trial investigating the effect of participation in the Mathematical Reasoning programme on maths attainment amongst Year 2 pupils

Study objectives

There is a difference in maths attainment, as measured by GL Assessment's Progress Test in Maths (PTM7), for pupils receiving the Mathematical Reasoning intervention in comparison to control pupils who do not receive the intervention.

Ethics approval required
Ethics approval not required

Ethics approval(s)
There was no formal ethical approval for this trial. However, the evaluation will be conducted in accordance with NFER's Code of Practice, available at NFER Code of Practice. Each participating school's headteacher will provide their agreement to participate in the trial by signing the Memorandum of Understanding (MoU) that outlines the responsibilities of all parties involved in the trial. NFER will share a parent letter and withdrawal form with schools to be sent to parents /carers of all pupils that schools intend to nominate for screening. Through the withdrawal form, parents/carers will have the opportunity to withdraw their child from the evaluation and associated data processing at any stage of the trial.

Study design
Interventional two-arm randomized controlled unblinded effectiveness trial with the intervention assigned at cluster (school) level

Primary study design
Interventional

Secondary study design
Randomised controlled trial

Study setting(s)
School

Study type(s)
Other

Participant information sheet
See study outputs table

Health condition(s) or problem(s) studied
Maths attainment amongst 6- and 7-year-old pupils

Interventions
Before randomisation schools select one or more classes of Year 2 pupils to participate in the trial. Randomisation will then be carried out by an NFER Statistician using R code, in a 1:1 ratio of control to intervention. Randomisation will occur at the cluster (school) level and will not be stratified. The randomisation code will be stored for reproducibility and transparency and will be included as an appendix in the statistical analysis plan and final report. The statistician will not be blinded to group allocation. Randomisation allocation data will then be passed to NFER's Research and Product Operations team, who will liaise with schools.

At intervention schools, the teacher and TA for the participating Year 2 class receive the Mathematical Reasoning online training. This training consists of nine modules. The first four

modules cover the theory and rationale and provide an overview of the programme, module 5 provides practical guidance for implementing the programme and module 9. The remaining modules are optional. After completing the modules, the teacher and TA participate in three live webinars, which focus on participant-led discussion.

Mathematical Reasoning is designed to be delivered to whole classes of pupils in the place of a normal maths lesson. The programme consists of 12 units delivered by the trained teacher, with TA support, across 12-15 weekly sessions. Each session should last about one hour: 40 minutes on a whole-class component followed by 20 minutes for group activities. For the group activities, half the class works with the teacher, while the other half plays computer games. These computer games provide an opportunity to practice the concepts taught in the whole class session.

Control Year 2 pupils continue to be taught as usual and their teacher will not receive any additional training.

Intervention Type
Behavioural

Primary outcome measure
Maths attainment measured using the GL Assessment Progress Test in Maths (PTM7) score, a continuous scale, obtained from tests administered at schools by teachers in September 2024 (the pretest measure) and by NFER test administrators in June 2025 (post-intervention)

Secondary outcome measures
The following secondary outcome variables will be measured using the GL Assessment Progress Test in Maths (PTM7) 'process' categories (subscales):
1. Fluency in facts and procedures, continuous scale
2. Fluency in conceptual understanding, continuous scale
3. Problem-solving, continuous scale
4. Mathematical reasoning, continuous scale
Each of these will be obtained from tests administered at schools by teachers in September 2024 (the pretest measure) and by NFER test administrators in June 2025 (post-intervention)

Overall study start date
23/10/2023

Completion date
30/06/2025

Eligibility

Key inclusion criteria
1. All state primary schools in England are eligible to participate: no particular regions will be prioritised during recruitment
2. The entire class of pupils completing Year 2 during the 2024/2025 academic year at a participating school is eligible for inclusion. If there are more than one Year 2 class in a school, one or multiple classes may be included, as the school wishes.

Participant type(s)
Learner/student

Age group
Child

Lower age limit
6 Years

Upper age limit
7 Years

Sex
Both

Target number of participants
6,168

Total final enrolment
6292

Key exclusion criteria
1. Schools are excluded if they are participating in the Maths-Whizz and Maths Mastery trials or participating in the 2023 pilot study of the new Mathematical Reasoning training model
2. There are no pupil exclusion criteria. The programme is delivered to the whole class, with reasonable adjustments made for pupils with special educational needs or disabilities (SEND) where necessary.

Date of first enrolment
01/02/2024

Date of final enrolment
30/06/2024

Locations

Countries of recruitment
England

United Kingdom

Study participating centre
National Foundation for Educational Research
The Mere
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Sponsor information

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Education Endowment Foundation

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Sponsor type
Charity

Website
https://educationendowmentfoundation.org.uk/

ROR
https://ror.org/03bhd6288

Funder(s)

Funder type
Charity

Funder Name
Education Endowment Foundation

Alternative Name(s)
EducEndowFoundn, Education Endowment Foundation | London, EEF

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
United Kingdom

Results and Publications

Publication and dissemination plan

The study protocol is published on the Education Endowment Foundation website here: https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/mathematical-reasoning-2023-24-trial

We intend to publish the final report in March 2026, which will be accessed in the same location.

Intention to publish date

31/03/2026

Individual participant data (IPD) sharing plan

The datasets analysed during this study will be stored in a non-publicly available repository, the EEF data archive. Within 3 months of the end of the project, NFER will send school and pupil data to the Education Endowment Foundation's (EEF) data archive partner. This will include enough pupil-level data for an analyst to replicate the impact analysis. At this point, EEF's data archive partner will keep a copy of the data and EEF will become the Data Controller. This data may be shared in an anonymised form with other research teams. Further matching to NPD and other administrative data may take place during subsequent research. All analyses will be conducted by Accredited Researchers within the Office for National Statistics' Secure Research Service.

IPD sharing plan summary

Stored in non-publicly available repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol file	version 1.0	03/07/2024	10/07/2024	No	No
Participant information sheet			17/07/2024	No	Yes