Young Enterprise: Mathematics in Context, a two-armed cluster randomised trial

Evaluation Report

September 2022

Geoff Wake, Jeremy Hodgen, Michael Adkins, Shaaron Ainsworth and Sheila Evans

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For more information about the EEF or this report please contact:

Jonathan Kay
Education Endowment Foundation
5th Floor, Millbank Tower
21–24 Millbank
SW1P 4QP

0207 802 1653

jonathan.kay@eefoundation.org.uk

www.educationendowmentfoundation.org.uk

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About the evaluator

The project was independently evaluated by a team from the University of Nottingham and the UCL Institute of Education: Geoff Wake, Jeremy Hodgen, Michael Adkins, Shaaron Ainsworth and Sheila Evans.

The lead evaluator was Geoff Wake.

Contact details:
Professor Geoff Wake
School of Education
University of Nottingham
Wollaton Road
Nottingham NG8 1BB
Tel: +44 (0) 115 846 6219
Email: geoffrey.wake@nottingham.ac.uk

Acknowledgements

The research team and authors of this report would like to thank the many teachers and their pupils who took part in the trial; both those who took part in the intervention programme and those who went about their business as usual. The time and effort they gave to ensure that we had adequate data to work with was essential and we cannot thank them enough.

We would also like to thank the developers at Young Enterprise who worked on setting up and ensuring the smooth running of the MiC programme: their work and support has been invaluable at every stage. We are especially grateful to Russell Winnard, Alison Wakefield, Jess Lee, Liz Booth Sally Thomas, Feyi Onamusi and Andrew Berry.

The team at EEF have also been extremely helpful, and especially understanding during more recent times when covid-19 slowed down our access to work with national databases of pupil performance. This has included at various times: Camilla Nevill, Florentina Taylor, Peter Henderson, Anneka Dawson, Celeste Cheung, Christine Kelly, Elena Rosa Brown, Eleanor Stringer, Ben Simuyandi and Guillermo Romero.

Finally, as a research team we work closely with our Research Operations Team in the School of Education and without their careful attention to the detail of collecting and processing the large volume of data from across all schools we could not have managed to complete this work. We would particularly like to acknowledge the work of Kanchana Minson, Alex Phillips, Laura Compton, Tamsyn Smith and James Fox.

Executive summary

The project

Young Enterprise: Mathematics in Context (MiC) is designed to improve pupils' financial capability, and specifically their financial knowledge and understanding, applied numeracy and problem-solving skills. The intervention targets all pupils over the two years of GCSE assessment. In this trial, regular Mathematics lessons were replaced with MiC lessons when pupils were in Year 10 (age 15). Teachers were asked to use a minimum of ten lessons selected from a bank of twelve. These were to be taught spread over Year 10 of the KS4 curriculum. Teachers were encouraged to continue teaching Mathematics in financial contexts to the same pupils in Year 11.

Lead teachers attended a one-day training course in regional hubs led by a Young Enterprise consultant. These lead teachers then modelled the teaching approach in their own lessons. They were also expected to disseminate the lessons within their schools by providing 'cascade' training (nominally a half-day) and mentoring to three other Year 10 Mathematics teachers. A Young Enterprise consultant provided in-school support to lead teachers.

The evaluation was a two-armed randomised controlled efficacy trial, involving 125 schools and 11,989 pupils. The process evaluation included teacher surveys and five case studies. School recruitment began in September 2016. The intervention ran in schools from September 2017 to June 2018. A specially developed and validated financial literacy test, consisting of financial problems involving some mathematics, was taken in June and July 2018. The delayed GCSE post-test was conducted in May and June 2019.

The trial was developed and delivered by the charity Young Enterprise. It was co-funded by the Money and Pensions Service as part of an EEF mini-themed round on financial education and attainment.

Table 1: Key conclusions

Key conclusions
1. Pupils in the Young Enterprise: Mathematics In Context (MiC) schools made no additional progress in Mathematics attainment compared to pupils in the other schools. This result has a high security rating.
2. Pupils in the MiC schools made no additional progress on questions in GCSE Mathematics involving problem-solving or in contexts involving money, or in financial literacy, compared to pupils in the other schools.
3. Pupils eligible for FSM in the MiC schools made no additional progress in Mathematics attainment at GCSE compared to FSM-eligible pupils in the other schools.
4. Teachers showed a high level of support for the MiC intervention. Eighty-one percent reported that they believed the intervention improved pupils' understanding and learning of financial literacy. Close to half of lead teachers felt that lessons had improved pupils' attitudes towards Mathematics.
5. The MiC intervention was carried out with high levels of compliance in terms of delivery and high fidelity in terms of the lesson aims and design. Teachers reported that the training, support and resources supplied made the intervention easy to deliver.

EEF security rating

These findings have a high security rating. This was an efficacy trial, which tested whether the intervention worked under developer-led conditions in a number of schools. 17% of the pupils who started the trial were not included in the final analysis because their school did not provide test data.

Additional findings

Pupils in MiC schools made, on average, no additional progress in Mathematics attainment compared to those in the control group equivalent. This is our best estimate of impact, which has a high security rating. As with any study, there is always some uncertainty around the result: the possible impact of this programme also includes negative effects of up to two months of less progress and positive effects of up to two months of additional progress. In terms of secondary outcomes, pupils took a financial literacy test immediately after the intervention. For this test, pupils in MiC schools made, on average, no additional progress compared to those in the control group equivalent. Secondary outcomes related to the GCSE Mathematics results were also investigated. This analysis looked in detail at questions relating to problem-solving, those set in a financial context, and questions related to money. The results for all outcomes indicated effects that were all very small in magnitude, indicating zero months' progress[1].

The intervention was delivered as intended. Lead teachers appreciated the initial training and in-school consultant support, and were positive about the initial professional development (PD) session delivered by Young Enterprise. Consultants provided in-person visits or remote support as expected, and most teachers reported receiving cascade training from lead teachers. Teachers delivered the lessons with fidelity, with, on average, 8.8 lessons taught per teacher (against a target of 10) and adaptations often related to small details rather than pedagogic strategies.

Lead teachers and teachers valued this intervention. Most believed that it improved pupils' understanding, learning and attitudes to financial literacy. Approximately half of lead teachers felt that the lessons had improved pupils' attitudes towards mathematics. But most teachers believed that the intervention did little to improve their pupils' mathematical knowledge and were neutral with regards to this.

There was some evidence that teachers' own financial literacy improved significantly as a result of the intervention. Since teacher knowledge is a critical factor in the quality of teaching (Coe *et al.,* 2014), this may partially explain the trial result. The PD for this intervention was limited: just one day of training for the lead teachers, who were then expected to 'cascade' this training to colleagues. A more intensive PD programme together with coaching might be required to develop teachers' knowledge and pedagogic skills of financial literacy.

The intervention was largely delivered when the pupils were in Year 10, a year before they took the GCSE examination. Given this delay, and as financial literacy can only be expected to support a small part of the examination syllabus,[2] the lack of an effect on the GCSE is perhaps not surprising. However, the financial literacy test was taken by pupils immediately following the intervention and there was no impact on this secondary outcome measure. It may be that pupils needed more time to develop an understanding of the financial concepts introduced in the MiC lessons in order to then solve financial literacy problems. Alternatively, a more substantial intervention involving more lessons may have been more likely to have had an impact on the pupils' financial literacy.

Cost

The average cost of MiC for one school was around £1,807, or £2.42 per pupil per year when averaged over three years. This assumes 83 pupils per year, rising cumulatively from 83 pupils in the first year to 249 pupils in the third year. Each pupil would receive one year of the main intervention, followed by additional materials in Year 11.

Impact[3]

Table 2: Summary of impact on primary outcome(s)

Outcome / group	Effect size (95% credible interval)	Estimated months' progress	EEF security rating	No of pupils observed (intervention; control)	EEF cost rating
GCSE Mathematics standardised raw score (z-score by board and tier)	0.02 (−0.10, 0.14)	0 months	🔒🔒🔒🔒	9,915 (4,898; 5,017)	£ £ £ £ £
GCSE Mathematics standardised raw score – Free School Meal (FSM) pupils	0.03 (−0.10, 0.17)	0 months	🔒🔒🔒🔒	2,249 (1,141; 1,108)	£ £ £ £ £

[1] Months' progress is explained here: https://d2tic4wvo1iusb.cloudfront.net/documents/toolkit/EEF-Toolkit-guide.pdf?v=1649831383
[2] At Foundation level across papers from the three Awarding Bodies, we found that financial context questions accounted for approximately 14% of marks, problem-solving between 20% and 30% and questions in context (rather than 'pure' mathematics) between 43% and 55% . At Higher level, between 4% and 12% of marks were available for questions in financial contexts, between 28% and 43% of marks were attributable to problem-solving and between 32% and 44% to questions in context.
[3] This work was produced using statistical data accessed via the ONS Secure Research Service. The use of this data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

Introduction

Background

Given the emphasis on financial education in the National Curriculum in Mathematics citizenship, providing guidance to schools on effective ways of teaching financial capability is both important and timely. We note that the terms *financial literacy* and *financial capability* are often used interchangeably as intended outcomes for financial education. The OECD PISA study defines financial literacy as follows:

> *"Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life" (OECD, 2013, p.144).*

In contrast, the Money and Pensions Service (2014; Bagwell *et al*., 2014) define financial capability as having three broad dimensions – *connection*, which is related to exposure and access to appropriate financial products and channels; *mindset*, which looks at financial attitudes and motivations as well as more general attitudes and motivations; and finally *ability*, which addresses both financial knowledge and understanding, as well as basic skills such as applied numeracy, literacy and problem-solving. In this report, we will in general refer to financial capability to encompass these complex interacting aspects of learning.

Financial capability is an important life-skill and is likely to make a significant difference to young people's life chances, particularly those from the most disadvantaged groups. Indeed, results from the latest UK Adult Financial Capability Survey (Money and Pensions Service, 2018) indicate that disadvantaged groups tend to face the greatest challenges relating to managing money and making financial decisions.

Financial education is, however, relatively poorly understood. The 2018 evidence review 'Developing financial capability in children and young people' noted "A great deal of the evidence of impact from financial capability interventions for CYP is relatively recent and much of it is lacking in substance and rigour" (Money and Pensions Service, 2018, p. 3). Nevertheless, some recent evidence is available. O'Prey & Shephard's (2014) meta-analysis of 21 studies of financial education found greater effects on knowledge (0.18) than on attitudes (0.08) or behaviour (0.07). However, a meta-analysis of 19 studies for the World Bank (Miller *et al.,* 2014) found effect sizes on different behaviours ranging from 0.10 to −0.08. In both meta-analyses, the results should be treated with a great deal of caution as they aggregate widely different studies set in both developed and developing countries (not including the UK).

Financial education presents a number of challenges: First, financial capability is not equivalent to numeracy or attainment in mathematics. Indeed, whilst numeracy is a necessary element, it is not on its own sufficient for the development of financial capability (e.g., Huston, 2010). Hence, whilst the OECD's PISA survey at age 15 internationally finds a relatively high correlation between mathematics and financial literacy (0.87), the survey also found "a wide dispersion of pupil performance in financial literacy amongst pupils who scored at the same level in the mathematics and reading assessments" (OECD, 2020, p. 62). Second, the use of real-world contexts in teaching, particularly mathematics teaching, is fraught with difficulties (e.g., Lave, 1988). Improving financial capability at least in part involves the application and use of numeracy in context, yet evidence suggests that teachers find the application and use of mathematics difficult to teach (e.g., Lesh & Zawojewski, 2007) and that context may in some circumstances hinder, rather than enhance, pupil learning of mathematics (Kaminski *et al.,* 2008). Third, Gieger, Goos & Forgasz's (2015) survey of the literature found only very limited research about the teaching of financial capability within the mathematics curriculum along with mixed results for interventions in financial education. Fourth, financial education may be hindered by pupils' lack of experience and familiarity with financial products and decisions (Bagwell *et al.,* 2014). Teachers themselves often have poor knowledge and understanding of finance issues and financial capability, and this is likely to impact on pupil learning (Atkinson, 2008).

Intervention

MiC is an intervention that seeks to improve children's financial capability, and specifically their financial knowledge and understanding, applied numeracy and problem-solving skills. The intervention is based on an adapted form of an earlier project funded by the London Schools Excellence Fund (PFEG, 2015), which was developed by the charity Young

Enterprise. This earlier project involved a small-scale evaluation of the impact on pupil attainment involving comparison of the intervention group (260 pupils) to a control group (101 pupils) who were taught by the same teachers. This intervention group made greater gains on a levelled GCSE-based assessment of their mathematics.

The trial intervention was delivered by Young Enterprise, the developer, and took place over the school year 2017–18. The intervention consists of a series of 10–12 lesson plans, each focused on a specific area of mathematics in the context of financial capability and aimed at Year 10 pupils, together with a one-day external initial training programme, on-going in-school support from a Young Enterprise consultant mentor, and cascade training to colleagues within the mathematics department by the designated school lead.

The TIDier framework is accompanied by an illustrative logic model (see Figure 1).

1. Brief name:

Young Enterprise: Mathematics in Context (MiC)

2. Why (rationale/theory):

The intervention is based on an adapted form of an earlier project funded by the London Schools Excellence Fund (PFEG, 2015), which was developed by the charity Young Enterprise. This earlier project involved a small-scale evaluation of the impact on pupil attainment involving comparison of the intervention group (260 pupils) to a control group (101 pupils) who were taught by the same teachers. This intervention group made greater gains on a levelled GCSE-based assessment.

3. Who (recipients):

A minimum of four Year 10 classes (25 pupils per class) from a school cohort going on to sit GCSE examinations in Year 11. Most schools contributed four classes with approximately 100 pupils per school.

4. What (materials):

Each teacher was provided with a handbook, with detailed lesson plans and PowerPoint slides for 12 MiC lessons to be taught during Year 10. The lessons had been written by one of the consultants who was experienced as a writer of resources and who had previously done similar work for the developer.

In general, the Mathematics topic(s) of a lesson was embedded in a context that had either immediate interest or potential interest in the near future, such as exploring taxation of income. A problem scenario was introduced that pupils were asked to solve. Lesson plans gave the teacher a high level of support about how to run the lesson and gave advice about financial aspects. The Mathematics focus and financial capability focus for each of the lessons is listed in Table 3.

Table 3: The Mathematics and financial capability foci of the 12 MiC lessons

Lesson title	Mathematics	Financial capability
Lesson 1: Cooking on holiday	• Apply ratio to real-life contexts • Model and solve a contextualised multi-stage, real-life problem	Understand how planning expenditure within a budget helps to control spending
Lesson 2: You've been scammed	• Use a frequency tree to analyse alternative outcomes • Calculate frequencies using non-conditional and conditional probabilities • Use percentages as multiplicative operators	Understand the dangers of posting personal details online

Lesson 3: Moped to go	• Calculate simple interest and compound interest • Use of multipliers to model compounding (optional – GCSE grades 5+)	Understand how credit cards work, calculate the cost of credit and compare to a savings option
Lesson 4: Tax – what's the point	• Interpret pie charts, measure sector angles and calculate values associated with sectors • Construct pie charts	Understand how central government allocates income to national spending
Lesson 5: Tax around the world	• Calculate percentages of amounts • Interpret graphs of salary vs. tax and understand that an intersection point represents a situation where two countries' tax regimes would charge the same tax for that salary	Understand how income tax is deducted nationally and internationally
Lesson 6: Careers and cash	• Plot a real-life graph • Interpret the area under the graph as representing total pay • Estimate the area under the graph • (Mathematics Higher tier) (optional) Link the rate of pay increase to the gradient of the graph	Understand how salaries may change (grow) over time – or not.
Lesson 7: Divvying the bills	• Divide costs by given ratios (optionally, calculating costs using the unitary method)	Understand the dilemmas faced when planning and budgeting in a group. Young people talk openly about money with friends and family
Lesson 8: A trip around Europe	• Use graphs of Euro/Sterling conversions to decide which offers the best deal • Use alternative exchange rates to compare costs	Understand how best to buy foreign currency and avoid excess charges
Lesson 9: A taxi home	• Plot graphs of straight-line functions • Calculate the equation of a line between two points (optionally, plot the line within a spreadsheet)	Understand how to predict the cost of a taxi home and that it is a function of time of day as well as distance
Lesson 10: Going green	• Interpret information provided in tabular form • Solve two simultaneous equations in two variables using graphs • Model costs of utilities as straight line equations in the form $y = mx + c$	Understand how gas and electricity bills are constructed Make choices about alternative energy products
Lesson 11: Rough and ready	• Understand the need for appropriate accuracy and why estimation is a valuable tool for life • Work to a stated level of accuracy • Check answers using calculators • State result in terms of upper and lower bounds (Higher tier only)	Obtain rough costs for products Understand the need for appropriate accuracy and why estimation is a valuable tool for life

Lesson 12: Not just basic pay	• Use fractions as operators • Use percentages as operators • Solve real-life problems	Understand that people are paid for work in many different ways Know about the minimum wage and its application to young people Understand that decisions about money invariably involve an element of risk

5. What (procedures):

The lesson materials were designed to provide sufficient guidance to teach the lessons and covered both the mathematical and financial elements.

A lead teacher from each participating school attended a one-day external training course in regional hubs led by a Young Enterprise consultant. These courses were aimed at giving information to school lead teachers about the project. The training was organised in eight sections:

1. Welcome and introductions
2. MiC project overview and outcomes
3. Financial Mathematics and the GCSE
4. Evaluation process
5. MiC lesson plans
6. Lead teacher involvement and consultant support
7. Q & A session
8. Lead teacher's meeting with their consultant

Following this training, the lead teachers were expected to model the teaching approach by implementing the lessons and pedagogies into their own lessons. Also, lead teachers were expected to disseminate the lessons and approaches more widely within their schools by providing 'cascade' training (nominally half a day) and ongoing mentoring to the three other Year 10 Mathematics teachers.

Additionally, the Young Enterprise consultants provided 'bespoke' in-school support to lead teachers, adapting this support to the perceived and emerging needs of the school's teachers and pupils. A key aspect of the consultant's work with a school was to support the lead teacher with their 'cascade' training. The Young Enterprise consultant was expected to provide three days' equivalent time of mentoring support delivered over up to eight visits.

6. Who (implementers):

There were several implementers: lead teachers, other Mathematics teachers and Young Enterprise consultants.

Each school identified one lead teacher and at least three other Mathematics teachers, all with Year 10 Mathematics classes. All these teachers taught MiC lessons.

Young Enterprise consultants aimed to:

- Ensure that lead teachers understood the aims of the project, as well as the evidence supporting the inclusion of Mathematics within a greater financial context, and how this can positively impact pupil engagement and attainment.
- Allow teachers to use supporting resources that they found themselves (as long as the financial context of the lesson plans remained intact).
- Help teachers differentiate the lesson plans to suit their pupils where and when this was raised as an issue
- Ensure that lead teachers were on track for delivery of given lesson plans as per monthly aims.
- Complete Young Enterprise lesson-tracking sheet to record lessons taught.
- Help facilitate evaluation procedures and processes as provided by the University of Nottingham.
- Provide in-school support and mentoring for the cascade training session.
- Ensure that lead teachers understood the cascade training. Although lead teachers were expected to lead on the cascade training, consultants were able to collaborate on this if required.

7. How (mode of delivery):

Each teacher (i.e., the Lead Teacher and the three other mathematics teachers), were expected to teach MiC lessons during timetabled mathematics lessons in Year 10. Teachers were encouraged to continue teaching financial capability in mathematics to the same pupils in Year 11 during the 2018–19 academic year. Access to an online forum with additional online materials was provided to facilitate this.

8. Where (setting):

MiC lessons were taught in pupils' normal Mathematics classrooms (equipped with a data projector to work with the lesson introductory materials).

9. When and how much (dosage):

Teachers were asked to teach at least 10 of the 12 MiC lessons during Year 10 at times convenient to the teacher and aligned with the school's scheme of work in Mathematics.

Teachers were encouraged to continue teaching financial capability in Mathematics to the same pupils in Year 11 during the 2018–19 academic year. No additional support was offered.

10. Tailoring:

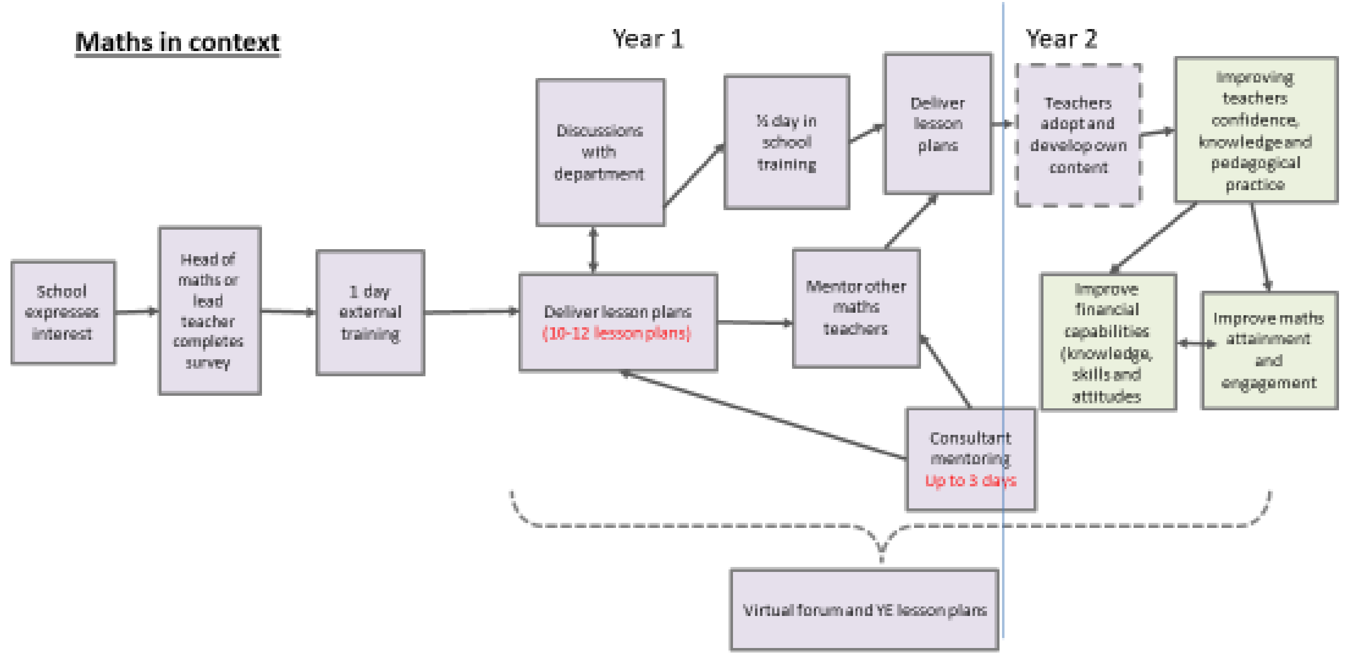
Lead teachers could make minor changes to the lesson plans in order to best fit with particular topics they were covering or to better cater to pupils' needs. For example, changes might be made to capture a particular aspect of the context that might make the lesson more motivating for pupils. These changes were to be made by lead teachers rather than consultants or other teachers. It was expected that the consultants would ensure that the financial context of the lesson plans remains intact.

This was in line with the directions given at the initial training for lead teachers at which they were informed that they, "with support from Young Enterprise consultants, should try and ensure consistency in terms of all teachers delivering the lesson plans, and sticking to the lesson objectives and materials in each [lesson]". The Young Enterprise consultants were also tasked with helping the lead teacher to monitor their participating teachers to ensure and assess that there was consistency in the delivery of the lesson plans.

11. How well (planned):

Schools were required to enable the lead teacher to attend the one-day training course, ensure that the other Mathematics teachers received the cascade PD, and that the required MiC lessons were taught to all the relevant Year 10 classes. The Young Enterprise consultant was available to support this.

Figure 1: Young Enterprise MiC Logic Model



Evaluation objectives

Impact evaluation

The Young Enterprise MiC evaluation sought to address the following research questions (RQs). These were set out in the evaluation **protocol**, discussed further in the **statistical analysis plan**.[4]

The evaluation addressed the following primary research question:

RQ1. Does Young Enterprise: Maths in Context have significant effect on pupils' attainment in Mathematics at GCSE when compared to a business-as-usual control?

In addition, the evaluation addressed the following secondary research questions:

RQ2. Does Young Enterprise: Maths in Context have significant effect on pupils' financial capability when compared to a business-as-usual control?

RQ3. Does the intervention have a significant effect on pupils' attainment in a GCSE Mathematics financial capability sub-scale when compared to a business-as-usual control?

RQ4. Does the intervention have significant effect on pupils' engagement in Mathematics and financial capability when compared to a business-as-usual control?

RQ5. Are the effects on mathematical attainment, financial capability and engagement significantly different for children eligible for Free School Meals (FSM)?

RQ6. Are the effects on mathematical attainment, financial capability and engagement different for girls and boys?

RQ7. To what extent are any effects on mathematical attainment, financial capability and engagement mediated by the quantity of Mathematics teaching that includes financial contexts and related problem-solving activities?

RQ8. Are there differences in the effects on mathematical attainment, financial capability and mathematical self-efficacy between the lead teachers and other teachers in the intervention schools?

Implementation and process evaluation (IPE)

The IPE addressed the following research questions:

RQ9. To what extent do the Young Enterprise training sessions, materials and resources enable teachers to overcome pupils' lack of experience and familiarity with financial products and decisions? To what extent does Young Enterprise enable teachers to use financial contexts to enhance learning of Mathematics, including the application and use of Mathematics in context? [*Specific aim of the intervention, Fidelity & Adherence, Quality*]

RQ10. To what extent do teachers perceive the intervention resources, training and mentoring to be effective? [*Specific aim of the intervention, Fidelity & Adherence, Quality*]

RQ11. To what extent do intervention schools, lead teachers and other teachers adhere to the intervention in terms of the delivery, the quality of delivery and how much of the intended programme is delivered? To what extent does the intervention enable teachers to use financial contexts and related problem-solving tasks more effectively in Mathematics lessons? To what extent is the intervention manageable for teachers to deliver? Is the intervention sufficiently adaptable to the needs of different pupils and

[4] All information pertaining to this study can be found on the EEF website
https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/maths-in-context

teachers? [*Fidelity & Adherence, Quality, Dosage, Programme differentiation, Reach, Responsiveness, Implementation factors*]

RQ12. How variable is the fidelity and quality of implementation between intervention schools? What school and contextual factors afford or constrain the fidelity quality of implementation? In what ways do schools support the delivery intervention, and to what extent are the different approaches effective? [*Fidelity & Adherence, Quality, Reach, Programme differentiation, Implementer factors*]

RQ13. To what extent is the intervention scalable? [*Factors relating to implementation*]

RQ14. To what extent does the intervention have an effect on teachers' confidence towards, knowledge of and pedagogical practice relating to financial capability and how it relates to Mathematics? To what extent are any effects on mathematical attainment, financial capability and engagement mediated by teachers' confidence towards, knowledge of and pedagogical practice relating to financial capability and how it relates to Mathematics? [*All implementation factors*]

RQ15. What does usual practice relating to the teaching of financial capability in Mathematics within control schools look like? To what extent (if at all), and how, do teachers in the control schools use financial contexts and related problem-solving tasks in Mathematics lessons? [*Monitoring of control group*]

RQ16. To what extent does the intervention encourage teachers to develop effective tasks and strategies to address financial capability in Mathematics lessons? [*Specific question relating to the aims of the intervention, Adaptation*]

Ethics and trial registration

The study was reviewed and approved by the University of Nottingham School of Education on 23rd May 2017 (ref: 2017/56). The trial is registered with ISRCTN (**www.controlled-trials.com**) reference number: ISRCTN58590757.

Data protection

As the project was approved prior to GDPR, ethical clearance was granted on the basis of opt-out consent by pupils and their parents/carers. Pupils and their parents or carers were provided with information about the project and how personal data would be processed, and given the opportunity to object and withdraw their data. Surveys (for pupils, intervention teachers, Heads of Mathematics at all schools) included information on the research and the participants were informed that completion of the survey would be taken as giving consent. For case studies, observations and interviews with teachers, and other school staff, active consent was sought on an opt-in basis. The headteacher of each school was required to sign a Memorandum of Understanding (MoU) prior to randomisation in order to participate in the trial (see Further Appendices). With the enactment of GDPR in May 2018, updated participant information sheets and privacy notices were sent to every pupil in the academic year, along with participating staff.

Data was processed under the legal basis outlined in article 6(1)(e), "necessary for the performance of a task carried out in the public interest or in the exercise of official authority." For special category data the additional legal justification for processing, as required by article 9 of the GDPR, was Article 9(2)(j), "processing is necessary for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes in accordance with Article 89(1)." Surveys and case study data were processed under Article 6(a) "the data subject has given consent to the processing of his or her personal data for one or more specific purposes." Copies of the pupil information sheet, parental information sheet and teachers' information sheet, along with the updated GDPR compliant documents can be found in the Further Appendices.

Project team

The University of Nottingham's Evaluation team was made up of:

Professor Geoff Wake directed the project and led on the development/pilot phase, the process evaluation, also contributing to the impact evaluation and validation of measures.

Professor Jeremy Hodgen jointly directed the project, contributing to all aspects of the project and led on the impact evaluation and the validation of measures.

Dr Michael Adkins conducted the randomisation procedures, quantitative analysis and contributed to all aspects of the study, including drafting the evaluation protocol and report-writing.

Professor Shaaron Ainsworth advised on aspects of experimental design and led on the development of instrument measuring pupil perceptions of how, and how frequently, real-world and financial contexts are used in Mathematics lessons.

Sheila Evans was responsible for the day-to-day management of the evaluation, maintaining contact with schools and undertaking the fieldwork and analysis relating to the process evaluation.

Dr David Martin contributed to a small study that explored the use of the approach and lessons with GCSE resit pupils in colleges and which in May 2017 produced a report on the feasibility and promise of the MiC intervention for post-16 Mathematics pupils. The outcome of this recommended that a pilot study would be needed to consider how to best situate the approach for post-16 pupils so that pupils' prior learning could be taken into account and so that they might be best motivated by the approach.

Kanchana Minson provided the day-to-day administration, including assisting the team to maintain contact with schools.

The Young Enterprise team, acting as the developer was made up of:

Russell Winnard, Director of Programmes and Services

Liz Booth, Head of Programme and Services

Alison Wakefield, Programme Manager

Jess Lee, Programme Manager

Sally Thomas, Programme Manager

Feyi Onamusi, Programme Manager

Andrew Berry, Impact and Evaluation Manager

Methods

Trial design

The MiC evaluation was designed to recruit at least four classes from a Year 10 cohort in each participating school, providing a randomised controlled efficacy trial for approximately 13,000 pupils in 130 schools.

During the trial the exam board ceased to publish uniform mark scale (UMS) scores. This resulted in a change to the primary outcome measure from UMS scores to a standardised raw score which, along with the baseline measures and the trial design, is summarised in Table 4.

Table 4: Trial design

Trial design, including number of arms		Two-arm, three-level cluster randomised trial
Unit of randomisation		School
Stratification variable(s) (if applicable)		% FSM and North–South dichotomous indicator
Primary outcome	Variable	Mathematics attainment
	Measure (instrument, scale, source)	GCSE z-score adjusted raw score, collected directly from schools.
Secondary outcome(s)	Variable(s)	Mathematics attainment (including problem-solving, context and money sub-scales); financial capability
	Measure(s) (instrument, scale, source)	GCSE grade score, 0–9, collected from schools and the NPD; GCSE; GCSE AO3 sub-scale z-score equated, collected from schools; GCSE context sub-scale z-score equated, collected from schools; GCSE money sub-scale z-score equated, collected from schools; financial capability score (bespoke questionnaire) – (0–10)
Baseline for primary outcome	Variable	Mathematics attainment
	Measure (instrument, scale, source)	KS2 Mathematics fine points, collected from the NPD
Baseline for secondary outcome(s)	Variable	Mathematics attainment; financial capability
	Measure (instrument, scale, source)	KS2 Mathematics fine points, collected from the NPD; bespoke financial capability instrument.

Participant selection

As set out in the **trial protocol**, all pupils from Year 10 undertaking the GCSE Mathematics course and sitting either foundation or higher tier papers from all three English examination boards – Assessment and Qualifications Alliance (AQA), Pearson Edexcel and Oxford Cambridge Recognition (OCR) – were eligible for inclusion in the trial.

Young Enterprise used their wide existing network to advertise the trial and approach potential schools. At the school level, all state schools were eligible unless they had been participants in Young Enterprise's previous Maths in Context trial, funded by London Schools Excellence Fund pilot (PFEG, 2015). Additionally, eligible schools needed to be able to provide a minimum of four classes of Year 10 pupils. Recruitment aimed to maximise the number of schools with an above-average proportion of pupils qualifying as everFSM6 to ensure that the sample as a whole had at least 29.3% of pupils (the national-level mean of everFSM6 pupils in secondary schools at the time of the design) in this category.

To participate in the trial, schools needed to provide:

1. Signed MoU[5]
2. Confirmation that consent forms had been sent out and any opt-outs
3. Provision of the following personal data for each pupil identified as eligible: unique pupil number (UPN), forename, surname, date of birth and gender
4. Provision of the class teacher ID.
5. Pre-test data for all eligible pupils (financial capabilities assessment only).

Outcome measures

Baseline measures

The key baseline measure for the primary analysis, and all secondary analyses using GCSE related outcomes, was the KS2 national test score in Mathematics taken by all participating pupils at age 11 (KS2 Mathematics fine points score). This was drawn from the DfE's National Pupil Database (NPD). As such all participating schools were requested to provide five points of personal data (detailed above in point 3) in order to reliably carry out the matching to existing administrative data.

Figure 2 presents a histogram of the KS2 Mathematics fine points score for all participating pupils. While there was some evidence of a floor and ceiling effect, the measure had good statistical properties and was moderately correlated with the GCSE z-score (r = 0.46) and strongly correlated GCSE grade scores (r = 0.73). Note a reason for the apparent ceiling effect is that there were approximately 800 pupils who took the optional-level 6 SAT papers, which is represented by the bin on the right-hand side of the figure.

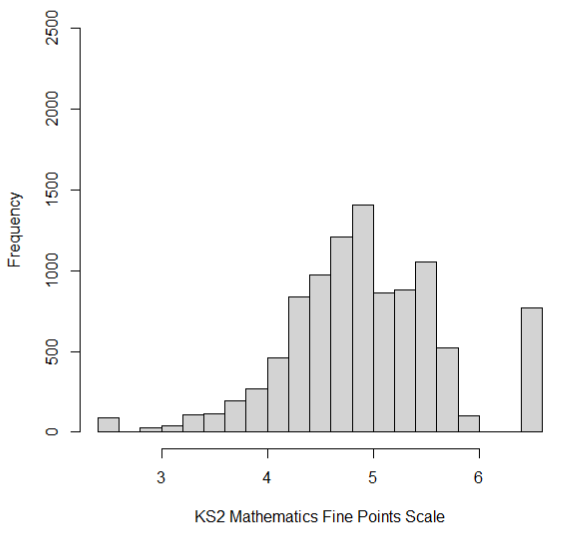


Figure 2: KS2 Mathematics fine point score histogram (N = 11,419, source: NPD).

For the secondary analysis of financial capability, pupils completed the financial capability survey prior to school randomisation. Results from the survey were used as baseline controls at post-intervention.

[5] For the MoU template, please refer to Appendix A.

Primary outcome

We originally proposed using the GCSE Mathematics UMS in order to measure attainment. Unfortunately, during the trial, the exam boards ceased publishing UMS scores within the returns to schools. Therefore, we adapted the design's primary outcome to the GCSE Mathematics raw score achieved by pupils at the first attempt. Raw scores were preferred to published grades to improve discrimination and strengthen the statistical modelling. These data were collected by schools directly on release by awarding organisations in Autumn 2019. Schools downloaded the item-level data and transferred these securely to the University of Nottingham evaluation team. In order to equate the scores, these data were adjusted by generating z-scores for tier and examination board. We standardised each tier and exam board separately to have means of 0 and standard deviations of 1 and merged to create a single scale. The distribution of the outcome is presented in Figure 3.

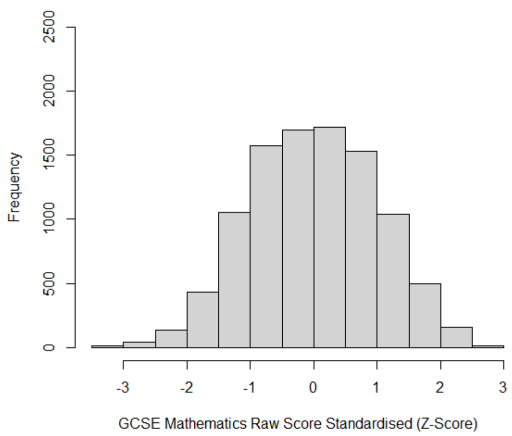


Figure 3: GCSE adjusted raw score distribution (N = 11,419, source: AQA, Edexcel and OCR)

Secondary outcomes

Four secondary outcome measures and one additional measure were proposed: three item-level GCSE Mathematics sub-scales (A03 – problem-solving, context and money) and a financial capability score. The details of collection, the distributions and design (where appropriate) are detailed below.

GCSE sub-scales (A03 – problem-solving, context and money)

The AO3 scale was created on the basis of the mark scheme for each tier issued by the respective awarding organisation. In order to create context and money sub-scales, the questions and mark schemes for each tier (Foundation or Higher) for each awarding body (AQA, Edexcel or OCR) were coded independently by two members of the evaluation team. Questions that addressed AO3 and those that were set in a financial context of money were coded as such with some questions being identified as both AO3 and financial. Agreement in coding was high and any disagreements were resolved by discussion. In each case, scores were created by summing the marks for relevant questions. These were then standardised using the same process as for the primary outcome.

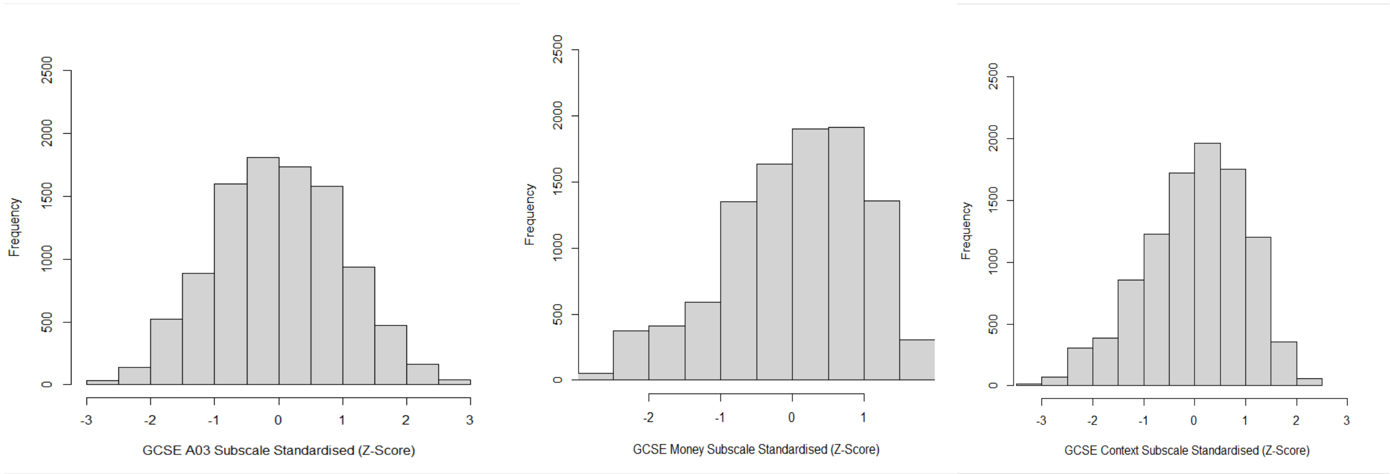


Figure 4: GCSE item-level adjusted sub-scale distributions – A03, context and money, (N = 11,419, source: AQA, Edexcel, OCR, the NPD, and UoN)

GCSE grade score

We proposed including the traditional GCSE grade score as a sensitivity analysis outcome. This was collected from schools and supplemented by data gathered from the NPD. A discrete histogram illustrating the distribution of grade scores is presented in Figure 5.

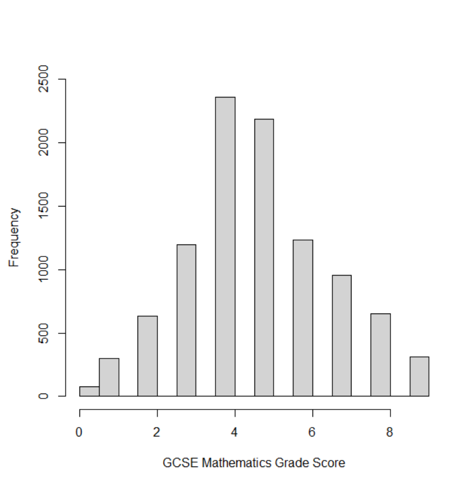


Figure 5: GCSE grade score distribution (N = 11,419, source: AQA, Edexcel, OCR and the NPD)

Financial capability test

To measure the financial capability of the pupil, we devised and validated a financial capability measure consisting of 11 multiple-choice Mathematics-based questions, which had a strong relevant financial: mobile phone contract pricing, income tax, supermarket offers, online shopping risk, travel costs, average costs, and plumbing charges. The test was piloted with 379 and 465 pupils in two separate pilots between March and April 2017 and subsequently validated using Rasch modelling.[6]

The test was in machine-readable format and administered by schools. The same test was used for pre-test (baseline) and post-test (secondary outcome).

[6] Rasch modelling is a statistical approach often used in the development of items, tests and instruments by modelling individual raw responses to dichotomous or polytomous items to build a measure of item difficulty and person ability on a latent scale. In this case we used Rasch modelling to narrow down a set of items for measuring a concept of 'financial capability' prior to and post intervention.

Sample size

We determined the appropriate sample size using Raudenbush *et al*.'s (2011) Optimal Design software to estimate statistical power based on recruiting schools to a two-arm and a three-level cluster randomised trial with the intervention delivered at level 3 – the school level. The structure of the intervention was made up of three levels – pupils were clustered in classes which were then further clustered in schools.

As the research design involved cascade training to multiple teachers, and the number of pupils involved was very high, the greatest change in power was from adding additional schools. We fixed the following parameters: $\alpha = 0.05$ (which refers to the probability of rejecting the hypothesis tested when it is true – 5%), 25 pupils per class and 4 classes per school, intra-cluster correlation for level 2 (class teachers) = 0.05 and for level 3 (schools) = 0.165 (which refers to the variance between participants with the same teacher and for those in the same school). Here, we assumed that, as pupils are generally in sets within Mathematics, this should reduce the variation observed at the class level. Since the EEF (2015) guidance on ICC indicates an ICC for GCSE Mathematics of 0.165, we considered our assumptions overall to be realistic. We also included an additional pre-test (KS2 Mathematics score) covariate as a school-level aggregate with the assumption that the post- and pre-test have a correlation of 0.7 (Benton & Sutch, 2014, p. 21) setting the level 3 variance explained at 0.49 ($r = 0.7$). This has the effect of reducing the unexplained variance and boosting the expected statistical power of the study.

This produced an estimated minimum detectable effect size (MDES) of 0.167 (for 130 schools) and 0.175 (for 120 schools). For the everFSM6 sub-group analysis, a conservative estimate of 8 everFSM6 pupils per class (approximately 30%) produced an MDES of 0.18. Further assessments of statistical power are presented in Table 9.

Randomisation

Randomisation took place in July and September 2017, with baseline testing on the financial capabilities assessment taking place in June prior to schools being randomised. Due to issues of recruitment, we randomised schools into the intervention and control conditions in two batches: 122 schools on 12th July 2017 using the stratified approach outlined below, and three schools[7] on 18th September using a simple randomisation approach. We used a school-level randomisation approach using a block design stratified by geographical area and everFSM6. The geographical location of schools was more diverse than planned, and, hence, following discussion with the developer, we decided to stratify schools into just two regions: North and South. Hence, an eight-block design was used. For the second batch, a simple randomisation procedure was adopted due to the small number of schools involved. However, we have incorporated stratification variables within the modelling as controls to adjust for everFSM6 and region across all schools.

The main block randomisation procedure incorporated three core steps. First, we pre-processed the school-level data – checking school names, Unique Reference Numbers and postcodes against Edubase records. Second, we set up a split function in R which worked on the basis of simple randomisation to split schools equally into intervention and active control arms (for use within the everFSM6 and North–South blocks). Third, we then randomised the schools, using a random number generating (RNG) seed. This was the value of the FTSE 250 at midday on the day of randomisation (12th July 2017) (seed = 19,267) which we used for both rounds of randomisation.

Statistical analysis

Our analysis modelled the effect of Young Enterprise: Mathematics in Context on the basis of intention-to-treat (ITT) using a series of linear multilevel analyses estimated by Bayesian Inference for both the primary and secondary outcomes. The analysis was conducted in the Office for National Statistics Secure Research Service (ONS SRS) as a result of changes to the way in which data extracts from the NPD are shared by the DfE.

[7] During the second round of recruitment, more schools were targeted; however, at the point of randomisation only three schools had completed the prerequisites.

Primary analysis

The primary outcome was the difference in the average post-intervention score measured by the adjusted GCSE raw score between the group receiving the Young Enterprise Mathematics in Context intervention and the business-as-usual control. It is represented by the regression equation set out below and we describe the components in detail here. The individual level of the model has a grand mean of the GCSE Mathematics score post-test (represented by β_0), which we allow to vary by membership of class and school (represented by the intercept adjustments v_{0k} and u_{0jk}); an individual-level binary treatment covariate where 0 represents those pupils who received the control condition and 1 which represents those pupils who received the MiC intervention; a normally distributed and mean-centred pre-test covariate, two randomisation covariates – everFSM6 and North–South location (β_3 and β_4) – and lastly an error term (ε_{ijk}).

$$y_{ij} = \beta_0 + \beta_1 treatment_i + \beta_2 pretest_i + \beta_3 South_k + \beta_4 everFSM6_k + v_{0k} + u_{0j} + \epsilon_{ijk}$$
$$v_{0k} \sim N(0, \sigma^2_{school}) for\ k = 1 \ldots K$$
$$u_{0j} \sim N(0, \sigma^2_{Class}) for\ j = 1 \ldots J$$
$$\epsilon_{ijk} \sim N(0, \sigma^2_{\epsilon}) for\ i = 1 \ldots N$$

This was originally going to be fitted using the R package *brms* (Bürkner, 2017), but due to software limitations within the ONS SRS, we used *rstanarm* (Goodrich, Gabry & Brilleman, 2020), which fits very similar models, but with less potential for customisation than *brms* (Bürkner, 2018). In a departure from the **SAP** as the software and recommendations have significantly evolved in the last few years, we used the following default priors – normal priors with a mean of 0 and standard deviation of 2.5 on the intercept and the coefficients, exponential priors with a standard deviation of 1 on the error term and a Lewandowski–Kurowicka–Joe prior on the covariance matrix. These were all autoscaled by the software and extremely conservative, providing a small amount of data for regularisation. The use of weakly informative priors is for improving the efficiency of the mixing of the algorithm rather than exerting significant influence on the resulting posterior distribution (for a basic discussion of the default priors and prior distribution choices, see Gelman, Hill & Vehtari, 2021, pp. 119–127).

Secondary analysis

As discussed above, we have the following secondary outcome measures – three sub-scales: scale for financial and problem-solving items from the GCSE Mathematics papers, and a bespoke financial knowledge and understanding instrument. We model these two outcomes separately using a similar model specification to the primary outcome. For the sub-scales of financial and problem-solving items, we used the KS2 Mathematics result as the pre-test. For the bespoke financial knowledge and understanding instrument, we have designed and piloted a pre-test and used this in place of the KS2 Mathematics result. For the financial and problem-solving scales, we followed the same model specification to the primary analysis. Due to data linkage difficulties, we simplified the model for the financial knowledge and understanding instrument and the equation is presented below:

$$y_{ij} = \beta_0 + \beta_1 treatment_i + \beta_2 pretest_i + \beta_3 South_j + \beta_4 everFSM6_j + u_{0j} + \epsilon_{ij}$$
$$u_{0j} \sim N(0, \sigma^2 school)\ for\ j = 1 \ldots J$$
$$\epsilon_{ijk} \sim N(0, \sigma^2_{\epsilon}) for\ i = 1 \ldots N$$

Analysis in the presence of non-compliance

Compliance was scored at the school level on a 5-point scale, using the following criteria:

- Adequate staffing: School identified one lead teacher, and (at least) three other teachers, and associated Year 10 classes [Full compliance required, aside from schools with fewer than four teachers and classes; Evidence: school data / developer records / checks by consultants]
- Attendance at training: Lead teachers attend one day training [Full compliance required; Evidence: developer attendance records]
- Cascade training: Lead teachers provide cascade training for three other teachers [Full compliance required; Evidence: teacher survey / checks by consultants]

- Consultant support: Consultants provide three days' equivalent time of mentoring support, delivered over up to eight visits [Full compliance required; Evidence: developer records]

- Lessons: All classes should be taught the MiC lessons [Minimum compliance: 10/12 lessons; Evidence: developer records / checks by consultants / teacher survey]

As pre-specified in the SAP, to assess treatment effects in the presence of non-compliance, an instrumental variables approach was undertaken using a two-stage least squares (2SLS) analysis fitted classically. Due to software limitations in the SRS this was fitted as a single-level model, which is less conservative given that standard errors are likely to be smaller and less precise than when fitted as a multilevel model. The first stage of the analysis was specified as follows:

$$Compliance\ y_i = \beta_{0i} + \beta_1 Treatment_i + \beta_2 Pretest\ Outcome_i + \varepsilon_i$$

The final stage incorporates the predicted values for compliance as a further covariate is presented below:

$$y_i = \beta_{0i} + \beta_1 Compliance\ \hat{y}_i + \beta_2 Pretest\ Outcome_i + \varepsilon_i$$

Missing data analysis

A descriptive comparison of missingness in both arms was carried out. A multilevel logistic regression model of missingness was also fitted to understand the probability of missingness for the outcome and pre-test, being fitted classically using the R package *lme4*. Due to software limitations within the ONS SRS, a two-level multilevel multiple imputation model was fitted using the primary model's outcome, covariates, school index and three auxiliary variables – everFSM6, Gender and KS4 grade score using the joint modelling package *Jomo* in R (Quartagno & Carpenter, 2022). The sampler was run for 800,000 iterations, generating five imputed datasets. Visual checks and potential scale reduction factors were assessed for evidence of convergence. The five imputed datasets were extracted, and the primary model was fitted, and posterior distributions combined. Then the appropriate summary statistics were generated, along with effect sizes.

Sub-group analyses

Four sub-group analyses were carried out using interaction models. The first examined the difference in the average score on the adjusted GCSE Mathematics raw score between those eligible for FSM in the previous six years in receipt of the MiC intervention vs. those eligible for FSM in the business-as-usual control group. The second examined the difference in the average score on the adjusted GCSE Mathematics raw score between male pupils in the treatment and control groups, and the female pupils in the treatment and control groups. The third examined the average difference in the adjusted raw score for those taught by the lead teacher,[8] and finally the fourth examined the impact of the intervention on the GCSE Mathematics raw score for those taking Higher Mathematics and those taking Foundation Mathematics papers. These were estimated and Hedges *g* standardised effect sizes and region of practical equivalence statistics were calculated in the same manner as the primary analysis and detailed below.

Additional analyses and robustness checks

We carried out the following additional analyses and robustness checks. In order to check the impact of the use of the adjusted GCSE raw score, we also modelled the GCSE grades collected from schools and further supplemented by the DfE's NPD extract. This used the same model specification and estimation procedure as the primary analysis. Secondly, we checked the robustness of our Bayesian analyses by also fitting these classically and with different software – in R and MLwiN.

Estimation of effect sizes

We estimated effect sizes by using the posterior simulations returned as part of our fitted model. This has the benefit of being able to compute direct probabilities of certain effect sizes, calculate a region of practical equivalence or ROPE,

[8] Control schools did assign both lead and cascade teachers prior to randomisation, although they never received treatment. In this case, usually lead teachers in the control setting were more experienced senior teachers.

and average effect with 95% credible intervals. The ROPE (Krushke, 2018, p. 270) provides a set of rules to allow the researcher to judge whether the evidence within a Bayesian posterior distribution is practically different from a null value. It calculates a user set highest density interval where the majority of the range of credible values fall (in our case set to between 2.5% and 97.5%) and an effect size range which we set to ±0.1 or half of a small effect. If the values fall within the effect size range, we can accept the null, if they fall outside that range we can reject the null value, and if the evidence is mixed then a decision is withheld.

Our equation for Hedges g effect sizes is set out below, where the numerator of $\overline{Yt} - \overline{Yc}$ is the mean difference in post-test scores between the treatment and control group, and the denominator ($\sigma^2 school,\ \sigma^2 class\ and\ \sigma^2$) is the square root of the three variance parameters for the school, class and individual level:

$$ES = \frac{\bar{Y}_T - \bar{Y}_C}{\sqrt{\left(\sigma^2_{randomisation\ group} + \sigma^2_{school} + \sigma^2_{class} + \sigma^2_{y}\right)}}$$

Estimation of intra-cluster correlations (ICC)

Primarily, intra-cluster correlations (ICC) provide updated data on clustering within classes and schools for future EEF trials, but they are also used to assess the power calculations made for this trial. They were calculated for the primary and secondary outcome measures using a variance components multilevel model estimated by Bayesian inference. This is an empty model which contains the outcome and the varying intercept adjustments for class and school membership only. Pupil, class and school-level variances were extracted from the posterior simulations to calculate class and school-level ICC.

Implementation and process evaluation (IPE)

The purpose of the IPE was to understand how the MiC intervention was implemented in schools; the barriers and facilitators to implementation and to delivering the implementation with fidelity; and the extent to which the mechanisms were as anticipated in the logic model and TIDieR description (see above). Additionally, the IPE compared the intervention to usual practice in the control schools and examined the potential scalability of the intervention. The specific research questions are set out in the *Evaluation objective* section above.

Multiple sources of data were collected to address the IPE research questions following a sequential mixed methods design (Johnson & Onwuegbuzie, 2004). The primary approach involved surveys which were complemented by case study data from five intervention schools chosen to be geographically dispersed and of different sizes and types. Case study data involved interviews with teachers, lead teachers and lesson observations, with the lesson observations providing prompts for interviews that were used alongside an interview protocol. In addition, administrative data were collected from the developer on attendance at training sessions, frequency of consultant visits and MiC lessons (based on teacher records). Additional data were collected through interviews with key developer personnel and observations of PD, both of which were mainly used to provide context for the IPE.

Survey data were analysed descriptively, whilst the qualitative analysis of case study data followed Braun & Clarke's (2006) six-step approach to thematic analysis, and drawing also on Nowell et al.'s (2017) related thematic approach. Table 5 summarises the dataset and which of the RQs each method was designed to address.

Table 6 presents the survey sample sizes and response rates.

Table 7 presents key characteristics of the five case study schools. The IPE data was all collected by the evaluation team.

Table 5: IPE data collection overview (for overview of when these activities took place, please see Timeline in Table 8: TimelineTable 8)

Data collection	Research questions addressed
1. Teacher records of how frequently real-world and personal finance contexts are used in Mathematics lessons	11
2. Pupil perceptions of how, and how frequently, real-world and financial contexts are used in Mathematics lessons in a sample of intervention and control classes (pupil surveys)	11
3. Planned and actual attendance at the Maths in Context PD sessions (attendance records)	9
4. Developer PD planning (documentation)	9
5. Observation at PD Sessions (observation notes)	9
6. Interviews with the MiC PD team: context and managerial issues	10
Surveys of intervention teachers' financial capability: (teacher survey)	11, 14
7. Surveys of intervention participants and schools (teacher and pupil surveys) Teacher surveys in formed by 4, 5 and 6 above	9, 10, 11, 12, 13, 14, 15, 16
8. In-depth case studies of intervention schools (case study visits, classroom observations and interviews)	9, 10, 11, 12, 13, 14, 15, 16
9. Planned and actual implementation (teacher records)	11

10. Survey of usual practice (teacher and pupil surveys)	15

Table 6: Survey samples and response rates for senior leaders (SLT), lead teachers (LT) and teachers (T)

Survey	Group	*N* responses	Target response	Response rate
Feedback survey on one-day training (LTs)	treatment	54	62	87%
Pre-intervention survey (LTs)	treatment	59	62	95%
Pre-intervention survey (T)	treatment	180	186	97%
Pre-intervention survey (SLT)	treatment & control	122	125	98%
Usual practice pre-intervention survey (LTs)	treatment	59	62	95%
Post-intervention survey (LTs)	treatment	151	186	81%
Post-intervention survey (T)	treatment	43	62	69%
Post-intervention survey (SLT)	treatment & control	95	125	76%
Usual practice post-intervention survey (LTs and LT equivalents)	treatment	54	62	87%

Table 7: Characteristics of the five case study schools

Characteristic	Number
Attendance at training	
Attend one-day session	5
Free School Meal %	
10–20%	2
20–30%	1
30–40%	2
Region	
North	3
South	2
OFSTED Rating	
Outstanding	1
Good	3
Requires improvement	1

Costs

Information about the time and costs associated with the intervention were gathered from several sources:

- Developer: Actual costs of regional training days, in-school support by consultants and handbook
- Evaluator estimates: Estimated costs of teacher supply cover and travel to the regional training days
- Lead teacher surveys: School / lead teacher estimated photocopying requirement (with costs then estimated on the basis of this).

Costs of regional training days, in-school support by consultants and the handbook were supplied by the delivery team. Costs of teacher supply cover was estimated using supply cover rates set at an average of £200 across the schools. Travel was estimated at an average of £50 per teacher attending. Costs associated with photocopying worksheets was estimated by the evaluator on the basis of survey responses by lead teachers. Lead teachers were asked whether the intervention had incurred additional costs (Yes/No). A total of 75% of 59 lead teachers responded 'Yes' and free responses indicated that this was largely additional photocopying (only one respondent mentioned time for planning cascade training). Estimate of photocopying based on 3 sheets per pupil for 10 lessons at £0.01 per sheet for 75% of pupils.

Determining the overall cost per pupil per year was in accordance with the EEF (2019) guidance on cost evaluation. Additional qualitative data on time and cost were collected through interviews as part of case studies.

Timeline

Table 8: Timeline

Dates	Activity	Staff responsible / leading
June 2016–June 2017	Development phase: trialing of lessons, research into GCSE sub-scale and financial capability measure	Russell Winnard, Liz Booth; Geoff Wake, Jeremy Hodgen, Shaaron Ainsworth, Michael Adkins.
August 2017	Trial Registration	Michael Adkins
September 2016–April 2017	Recruitment of schools	Russell Winnard, Liz Booth.
March 2017–June 2017	Collection of pupil data and pre-test of financial capability measure	Michael Adkins, Kanchana Minson
June 2017	Randomisation	Michael Adkins
September 2017	Intervention group lead teacher training	Russell Winnard, Liz Booth
September 2017–May 2019	Intervention	–
January 2018–March 2018	Visits to case study schools	Sheila Evans
February 2018–June 2018	Teacher/school questionnaires	Geoff Wake, Sheila Evans, Kanchana Minson
April 2018–May 2018	Administer financial capability test	Michael Adkins, Kanchana Minson
August–November 2019	Collect GCSE raw scores from schools	Michael Adkins, Alex Phillips, James Fox
August 2019	Submission of NPD application	Michael Adkins, Jeremy Hodgen.
March 2021	NPD application approved[9]	–
July 2021–March 2022	Analysis and report writing	Geoff Wake, Jeremy Hodgen, Michael Adkins

[9] The NPD application for data sharing and matching was delayed by the implementation of GDPR, and later the COVID-19 pandemic.

Impact evaluation results

Participant flow including losses and exclusions

Figure 6: Participant flow diagram

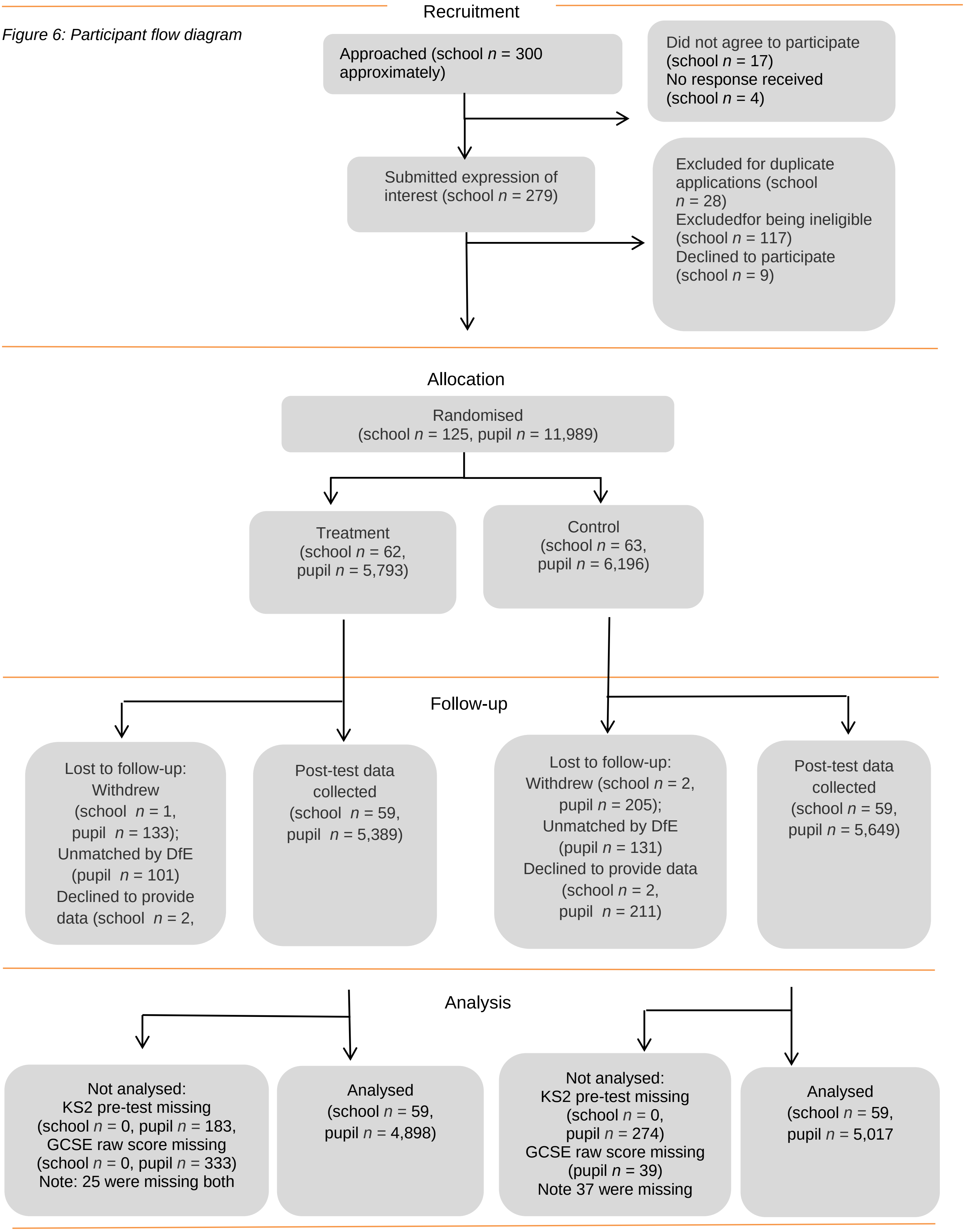


Table 9: Minimum detectable effect size at different stages

		Protocol		Randomisation		Analysis	
		Overall	everFSM6	Overall	everFSM6	Overall	everFSM6
MDES		0.167	0.18	0.176	0.194	0.196	0.20
Pre-test/post-test correlations	Level 1 (pupil)	–	–	–	–	–	–
	Level 2 (class)	–	–	–	–	–	–
	Level 3 (school)	0.7	0.7	0.7	0.7	0.46	0.46
Intra-cluster correlations (ICC)	Level 2 (class)	0.05	0.05	0.05	0.05	0.34	0.33
	Level 3 (school)	0.165	0.165	0.165	0.165	0.06	0.04
Alpha		0.05	0.05	0.05	0.05	0.05	0.05
Power		0.8	0.8	0.8	0.8	0.8	0.8
One-sided or two-sided?		two-sided	two-sided	two-sided	two-sided	two-sided	two-sided
Average cluster size (students per teacher)		25	8	26	5.9	22.33	5.33
Average cluster size (students per school)		100	32	96	22.1	84.03	19.39
Average cluster size (teachers per school)		4	4	3.8	3.8	3.8	3.6
Number of schools	Intervention	65	65	62	62	59	57
	Control	65	65	63	63	59	59
	Total:	130	130	125	125	118	116
Number of teachers	Intervention:	260	260	232	232	227	206
	Control:	260	260	238	238	225	216
	Total:	520	520	470	470	444	422
Number of pupils	Intervention	6,500	2,080	5,793	1,332	4,898	1,141
	Control	6,500	2,080	6,196	1,425	5,017	1,108
	Total:	13,000	4,160	11,989	2,757	9,915	2,249

The Minimum Detectable Effect Size (MDES) was calculated by using Optimal Design (Raudenbush *et al.,* 2011) at the protocol, randomisation and primary outcome analysis stage. We employed a 3-level cluster randomisation design with person-level outcomes. Pupils were nested in classes and further nested within schools. Treatment was administered at the school level. The design stage assumed 25 pupils per teacher, four teachers per school and 130 schools, with schools having a 0.5 probability of being assigned to the treatment condition. Interclass correlations were assumed to be 0.05 at the class level and 0.165 at the school level. This produced an MDES of 0.167 for the main effect and 0.18 for the everFSM6 sub-group analysis. Updated with the data from the randomisation stage (fewer schools recruited and a smaller average cluster size than expected) suggested an achievable MDES of 0.176 and 0.194 for the main effect and everFSM6 sub-group analyses respectively.

However, at the analysis stage, we found a much weaker correlation than anticipated between pre-test (the KS2 fine scores) and post-test (the equated GCSE z-scores): a pre-post correlation of 0.46, although GCSE grade score and KS2 were more strongly correlated at 0.74.

We also found that the ICC was considerably higher than anticipated at the class level (0.34), and significantly lower at the school level (0.06). This may reflect clustering related to allocating pupils into Mathematics classes or sets by attainment. With the reduced sample size due to attrition and missingness, the achievable MDES has been calculated as 0.196 and 0.20 for the main effect and everFSM6 sub-group analyses respectively.

Attrition

A total of 11,989 pupils in 125 schools were randomised, with 5,793 being assigned to treatment and 6,196 assigned to control. Three schools (300 pupils) withdrew shortly after randomisation, one in the treatment group and two in the control. A further 38 pupils withdrew their data from the study, 232 pupils could not be matched to the NPD by the DfE and 4 schools (381 pupils) declined to provide the post-test data. The latter made up a significant proportion of the overall attrition. Hence, overall pupil attrition from randomisation to analysis was 2,074 pupils (17%). While there is some evidence of differential attrition with more pupils lost to the analysis in the control condition rather than the intervention, this is relatively small. Table 10 presents a summary of the attrition data.

Table 10: Pupil-level attrition from the trial (primary outcome)

		Intervention	Control	Total
Number of pupils	Randomised	5,793	6,196	11,989
	Analysed	4,898	5,017	9,915
Pupil attrition	Number	895	1,179	2,074
	Percentage	15%	19%	17%

Pupil and school characteristics

Table 11 provides summary data on the school- and pupil-level baseline characteristics on school type, Ofsted rating, urban vs. rural location, school-level percentage eligible for FSM in the past six years, percentage achieving grade 4 in GCSE Mathematics, pupil-level eligibility for FSM in the past six years, gender, and KS2 Mathematics fine point score.

On pupil-level data, there is very good balance evident between the treatment and control group on all key measures. With the school-level data, schools were well balanced between intervention and control in the Ofsted ratings. Schools were well balanced on the continuous measure of percentage of everFSM6 pupils. At randomisation in 2017, there was a mean difference of 0.1 between intervention and control. This pattern was the same at the end of the trial, with a mean difference of 0.1, although the average percentage of everFSM6 pupils had fallen from 30.4 and 30.5 to 29.1 and 29.2 in intervention and control respectively.

Table 11: Baseline characteristics of groups as matched by the DfE (11,419 pupils)

School-level (categorical)	National-level mean	Intervention group		Control group		
		n/N (missing)	Count (%)	*n/N* (missing)	Count (%)	
Ofsted (as of June 2019)		63/63 (0)	10 (16%) Outstanding 36 (57%) Good 17 (27%) Requires improvement / Inadequate	62/62 (0)	11 (18%) Outstanding 34 (55%) Good 17 (27%) Requires improvement / Inadequate	
Urban vs. rural		63/63(0)	7 (11%) rural 56 (89%) urban	62/62(0)	11 (18%) rural 51 (82%) urban	
School-level (continuous)		*n/N* (missing)	Mean (SD)	*n/N* (missing)	Mean (SD)	
School percentage of everFSM6 pupils (as measured at randomisation – 2017)	29.3%	63/63(0)	30.4 (15.2)	62/62 (0)	30.5 (15.6)	
KS2 average points score of the cohort at the end of KS4 (as measured at randomisation – 2017)		61/63 (2)	27.3 (1.3)	62/62 (0)	27.2 (1.4)	
Pupil level (categorical)		*n/N* (missing)	Count (%)	*n/N* (missing)	Count (%)	
everFSM6		5,516/5,559 (43)	1,322 (24%)	5,812/ 5,860(48)	1,366 (23%)	
Gender		5,559/5,559 (0)	2,830 (51%) female 2,729 (49%) male	5,860/ 5,860(0)	2,918 (50%) female 2,942 (50%) male	
Pupil level (continuous)		*n/N* (missing)	Mean (SD)	*n/N* (missing)	Mean (SD)	Effect size
KS2 Mathematics fine point score		5,374/5,559 (185)	4.92 (0.73)	5,581/ 5,860 (279)	4.89 (0.76)	Pooled SD = 0.75 Effect size = 0.04

Outcomes and analysis

Primary analysis

The primary analysis of the impact of MiC as discussed above was assessed against the business-as-usual control arm, on the basis of ITT using a multilevel linear model estimated by Bayesian inference. The primary outcome of interest was the average difference in the GCSE raw post-test scores (adjusting for tiers and exam boards via the z-score method) between the Young Enterprise intervention group and the control group.

Table 12 presents the raw means of the intervention and control group. There is no clear evidence of an effect of the intervention, with the adjusted treatment effect being 0.02 (−0.10, 0.14). The region of practical equivalence suggested that the majority of the posterior distribution fell between −0.1 and 0.1 on the effect size scale, again indicating no evidence of a practical difference from 0.

Table 12: Primary analysis

	Unadjusted means					Model-based effect size (complete case analysis)		
	Intervention group		Control group					
Outcome	*n* (missing)	Mean (SD)	*n* (missing)	Mean (95% CI)	Total *n*	Adjusted mean difference	Hedges *g* (95% credible interval)	Region of practical equivalence (−0.1, 0.1 ES)
GCSE Mathematics standardised raw score (z-score by board and tier)	4,898 (895)	0.02 (0.98)	5,017 (1,179)	−0.02 (1.02)	11,989 (5,793, 6,196)	0.01	0.02 (−0.10, 0.14)	94.16 %

Secondary analysis

The secondary analyses of the impact of MiC as discussed above were assessed against the business-as-usual control arm, on the basis of intention to treat using a multilevel linear model estimated by Bayesian inference. Once the model took into account pre-test score, stratification variables and group indexes, there was no evidence of an effect. All the sub-scales had posterior effect size distributions which were substantially within the region of practical equivalence to 0 (see Table 13).

Table 13: Secondary analyses – unadjusted raw means and effect size

	Unadjusted means					Effect size		
	Intervention group		Control group					
Outcome	*n* (missing)	Mean (SD)	*n* (missing)	Mean (SD)	Total *n* (intervention; control)	Adjusted mean difference	Hedges *g* (95% credible interval)	Region of practical equivalence (−0.1, 0.1 ES)
GCSE A03 (z-score by board and tier)	4,898 (895)	0.05 (0.96)	5,017 (1,179)	−0.04 (1.04)	11,989 (5,793, 6,196)	0.04	0.04 (−0.10, –0.17)	82.9 %
GCSE context (z-score by board and tier)	4,898 (895)	0.1 (0.9)	5,017 (1,179)	−0.1 (1.0)	11,989 (5,793, 6,196)	0.05	0.06 (−0.08, –0.20)	72.9 %

GCSE money (z-score by board and tier)	4,898 (895)	0.0 (1.0)	5,017 (1,179)	0.0 (1.0)	11,989 (5,793, 6,196)	0.03	0.03(−0.09, –0.15)	88.7 %
Financial capabilities assessment	3,283 (2,510)	4.0 (2.2)	3,397 (2,799)	3.9 (2.2)	11,989 (5,793, 6,196)	0.04	0.02 (−0.09, 0.13)	93.7 %

Subgroup analyses

As with the primary and secondary analyses, all modelled effects for everFSM6, gender, lead vs. cascade teacher and tier of exam showed no clear evidence of an effect. For everFSM6 pupils, the model-based effect size was 0.03 (−0.10, 0.17), for males 0.01 (−0.10, 0.14) and for females it was 0.02 (−0.10, 0.14). The region of practical equivalence statistic again suggests that the effect is centred and practically equivalent to 0 (see Table 14).

Table 14: everFSM6 Sub-group analyses – unadjusted raw means and effect size

	Unadjusted means					Model-based effect size		
	Intervention group		Control group					
Outcome	*n* (missing)	Mean (SD)	*n* (missing)	Mean (SD)	Total *n* (intervention; control, missing)	Adjusted mean difference	Hedges *g* (95% credible interval)	Region of practical equivalence (−0.1, 0.1 ES)
GCSE Mathematics standardised raw score – FSM pupils interaction model	1,108 (6)	−0.3 (1.0)	1,141 (5)	−0.3 (1.0)	2,260 (1,114, 1,146, 11)	0.03	0.03 (−0.10, 0.17)	85.27 %

Additional analyses

As with the previous analyses, the results from the additional analyses, including the GCSE grade score reported below, were consistent and demonstrated no clear evidence of an effect for the MiC intervention. The region of practical equivalent highlighted that the majority of the distribution fell between −0.1 and 0.1 on the effect size scale.

Table 15: Additional analyses – unadjusted raw means and model-based effect size

	Unadjusted means					Model-based effect size		
	Intervention group		Control group					
Outcome	*n* (missing)	Mean (SD)	*n* (missing)	Mean (95% CI)	Total *n* (intervention; control)	Adjusted mean difference	Hedges *g* (95% credible interval)	Region of practical equivalence (−0.1, 0.1 ES)
GCSE Mathematics grade score – all pupils	5,496 (297)	4.8 (1.9)	5783 (413)	4.7 (1.9)	11,989 (5,793, 6,196)	0.05	0.03 (−0.11, 0.18)	83.7%

Estimation of effect sizes

As discussed above, effect sizes are calculated using Hedges *g*. These have been reported in Table 12 to Table 15 above. None of the reported effect sizes for the trial are bounded away from 0 and all are of a very small magnitude with ROPE statistics suggesting they are practically equivalent to 0.

Estimation of ICC

We carried out nine variance component model analyses to estimate the intra-cluster correlation at the class- and school-cluster levels. Intra-cluster correlation refers to the relatedness of responses within the class cluster and within the school cluster. In the design and randomisation power analyses, we had few previous 3-level trials to guide us and we proposed that there would be an ICC of 0.05 or 5% the variance at the class level and an ICC of 0.165 or 16.5% of the variance at the school level. At the analysis stage, we found that the ICC were much larger than expected for level 2 (class), but smaller for level 3 (school).

Table 16: ICC estimation, with variance parameter values for primary and secondary outcomes

	σ^2	σ^2_{class}	σ^2_{school}	Class-level ICC	School-level ICC
GCSE Mathematics standardised raw score (z-score by board and tier)	0.64	0.35	0.06	0.34	0.06
GCSE Mathematics standardised raw score – everFSM6 students	0.66	0.34	0.04	0.33	0.04
GCSE A03 (z-score by board and tier)	0.63	0.32	0.08	0.31	0.07
GCSE context (z-score by board and tier)	0.60	0.32	0.11	0.31	0.11
GCSE money (z-score by board and tier)	0.71	0.21	0.07	0.21	0.07
GCSE Mathematics grade score – all pupils	1.40	2.22	0.17	0.59	0.04
KS2 Mathematics fine point score (pre-test) – all pupils	0.23	0.34	0.03	0.57	0.05
KS2 Mathematics fine point score (pre-test) – everFSM6 students	0.24	0.32	0.01	0.57	0.02

Analysis in the presence of non-compliance

Compliance with the intervention was high. A total of 59 schools provided adequate staffing and 60 schools attended the PD events (out of 61). With regards to the cascade model, 57 of the schools were observed to carry out the training, with two schools failing to provide data and one school not carrying it out. Good engagement with the consultant was reported by 58 schools, with a further two failing to provide missing data and only one school indicating a lack of engagement. Finally in terms of the school average number of MiC lessons taught, the average was 8.8, with 12 of the schools compliant by teaching 10 of the 12 available lessons. As such this led to little discrimination between the schools. With compliance being measured on a scale of 0 to 5, out of the 61 schools, 52 achieved a score of 4 or 5, with the remaining 9 scoring 3. This compliance data was used in an instrumental variables approach, with the resulting effect size remaining consistent with the previously reported results in the primary, secondary and additional analyses sections.

Missing data analysis

In this trial, missing data was a relatively small issue. Of the 11,419 matched cases, the outcome was 90% fully observed, with the majority of the missing cases being made up of the 381 missing from 4 schools who declined to return the GCSE scores. There were approximately 6.4 missing outcomes scores from pupils per school across 113 schools. KS2 Mathematics fine point score was 96% fully observed and GCSE Mathematics grade point score and everFSM6 were 99% fully observed with extremely minor missingness. The missingness data is summarised in Table 17.

Table 17: Pupil-level missingness in outcome and key covariates.

Variable	Percentage fully observed	Complete cases per variable (of 11,419 matched cases)	Notes
GCSE Mathematics standardised raw score (z-score by board and tier)	90%	10,310	A total of 381 missing pupils from 4 schools as they didn't provide the raw score. Average of 6.4 missing pupils across 113 remaining schools. Most of these we believe are from leaving school but not the trial, and being picked up for matching by the DfE. Of those with missing raw scores, 98 had a U grade in the KS4 GCSE variable. 503 were missing in the treatment group and 606 missing in the control group (these numbers include the 381 from the four schools not providing the raw score)
KS2 Mathematics fine points	96%	10,955	69 of those missing KS2 were also missing the GCSE raw score (27 in the treatment group and 42 in the control group). 185 were in the treatment group and 279 in the control
KS4 GCSE Mathematics (NPD)	99%	11,279	63 in treatment, 77 in control
everFSM6	99%	11,328	43 in treatment 48 in control

We constructed a classically estimated dropout model of missingness for the primary outcome of GCSE standardised raw score and we coded those missing either the outcome or the pre-test a value of 1 with the remaining completely observed cases coded with a 0. This missingness indicator was then specified as the outcome in a multilevel logistic regression model, with treatment condition, KS4 GCSE Mathematics grade, everFSM6 and the two randomisation covariates. The base case indicated a marginal probability of missingness of 0.106. Those with a GCSE Mathematics grade higher than the base category had a reduced probability missingness of 0.094, while those who were everFSM6 had a probability of missingness of 0.13. Finally, those schools situated in the South of England had a slightly increased probability of missingness of 0.167, although this was on the borderline of being bounded away from 0.

As discussed above, we ran a two-level imputation model for 800,000 iterations and generated 5 imputed datasets. We then fitted the primary model to each of the imputed datasets and merged the posterior samples, generating summary statistics. We found no change in the overall effect with a mean effect size of 0.02 (−10, 0.13). The region of practical equivalence statistic indicated the vast majority of the posterior distribution fell in the region very close to 0.

Table 18: Missing data imputation model-based effect size (θ) outcomes with credible intervals and proportion of the posterior distribution within region of practical equivalence (±0.1 ES)

	Mean (θ)	θ lower−95% credible interval	θ upper−95% credible interval	Region of practical equivalence (−0.1,0.1 ES)
GCSE Mathematics standardised raw score – imputation (z-score by board and tier)	0.02	−0.10	0.13	94.10 %

Implementation and process evaluation results

Summary

- The intervention took place in a self-selecting environment (through recruitment to the trial) in which teachers valued the opportunity to contribute to pupils' understanding and learning of financial literacy.
- The MiC programme was carried out with relatively high levels of compliance in terms of training and delivery and high levels of fidelity towards the intentions of the lessons' aims and design. This was particularly focused on ensuring pupils' experienced issues of financial literacy.
- In general, teachers involved in the intervention found it fitted well with their curriculum and the training, support and resources supplied made it easy to deliver, although a significant minority of teachers felt that the lesson took longer to plan than normal Mathematics lessons.
- The primary driving force behind in the intervention appeared to be the lead teacher element. There was evidence of less commitment to all aspects of the intervention from other participating teachers.
- The resources supported teachers in providing lessons that had a different 'feel' in which useful applications of Mathematics, in financial contexts, were prominent.
- Pupils enjoyed MiC lessons and valued the insights they provided into issues of financial literacy.
- Teachers adapted their approaches in ways that supported their perceived needs of pupils. This involved providing more insight for pupils into the financial contexts and/or structured support with the Mathematics as teachers felt was required.
- Teachers' perceptions were that the intervention provided pupils with new insights into, and knowledge in relation to, financial literacy but that it did little to improve their mathematical knowledge and was neutral with regards to this. Approximately half of lead teachers felt that the lessons had improved pupils' attitudes towards Mathematics.
- Teachers' confidence and knowledge about the teaching of financial literacy appeared to increase as a result of the intervention.

Introduction

In this section, we present an overview of the findings of the IPE. These are based on data collected from surveys and case studies. Following the practice in previous reports (e.g., Anders *et al.,* 2021) and as recommended by Nowell *et al*. (2017), our overview is presented according to themes rather than by RQs.

The quotations used are from the case study schools and although providing insights into teachers' understanding and opinions in relation to the intervention have been purposively selected to reflect findings from the surveys and views typically expressed in our case study interviews. The case study schools, Lead Teachers and Teachers have been anonymised: we differentiate between Lead Teachers (LT) and Teachers (T).

The evaluation explored whether the MiC programme met expectations of teachers to fulfil their perceived needs relating to financial literacy. Fundamental to this was whether or not the programme supported the learning of both financial literacy and Mathematics. Surveys and case studies provide insights into the experiences of teachers in working with their pupils in terms of their engagement with financial knowledge and Mathematics.

In this section, we discuss the context in which the intervention took place, the adherence to the logic model and fidelity, dosage, scalability, the impact on teachers' confidence and knowledge of the teaching of financial literacy and provide an overview of usual practice in control schools.

Context

The intervention took place in a context in which its intentions were supported by teachers and schools, and they were keen to participate. This is due to recruitment that sought schools who were interested in taking part: recruitment to trials of this nature tends to attract participation from those who primarily hope to be part of the intervention as this is something they would like to work on with their pupils

Participants (lead teachers, teachers and senior leaders) were largely supportive of the aims of the intervention, and this is reflected in their beliefs about the importance of financial literacy. This is evidenced in our pre-intervention survey of lead teachers, teachers and their senior leaders, of whom the overwhelming majority reported that they were aware of the benefits of financial education with agreement or strong agreement (97% of lead teachers, 93% of teachers and 91% of senior leaders). There were similarly high levels of agreement or strong agreement reported by respondents of their awareness of how financial capability can affect young people's future well-being (lead teachers 95%, teachers 95%, senior leaders: 98%). Those surveyed also reported agreement or high agreement that they believed that "it is important to use practical learning experiences based on day-to-day financial issues to develop young people's financial capability" (lead teachers 97; teachers 93%; senior leaders 93%).

These positive views were reflected in comments from case studies of which these two are typical:

> *I really am passionate about getting it introduced in the school because I just feel that it is a major thing that we're lacking.*
> *School B, LT*

> *I do feel that students don't know very much about finance, I feel like I came out of school not knowing how to get a mortgage and what rate of tax I should be paying and stuff like that so I think it is a good skill for them to be able to have and I will be interested to see whether it increases their attainment by knowing that and using those things as well.*
>
> *School A, T1*

These positive views may partially reflect the fact that the schools, and lead teachers, volunteered to take part in the project on the basis that they would have an opportunity to be involved in the intervention, with their pupils having an opportunity to experience the MiC approach and lessons having a strong financial literacy focus. It can be inferred from the signing of the MoU, both by lead teachers and senior leaders across all schools, that there was support for the aims of the programme in both the treatment and control arms of the trial.

Senior leaders in schools were also supportive of the programme in terms of its potential to have benefits for pupils' knowledge of, and motivation to learn about, financial literacy with 79% and 65% respectively agreeing or strongly agreeing with such outcomes. However, our case study work suggests that the extent of the detail that senior leaders had of the programme appears to have been variable. This is reflected by the varied views expressed by lead teachers in interviews in case study schools.

> *My line manager is actually a maths teacher as well, so she teaches in the maths department but also the head is really supportive as well, and she knows that what we're trying to do with embedding this and because we have started teaching the core maths as well, and she actually wants to try and get some sort of status as being a financial educating school, I can't remember the exact terminology of it.*
>
> *School B, LT*

> *[Senior management] are very vaguely aware of it, we had to run it by them at the very start just to get permission to get all of the student details out but no, no there is not really showing much interest because we haven't requested any interest from them really, so no.*
> *School E, LT*

The degree to which senior leaders had knowledge of the details of the trial probably reflects the level of autonomy that different heads of department exercised in running their departments as suggested by the lead teacher from School E.

In general, Mathematics curriculum leaders, and their senior leadership, were keen to be part of the implementation in ways that would benefit their learners from engagement with financial literacy. There was some indication that some teachers involved in the intervention had some reservations about the use of Mathematics teaching time to achieve this:

- 93% (*n* = 207) of teachers pre-intervention reported being aware of the benefits of financial education for young people
- 95% (*n* = 207) of teachers pre-intervention reported being aware of how the financial education of young people can affect their future well-being
- These figures had risen slightly to 97% and 97% respectively for teachers post-intervention (*n* = 151)
- Only 44% (*n* = 151) of teachers post-intervention considered that, during MiC lessons, pupils spend the right balance of time doing finance and doing Mathematics (because of the interest that pupils had in the financial aspects of the lessons and the discussions that generated). Teachers believed that to better prioritise Mathematics learning, less time should be spent on discussing financial issues.

The logic model and fidelity

We consider fidelity with respect to the logic model for the intervention (Figure 1), which provides an overview of the key features and support mechanisms involved in the intervention. These were as follows:

- External training for lead teachers
- Consultant mentoring and support
- Cascade training and support in-school by lead teachers
- Lesson plans
- Teaching (or delivery) of the lessons.

In addition, teachers were encouraged to continue teaching financial capability in Mathematics to the same pupils in Year 11 during the year following the main intervention, and access to an online forum with additional online materials was provided to facilitate this. Unfortunately, the evaluation was not funded to investigate this element of the intervention.

External training for lead teachers

Lead teachers were almost unanimously positive about the value of the initial PD session delivered by Young Enterprise. Following this, they reported that they understood their role as a lead teacher (98% agree or strongly agree) and what was involved in leading PD sessions for other teachers (98% agree or strongly agree). All lead teachers reported that, following this PD, expectations of them and their school were clear (100% agreeing or strongly agreeing).

As a result of this well-received training for lead teachers at the outset of the programme, they believed that it would help them teach Mathematics using financial contexts (100% agreeing or strongly agreeing), understand how the lessons could be integrated into their teaching (96%) and were more aware of financial contexts for teaching Mathematics (85%).

Consultant mentoring and support

Following the training day, the lead teachers could call on a consultant to support their implementation of the intervention. This support was bespoke to lead teachers' needs and, in addition to supporting delivery of the 'cascade', training of teachers within school could also be used at later stages of implementation.

Figure 7 shows the extent of the use of consultants to support implementation of the intervention. The consultants were contracted to work for up to 24 hours with each school. This consisted of in-person visits where this was considered beneficial, or alternatively telephone or email support. The data were gathered using activity logs kept by the consultants.

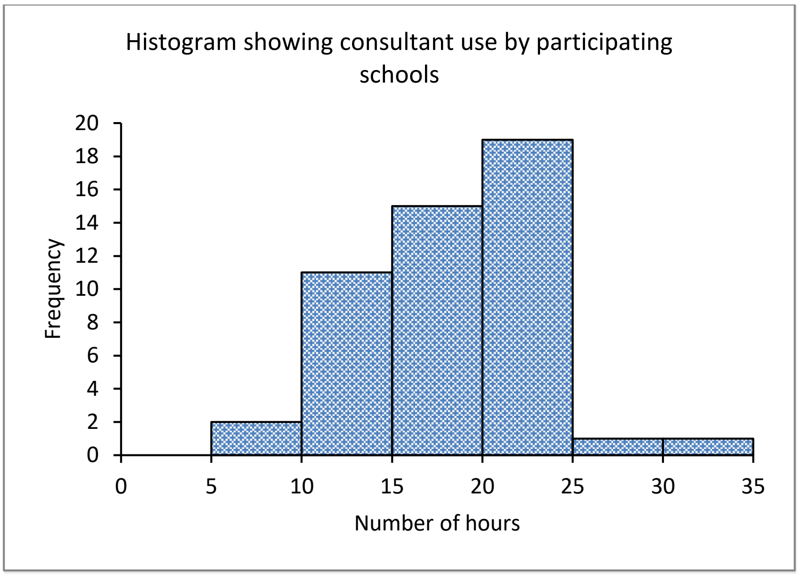


Figure 7: Histogram use (hours) of consultants by participating schools.

Cascade training and support in-school by lead teachers

Most, but not all, other teachers in the intervention believed that support from their lead teacher or the MiC consultant had helped them to implement the MiC lessons, with only a few believing this to be unhelpful (58% agreed or strongly agreed that the support was helpful, 34% neither, 8% disagreed or strongly disagreed).

Among the teachers, 44% reported attending one or more sessions led by their consultant and 21% attended a training session at the start of the year led by a consultant, although this was not a requirement of the programme.

Lesson plans

The intervention teachers were supported in their teaching of Mathematics using a financial context approach by twelve lesson plans and all of the resources required to teach these, including PowerPoints (and in some cases videos used to set the scene / introduce the context) for their use, and worksheets for pupils. A full overview including mathematical and financial contexts of all of the lessons is given in the TiDieR framework (see Appendix A). Seventy percent of teachers reported that the lesson plans provided sufficient guidance to support the teaching of the Mathematics content needed.

Most lead teachers considered that the resources made it easy to teach the MiC lessons (68% of them reporting for “all” or “most” of the time) and that the lessons were easy to fit into their Year 10 Mathematics timetable (56% reporting “all” or “most” of the time with 31% reporting “some of the time” or “almost never or some of the time” indicating the extent to which teachers struggle to adapt schemes of work that already heavily loaded with content). This quote from a lead teacher is typical of those who found the materials easy to work with.

> *I photocopied the work sheets, one between two and then one each for the one they had to fill in and then I flicked through the slides just to make sure I knew what was going to happen, I didn’t really do anything more than that and the good thing about these lessons is you don’t really have to, it is all there, timings everything, you don’t have to do much, the PowerPoint is all ready …*
> *School E, LT*

Whilst the majority of other teachers involved in the programme considered that the resources made it easy to teach the MiC lessons (52% “all” or “most” of the time), there was nevertheless a relatively large minority (25%) thought that at best only “some of the time” did the resources make it easy to teach the lessons (see Figure 8) with 23% reporting “half and half”. These outcomes may reflect the degree to which the teachers ‘personalised’ the lessons for use with their classes (see below). The survey results from these non-lead teachers concerning the ease of fitting the MiC lessons in the Year 10 timetable were also more mixed (42% agreeing “all” or “most” of the time, 42% agreeing with this statement “never” or “some of the time”, with 15% thinking this the case on only “half of occasions”).

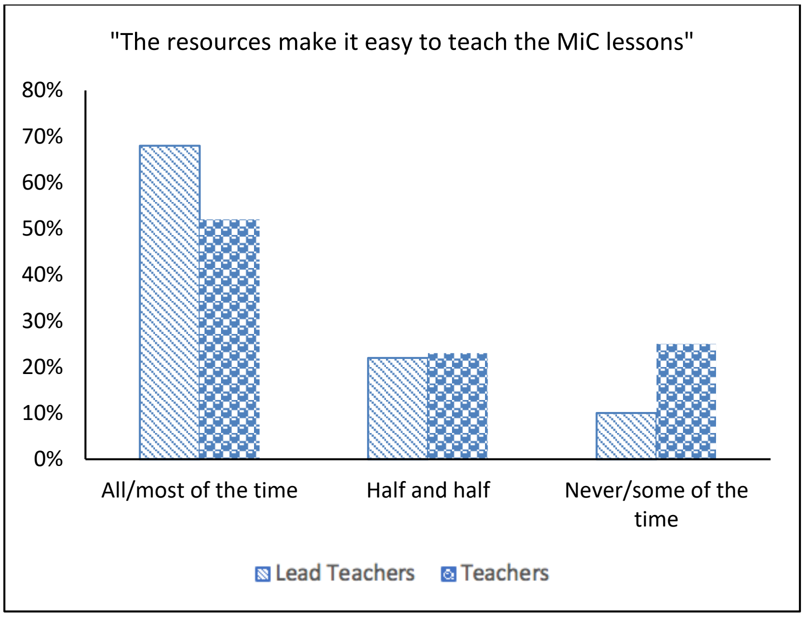


Figure 8:The extent to which teachers considered that the resources made it easy to teach the MiC lessons.

There was indication that the lessons may in some cases require additional workload to prepare (see Figure 9). Fifty-four percent of lead teachers considered this to be the case for "most" or "nearly all" of the time. This was less pronounced for other teachers, with 38% reporting that preparation needed for the lessons was more than usual in "all" or "most" cases. This, of course, will reflect the different, and new, approach of the unfamiliar lessons.

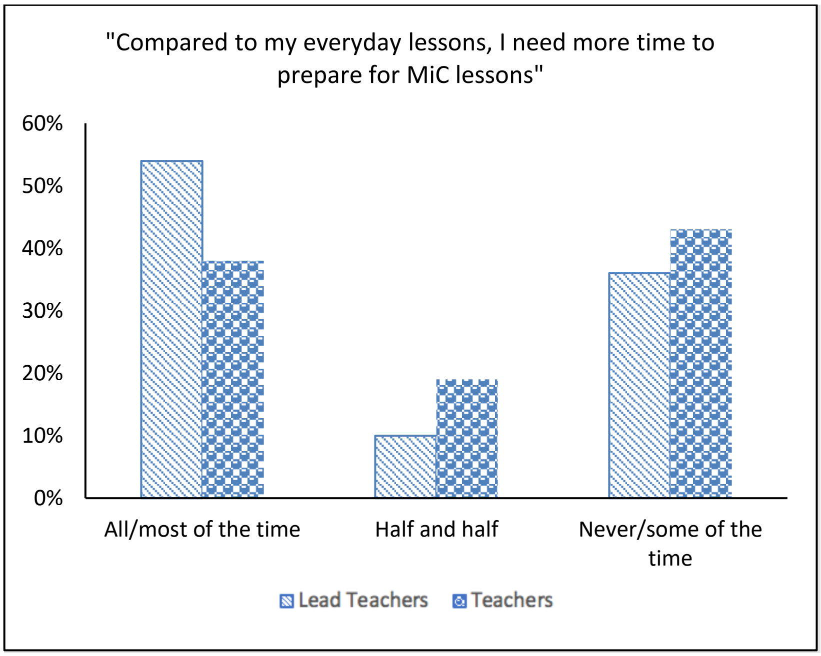


Figure 9: The extent to which teachers considered that MiC lessons required more time than usual to prepare for teaching lessons.

Teaching (or delivery) of the lessons

In implementing the lessons and resources, the lesson plans, in their design, provide a framework for teachers to ensure compliance with the main mathematical and financial literacy intentions of the programme. They also allow scope for teachers to adapt them to local conditions, especially in terms of allowing for schools to blend into their agreed usual practice, and also for meeting the needs of learners at different levels of attainment.

Lead teachers reported enjoying teaching the MiC lessons (85% agreeing or strongly agreeing) and considered that other teachers in their department enjoyed teaching the MiC lessons (75% agreeing or strongly agreeing). There were lower levels of enjoyment reported by the teachers themselves (56% agreeing or strongly agreeing, 17% disagreeing or strongly disagreeing and 28% neither agreeing nor disagreeing). This data, again, suggests that the lead teachers have the highest levels of commitment to the approach and were central to a school's involvement and engagement with the programme.

Because of the focus of the lessons on meaningful money contexts, teachers found that the lessons often had a different 'feel' to their usual lessons, especially in generating considerable interest and often enthusiasm in their pupils. Some teachers reported this as a challenge, which they also reported they enjoyed, as they adopted different, often more discursive, approaches in their teaching. For example, this lead teacher pointed to a particular way in which the lessons helped them motivate their pupils in a particular lesson.

> *… I noticed the optional link for the national careers service that had a massive impact on engagement with the class, they were suddenly so much more excited because they could pick and they could learn not just about the money that they're earning but what they need to get there, which causes a lot of thought for some of them because they don't realise what they need. …*
> *School D, LT*

In most cases, lead teachers and teachers completed their lessons within the planned 60 minutes (with a combined 26% reporting they took longer some or nearly all of the time).

Lead teachers and teachers reported a distinct shift in their practices in the MiC lessons due to the finance contexts of the lessons. Observations of lessons provided additional evidence that the lessons contained a substantial emphasis on financial literacy. Although small in number, these observations suggested a relatively high level of pupil engagement and interest in financial literacy issues. In response to this interest, teachers were both observed and self-reported that they spent time in lessons explaining financial processes to pupils, often providing insights from their own personal experiences which pupils were keen to hear. These quotations from teachers in two of our case study schools were typical of lead teachers and teachers.

> *I guess it sometimes feels a little bit like teaching a PSHE lesson because you're giving them kind of a wider knowledge of … things outside the classroom. I mean I guess that happens in normal lessons but you know there is things today that we have covered that weren't.*
> *School A, T*

> *… and we have discussions about it, quite often in Maths you wouldn't go into deep discussion about things whereas with this, we then discuss and we were comparing things so that was nice.*
> *School D, T*

> *… it is a plausible scenario, they can imagine it … they recognised the scenario, they recognised there was a real issue that needs to be tackled within the scenario erm and initially they were quite stumped about how to solve that and realised that they needed to erm get some sort of maths involved to create a fair solution or something they saw as a fair solution so you know it was an engaging task, that went well, ...*
> *School E, T*

Our survey data, as shown in Table 19 for both lead teachers (LT) and teachers (T), confirms this.

Table 19: Teachers' self-reporting the extent to which, in MiC lessons, they talk more than usual about their own experiences of using Mathematics in the real world.

	Almost never / some of the time		Half and half		All / most of the time	
	LT	T	LT	T	LT	T
In MiC lessons I talk more than usual about my own experience of using Mathematics in the real world	10%	15%	12%	11%	78%	75%

Teachers reported that the lessons were not only different from those of their usual practice in terms of the financial context of the Mathematics, but they also involved pupils in working more substantively on problem-solving.

> *You kind of give them the problem and I always like to let them have a go, to let them grapple with whatever it is, to let them struggle a bit, even because some of them might get it, even if you think they won't but yes often*

they need kind of an additional structure than the previous lesson.
School A, T

These lessons give them the challenge to be more independent and to extend their work in and solve a problem rather than just… kind of doing.
School C, LT

In terms of reach, or the suitability of lessons and resources to meet the needs of all pupils, lead teachers reported that the lessons worked particularly well for pupils in middle sets (76% strongly agreeing or agreeing), but 31% reported that they were not suitable for bottom sets, whilst 20% reported that the lessons were not suitable for top sets.

Case studies suggest that teachers address these issues by adapting the materials to some extent, although adhering to the core of the lessons' intentions. For example, one lead teacher discussed how they had provided more structure to the materials to better cater to lower attaining pupils. Among tactics adopted, lead teachers included a lesson starter that intended to remind and engage pupils in some of the basic calculation techniques that the main tasks would require (for example, calculating percentages), and others that were intended to support pupils' ways of working such as giving more structure to tasks.

Teachers also reported that they might strengthen the materials to provide even more practical contextual insight: for example, when working with bills they might provide further examples with different layouts so that pupils had variety in the ways in which they had to identify the information they needed to work with.

For higher attaining pupils, in some instances, teachers reported adding additional tasks of their own devising.

Through an interview one lead teacher provided insight into two ways (one mathematical and one in relation to providing structured support) they were using to support pupils in their lower attaining sets:

For the lower group … the starter … provided is a context, a story if you like, but for the Maths, particularly for my group, I have got to have a starter to get them to engage with the nitty gritty of the operations that they might have been using, the types of numbers that they might be using …

… I redesigned the table where they were working out the repayments so there was … more space for them to work on …
School A, LT

Other teachers and lead teachers provided other ways in which they adapted lessons to support the different needs of learners, both in terms of providing insight into financial contexts and supporting the development of mathematical thinking.

This quote from a teacher provides insight into how teachers engaged with such issues:

I think in terms of planning and preparation that might need more in terms of us working together and printing out some bills that we had got maybe and then give them several examples to pick out.

Yes we had to change… we had to make a table where there was a little bit more structure just to break it down into amounts for them, erm but no it helped them improve their percentages so that was good …
School A, T

The extent to which providing structured support was felt necessary depended on the setting in which the teachers were working, and the pupils involved:

They didn't need so much structure, in fact, because their graphing skills, because they are top set so… so if I was doing it with a lower ability, I would put more structure and more modelling into that bit.
School C, LT

In general, we did not find that adaptations made by teachers paid attention to substantial mathematical issues. Rather, teachers made adaptations that often focused more on small details in relation to preferred pedagogic strategies. When asked questions about adapting the materials, teachers in our case studies were prompted to reflect on how they might adapt lessons if and when they were to teach the lesson again. Comments such as this from a lead teacher were typical:

> *… if I was going to redesign the lesson, I would have made that last slide with all of the answers on in two parts, I don't know if you noticed I froze the board so that I wouldn't reveal all of the answers at once because it was a bit overwhelming so I encouraged them to do the columns with the totals first and then think about the difference between that and the kitty, so there is a few tweaks I would make if I had longer to sit down and think about it and maybe I will next year when I am just using them for fun but yes, they have been really good in terms of preparation.*
> *School E, LT*

Summary: Compliance and fidelity to the intended implementation as described in the logic model

The IPE indicated that in implementation of the intervention lead teachers and teachers largely followed the intentions of the programme in terms of engagement with the lead teacher training, the use of consultants, the cascade training, and the teaching of the lessons. In addition to the survey evidence, the impression we gained from each of the case study schools suggests that the programme was received with enthusiasm and teachers valued the lessons because of their focus on developing pupils' mathematical literacy.

Dosage

Both lead teachers and teachers in the intervention made substantial use of the lessons provided for them to teach. Expectations were that they would each teach 10 of the 12 possible lessons with their classes: in 12 cases this target was met, and there was an average of 8.8 lessons being taught by teachers.

Table 20 shows the relative usage of the different lessons with the lesson "You've been scammed" being least popular and "Tax around the world", "Careers and cash" and "Divvying the bills" being amongst the most widely used. This indicates that, for all lessons, lead teachers used lesson plans to a greater extent than teachers.

Table 20: Teacher has made use of the following lesson plans reported post-intervention (from teacher records)

Resources	Lead teacher (*n* = 59)	Teacher (*n* = 151)
Celebration meal	52 (88%)	108 (72%)
You've been scammed	36 (61%)	53 (35%)
Moped to go	45 (76%)	89 (59%)
Tax – What's the point	42 (71%)	90 (60%)
Tax – around the world	53 (90%)	109 (72%)
Careers and cash	54 (92%)	100 (66%)
Divvying the bills	55 (93%)	115 (76%)
A trip To Europe	50 (85%)	86 (57%)
Taxi home	50 (85%)	81 (54%)
Going green	46 (78%)	95 (63%)
Can I afford a car	40 (68%)	85 (56%)
Not just the basic pay	43 (73%)	84 (56%)

Scalability

Teachers' perceptions of the implementation of the programme are important in relation to the potential scalability of the MiC approach (in addition to its impact outcomes). Here, we report the lead teachers' and the teachers' perceptions of the implementation of the programme and their pupils' outcomes following their engagement with the programme.

Overall, teachers were supportive that the programme achieved outcomes that met the high expectations that they had in relation to engaging pupils with financial literacy. They reported that they belived the programme engaged pupils with financial knowledge: 76% of lead teachers and 52% of teachers agreeing or strongly agreeing with these sentiments.

Participating teachers believed that outcomes included:

- Improvement in pupils' knowledge of financial literacy (agreement or strong agreement from 93% of lead teachers and 77% of teachers).

- an increase in pupils' motivation to learn about financial aspects of life with 75% of lead teachers agreeing or strongly agreeing that this was the case (although the teachers involved in the intervention were less convinced, with only 45% agreeing or strongly agreeing and 42% neither agreeing or disagreeing).

Compared to teachers' strong support for the programme in terms of financial education, they were notably less convinced that the intervention had a positive impact on Mathematics learning. Although there was some evidence that lead teachers (47%) and teachers (21%) agreed with the statement that pupils' attitudes towards Mathematics had improved (see Figure 10), only 15% of lead teachers and 9% of teachers agreed or strongly agreed that their perception was that Mathematics attainment had improved as a result of the programme. Most, 78% of lead teachers and 60% of teachers, neither agreed nor disagreed that this was the case.

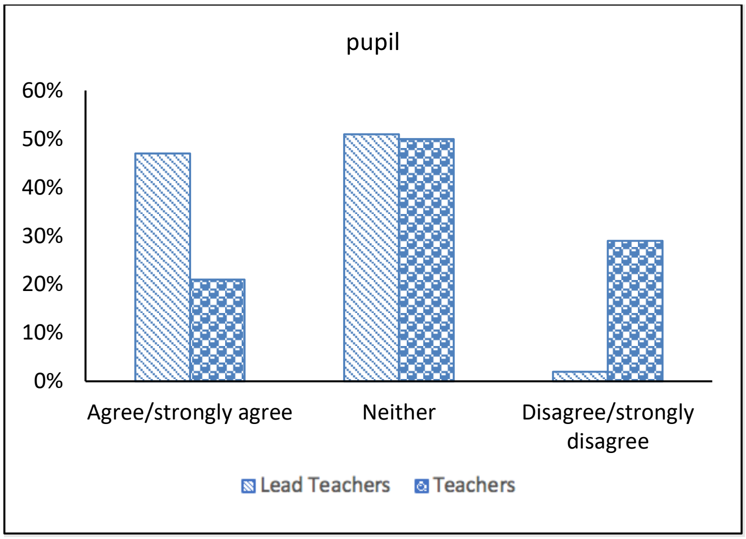


Figure 10: The extent to which lead teachers and teachers believed that pupils' attitudes towards Mathematics improved because of the intervention programme in classrooms.

Impact on Mathematics teachers' confidence and knowledge

Compared to their self-report prior to the intervention, in post-intervention surveys, teachers, but particularly lead teachers, reported that they were more confident about planning and teaching financial education lessons (leads: d = 1.1 & 1.0; others: d = 0.57 & 0.47) and teaching Mathematics in financial contexts (leads: d = 1.0; others: d = 0.38) across all financial topics covered in the lessons. Compared to their self-report prior to the intervention, in post-intervention surveys, teachers reported that they were more confident about managing money (leads: d = 0.3; others: d = 0.2) and making financial decisions (leads: d = 0.5; others: d = 0.25) although the effects were relatively small. The majority of lead teachers (63%) reported that, as a result of the teaching of the MiC lessons, teachers were more confident in their teaching of problem-solving. Lead teachers also considered that teachers' teaching of problem-solving tasks related to finance had improved (68% level of agreement).

Usual practice

We investigated usual practice using a pre- and post-survey of financial and problem-solving practices completed by lead teachers in both control and intervention schools. This data indicated that the frequency of financial contexts in Mathematics lessons was broadly similar across both arms of the trial and before and after the intervention (see Table 21). This data, based on report by teachers, indicates a similar distribution across both arms and before and after the intervention, and suggests that the MiC intervention did not result in more use of financial contexts as a result of the intervention.

Table 21: The frequency that teachers think that teachers in the department use financial contexts in KS4 Mathematics lessons (pre-intervention N = 120; post-intervention N = 94; column percentages based on treatment condition and intervention phase, and subject to rounding errors)

Questions	Pre-intervention		Post-intervention	
	Intervention	Control	Intervention	Control
In one or more lessons each week	2 (3%)	1 (2%)	2 (5%)	2 (4%)

In one or more lessons each fortnight	9 (15%)	7 (12%)	3 (7%)	7 (13%)
In one or more lessons each half term	24 (40%)	27 (45%)	21 (50%)	25 (48%)
In one or more lessons each term	14 (23%)	11 (18%)	11 (26%)	9 (17%)
Very rarely	11 (18%)	14 (23%)	5 (12%)	9 (17%)

Table 22 indicates schools' approach to managing problem-solving and financial Mathematics across both groups pre- and post-intervention. There is some indication that the intervention schools placed more responsibility for the teaching of financial Mathematics on individual teachers prior to the intervention.

Table 22: The departmental approach to teaching problem-solving (pre-intervention N = 120, post-intervention N = 94, note percentages are based on treatment condition and intervention phase)

	Pre-intervention		Post-intervention	
	Intervention	Control	Intervention	Control
Financial contexts				
The use of financial contexts in the teaching of Mathematics is the responsibility of individual teachers	36 (60%)	29 (48%)	18 (43%)	24 (46%)
There is a common approach to the use of financial contexts in the teaching of Mathematics at KS3	13 (22%)	9 (15%)	12 (29%)	14 (27%)
There is a common approach to the use of financial contexts in the teaching of Mathematics at KS4	15 (25%)	11 (18%)	16 (38%)	13 (25%)
There is little use of financial contexts in the teaching of Mathematics at KS4	19 (32%)	23 (38%)	11 (26%)	19 (37%)
Problem-solving				
Problem-solving lessons are part of the department's scheme of work	17 (28%)	10 (16%)	13 (31%)	14 (27%)
The teaching of problem-solving is integrated into usual lessons. This is coordinated across the department and is highlighted in the department's scheme of work.	28 (47%)	27 (45%)	17 (40%)	22 (42%)
The teaching of problem-solving is the responsibility of individual teachers	16 (27%)	23 (38%)	12 (29%)	16 (31%)

Cost

Delivery of the Maths In Context intervention cost approximately £1,807 per school for the year in which it was delivered. The majority of costs are incurred during the first year and are associated with the provision of the regional training days and teacher handbooks (costs incurred during the trial by the developer), supply cover and travel costs (incurred during the trial by the schools) and some photocopying of worksheets for lesson (cost incurred by the school on a yearly basis, estimated as discussed in methods).

To calculate the total cost per pupil over three years, we assumed that the intervention would be delivered to each Year 10 cohort of pupils. Hence, the number of pupils would cumulatively increase from 83 pupils in the first year, to 166 in the second year to 249 pupils in the third year (although each pupil would receive one year of the main intervention followed by additional materials in Year 11 as per the TIDieR framework). We assumed 83 pupils per school, as this was the average number of pupils per school in the trial at the analysis stage. Based on these assumptions, the total cost per pupil per school over three years is £2.42 (set out in Table 23). The cumulative cost breakdown is set out in Table 24 (figures rounded to the nearest pound).

Table 23: Cost of delivering MiC

Item	Type of cost	Cost	Total cost over 3 years	Total cost per pupil per year over 3 years
Regional training course (7 × one-day events, actual cost from developer)	start up (year 1 only)	£214.39	£214.39	£0.29
Teacher cover to attend training (59 lead teachers @ £200 per day est.)	start up (year 1 only)	£200.00	£200.00	£0.27
Teacher travel to attend regional events (59 teachers @ £50 each est.)	start up (year 1 only)	£50.00	£50.00	£0.07
Consultant in-school support (actual costs time & travel from developer	start up (year 1 only)	£1,282.75	£1,282.75	£1.72
Handbooks for teachers: print & distribution (actual cost from developer)	start up (year 1 only)	£28.77	£28.77	£0.04
Photocopying worksheets (est.)	recurring	£6.23	£31.13	£0.04
Total			£1,807.04	£1,807/3/249 = £2.42

Table 24: Cumulative costs of MiC (assuming delivery over three years)

	Year 1	Year 2	Year 3
Maths in Context	£1,782	£12	£12

In addition to the training for lead teachers by the developer, lead teachers were expected to deliver cascade training to the other three teachers in their school. In the survey of lead teachers, only one respondent reported that the cascade training was onerous.

Preparation to deliver the intervention in class was facilitated by 12 complete sets of resources for 12 lessons of which teachers were asked to teach at least 10 to their designated Year 10 classes. This required teachers to decide how best to fit the lessons into their curriculum or scheme of work for the year. There is evidence that teachers saw the MiC lessons as an 'addition' to their usual delivery of the curriculum with only 2% of lead teachers reporting that they would use the lessons to introduce new Mathematics topics and 56% reporting they wouldn't use them to introduce new topics. A total of 56% of lead teachers reported that they found it easy to fit the lessons into the Mathematics timetable for Year 10 and 31% reporting that they did not.

Conclusion

Table 25: Key conclusions

Key conclusions
1. Pupils in the MiC schools made no additional progress in Mathematics attainment compared to pupils in the other schools. This result has a high security rating.
2. Pupils in the MiC schools made no additional progress on questions in GCSE Mathematics involving problem-solving or in contexts involving money, or in financial literacy, compared to pupils in the other schools.
3. Pupils eligible for FSM in the MiC schools made no additional progress in Mathematics attainment at GCSE compared to FSM-eligible pupils in the other schools.
4. Teachers showed a high level of support for the MiC intervention. Eighty-one percent reported that they believed the intervention improved pupils' understanding and learning of financial literacy. Close to half of lead teachers felt that lessons had improved pupils' attitudes towards Mathematics.
5. The MiC intervention was carried out with high levels of compliance in terms of delivery and high fidelity in terms of the lesson aims and design. Teachers reported that the training, support and resources supplied made the intervention easy to deliver.

Impact evaluation and IPE integration

Evidence to support the logic model

In general, the intervention was delivered as described in the logic model. Lead teachers appreciated the initial one-day training and in-school consultant support. Most teachers reported receiving cascade training from lead teachers. We found evidence that teachers' own financial literacy improved significantly as a result of delivering the intervention. Since teacher knowledge is a critical factor in the quality of teaching (Coe *et al.,* 2014; Harrison, Marchant & Ansell, 2018), this may partially explain the null result of the trial. The PD for this intervention was relatively limited: just one day of training for the lead teachers, who were then expected to 'cascade' this training to their colleagues. Hence, the MiC approach was largely communicated through the lesson materials. It may be that a more intensive PD programme together with coaching might be required to develop teachers' knowledge and pedagogic skills of financial literacy.

The input of lead teachers was a critical factor in the logic model. Lead teachers received the initial MiC training, delivered the cascade training to other teachers and were responsible for sustaining the intervention in school. The IPE evidence indicated that the lead teachers largely carried out this role with commitment and indeed in many ways appeared to be the 'driving force' in implementation. However, whilst other teachers were generally positive about many aspects of the intervention, they appeared to be less committed to the intervention.

Interpretation

The impact evaluation results for this trial showed no impact on any of the primary or secondary outcomes; the results for all outcomes indicated effects that were all very small in magnitude, indicating zero months' progress. On the other hand, teachers believe that there is much value in pupils engaging with, and learning, financial literacy so it is important to note that incorporating such opportunities within the Mathematics curriculum did not appear to have a negative effect on pupils' Mathematics.

This trial evaluated an intervention that had shown positive results in a previous study (PFEG, 2015). This earlier study was less robust than the current trial. It used a quasi-experimental design involving a sample of 371 pupils, did not take account of clustering and used a non-blind GCSE-based outcome measure. Both the intervention and control groups were taught by the same small group of teachers and training was provided directly to these teachers. Conversely, the trial reported in this evaluation report involved cascade training by the lead teachers, who may not have developed sufficient expertise at the point of delivering this training. Additionally, the current trial involved a new set of lessons, specially designed on the basis of 'lesson learnt' from the previous study, and, hence, it is possible that these adaptations resulted in activities that were more difficult to implement.

The intervention was largely delivered when the pupils were in Year 10, a year before they took the GCSE examination. Given this delay, coupled with the fact that financial literacy is only a small part of the examination syllabus, the lack of an effect on GCSE is perhaps not surprising. However, the financial literacy test was taken by pupils immediately following the intervention and the lack of impact on this secondary outcome measure is disappointing. This was a specially developed and validated test consisting of financial problems involving some Mathematics. It may be that pupils needed more time to develop an understanding of the financial concepts introduced in the MiC lessons in order to then solve financial literacy problems. This would require a more substantial intervention.

Teachers valued this intervention and believed that the intervention improved pupils' understanding, learning and attitudes to financial literacy. Although they did not consider that the intervention would improve pupils' Mathematics, they did not believe that delivering the MiC lessons as part of the Mathematics curriculum would have a deleterious effect on Mathematics attainment. They also found the intervention easy to deliver. Only a minority of schools (20%) taught the required number (10) of lessons. Whilst the mean average number of lessons taught was relatively high (just under 9), it is possible that this may have had a small impact on the results, but it is unlikely that that this would have changed the overall findings of no additional progress. Unfortunately, we do not know whether teachers continued to teach financial literacy during the second year of the trial when the pupils were in Year 11, as envisaged by the developers, although, given examination pressures combined with the effort needed to plan additional financial literacy lessons, it seems likely that this did not happen in many classrooms.

Limitations and lessons learned

It is important to emphasise that, although we found no positive effects on mathematical attainment or financial literacy, we also found no evidence to indicate that devoting time during Mathematics lessons to the teaching of financial literacy had a negative effect on mathematical attainment and that teachers perceived benefits in terms of the pupils' knowledge and awareness of financial issues. It may be that a more substantial intervention involving more lessons is required to make a substantial difference to financial literacy as distinct from an awareness of the issues.

In terms of analysis, this report looks at questions that cover problem-solving, those set in real-world contexts, and questions involving money. One area of further analysis would be to focus on the overlap of these areas, and for example look at the subset of problem-solving questions which included financial contexts, and the subset of questions set in real-world contexts that involved money.

As with any trial, there are limitations to this study. First, the primary outcome was a delayed outcome, a year after the end of the intervention. Moreover, during this period, it is likely that teachers devoted considerable time to revision for the GCSE examination. Since the GCSE contains only relatively limited questions about financial literacy, it is likely that the teachers allocated little time to these issues. Second, the PD associated with this intervention was relatively light touch. As noted above, a key component of the intervention was cascade training by the lead teachers, who themselves received only one-day training plus the support of consultants in-school. It may be that a similar intervention with more intensive and more frequent PD of all teachers involved, perhaps involving coaching (Sims *et al.,* 2021) would have had more impact on pupil attainment.

Future research and publications

The teaching of financial literacy is important, and it is, therefore, also important to investigate how to teach it effectively. The intervention evaluated in this trial was different, with a much larger sample and a more ambitious design than the one delivered in the previous study. In our view, there is a need for an intermediate and more tightly controlled intervention coupled with more research on the integration of financial literacy and Mathematics in classrooms.

We plan to publish several academic journal papers summarising and extending the findings of this evaluation report, as well as discussing the implications for future research on financial literacy.

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Appendix A: EEF cost rating

Appendix table 1: Cost rating

Cost rating	Description
£ £ £ £ £	*Very low:* less than £80 per pupil per year.
£ £ £ £ £	*Low:* up to about £200 per pupil per year.
£ £ £ £ £	*Moderate:* up to about £700 per pupil per year.
£ £ £ £ £	*High:* up to £1,200 per pupil per year.
£ £ £ £ £	*Very high:* over £1,200 per pupil per year.

Appendix B: Security classification of trial findings

Appendix table 2: Padlock rating

Rating	Criteria for rating			Initial score	Adjust	Final score
	Design	**MDES**	**Attrition**			
5 🔒	Randomised design	≤0.2	0–10%		Adjustment for threats to internal validity	
4 🔒	Design for comparison that considers some type of selection on unobservable characteristics (e.g. RDD, diff-in-diffs, matched diff-in-diffs)	0.21–0.29	11–20%	4		4
3 🔒	Design for comparison that considers selection on all relevant observable confounders (e.g., matching or regression analysis with variables descriptive of the selection mechanism)	0.30–0.39	21–30%			
2 🔒	Design for comparison that considers selection only on some relevant confounders	0.40–0.49	31–40%			
1 🔒	Design for comparison that does not consider selection on any relevant confounders	0.50–0.59	41–50%			
0 🔒	No comparator	≥0.6	>50%			

Threats to validity	Risk rating	Comments
Threat 1: Confounding	Low	Quality RCT, little missing data / loss to follow-up.
Threat 2: Concurrent interventions	Low	Little evidence that either the intervention or control groups did any other intervention that would have affected results.
Threat 3: Experimental effects	Low	Unlikely, especially for the primary outcome which was highly motivated for both arms.
Threat 4: Implementation fidelity	Low	Intervention was delivered with relatively high fidelity – even though only 20% of schools did the required 10 lessons the average was 9 lessons and so it is unlikely that this affected the outcome.
Threat 5: Missing data	Low	While there was missing data, unlikely to be correlated with treatment arm or engagement with the materials. Missing data was explored using a further analysis and found to produce similar results.
Threat 6: Measurement of outcomes	Moderate	Primary outcome was altered from the original plan due to data availability – low concerns for bias. While the primary outcome was a full year after the initial intervention ended, the secondary outcome could have identified short-term effects had they existed.

Threat 7: Selective reporting	Low	Well-written and comprehensive report following pre-specified protocol and statistical analysis plan.

- **Initial padlock score:** 4 padlocks
- **Reason for adjustment for threats to validity**: 0 padlocks
- **Final padlock score:** initial score adjusted for threats to validity = 4 padlocks

Further appendices

Appendices 1 to 12 are available as a separate document (Technical Notes).

The Education Endowment Foundation
5th Floor, Millbank Tower
21–24 Millbank
London
SW1P 4QP

https://educationendowmentfoundation.org.uk

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