



Education  
Endowment  
Foundation

# Maths Counts

## Evaluation report and executive summary

November 2018

### Independent evaluators:

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Durham  
University



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## About the evaluator

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## Executive summary

### The project

Maths Counts aims to raise the attainment of children who struggle with basic mathematics at Key Stage 2. The intervention was developed by The Mead Community Primary School drawing on the principles of the Numbers Count programme developed by Every Child Counts at Edge Hill University. Maths Counts lessons last 30 minutes and take place at least three times a week for a minimum of ten weeks. Schools have access to an online tool that stores information about pupils' progress, supports the planning of lesson objectives, and suggests activities and resources for each lesson. The first ten minutes of Maths Counts lessons focus on recall and reinforcement of prior learning, and the following 20 minutes introduce new knowledge and skills. The online tool suggests activities and resources to use, such as throwing and catching a soft football in order to count in sequenced steps or using coins to develop an understanding of money.

In this project, schools selected pupils in Years 3 to 6 to participate in the intervention, prioritising pupils at risk of not achieving nationally expected levels, younger pupils, and pupils eligible for the Pupil Premium. The intervention was delivered on a one-to-one basis by teaching assistants. Schools were able to approach the timetabling of the intervention flexibly, so some lessons were scheduled during maths lessons while some took place elsewhere in the school day. Teaching assistants were supported by their schools' maths leads (the school's maths co-ordinator or specialist teacher). Support for delivery of the intervention was provided by the Mead Academy Trust project team. Before the intervention started, the project team provided two days of training for both maths leads and teaching assistants. The maths leads then delivered four further training sessions throughout the intervention to the teaching assistants in their school.

After an initial development phase where the project team developed a website and the online tool, Maths Counts was evaluated by Durham University using a randomised controlled trial involving 291 pupils across 35 schools. Each school identified eight eligible pupils, four of whom were randomised to receive the intervention while the other four formed the 'business as usual' comparison group. The trial tested the impact of Maths Counts on maths attainment measured using the General Maths component of the CEM InCAS assessment. The implementation and process evaluation consisted of observations and interviews. School recruitment began in early 2016 and the project ended when pupils were tested in April 2017.

#### Key conclusions

1. Children who received Maths Counts made the equivalent of two additional months' progress in general maths, on average, compared to similar pupils that did not receive the intervention. This result has a low to moderate security rating.
2. Pupils who were eligible for free school meals made two months less progress if they took part in the intervention, compared to similar pupils who did not. This result may have lower security than the overall findings because of the smaller number of pupils.
3. Maths Counts appeared to be more effective with the youngest (Year 3) pupils and with the lowest attainers in this age group. This result may have lower security than the overall findings because of the smaller number of pupils.
4. Implementation appeared to be enhanced when Maths Counts had the support of school leaders who provided time and space for the intervention to take place.
5. The key challenge for implementation was finding sufficient time to plan and deliver the lessons. Staff turnover, staff absence due to illness, and pupil absences were other barriers which led to fewer sessions conducted than planned.

## EEF security rating

These findings have a low to moderate security rating. This was an efficacy trial, which tested whether the intervention worked under developer-led conditions in a number of schools. It was a well-designed randomised controlled trial. However, the trial was slightly smaller than usual and there were some important differences in prior attainment between the pupils who received the intervention and comparison pupils.


## Additional findings

Maths Counts appeared to be more effective with the youngest (Year 3) pupils and, amongst these pupils, with the lowest attainers. Pupils in Year 3 made substantial additional progress in maths and developed more positive attitudes towards maths. This finding is consistent with the views of the teaching staff that Maths Counts is better suited to the younger and lower performing pupils. However, all of the analyses conducted on individual year groups involved a small number of pupils and should be treated with caution. Further analysis suggested that schools that completed the intervention with good fidelity achieved more positive outcomes, suggesting that this is important for maximizing the impact of the intervention.

## Cost

The cost of running the Maths Counts programme is estimated at around £125 per pupil per year over three years. It has to be noted that the training is an initial starting up cost, and once trained, the Learning Partners (LPs) and maths leads (MLs) can, in turn, train other teachers or teaching assistants. Schools can continue using the programme with minimal costs as the boxes of resources and the privacy board (learning environment) can be used repeatedly with different children.

**Table 2: Summary of impact on primary outcome**

Outcome/Group	Effect size	Estimated month's progress	EEF security rating	No. of pupils	EEF cost rating
Maths	+0.12	2		291	£££££
Maths—pupils eligible for free school meals in past six years	-0.14	-2	N/A	133	£££££

## Introduction

### Intervention

Maths Counts (MC) is delivered by trained teaching assistants referred to by the developers as Learning Partners (LPs). Learning Partners is the preferred term as they do not necessarily need to be teaching assistants. They could, for example, be other trained school staff or students. These LPs are supported by a maths lead (ML). The ML is a senior maths teacher (usually the maths co-ordinator or maths specialist) whose role is to promote and manage Maths Counts within the school and support the LPs. Each ML supports two LPs. MLs select the LPs based on their skills and availability for planning and conducting the three sessions per week.

The unique feature of MC is the Digital Tool—a piece of software specially developed to facilitate the delivery of the intervention. The Digital Tool stores information about each learner's knowledge about maths concepts and understanding. It guides the Learning Partner in planning the lesson objectives for the individual learner and suggests activities and relevant resources to use for each lesson.

MC lessons are conducted using a privacy board which creates a 'Mini Learning Environment' (MLE). The board is used to display helpful visual resources for learning and is personalised for the learner. It can also be used to screen the lesson from distracting surroundings. Each school is provided with two of these boards, and schools can either make or buy additional boards if needed. Visual resources helpful in creating the MLE are available on the MC website.

Each learner also has a Maths Map, which is essentially a visual image of the progress they are making. This is a key component of the intervention, designed as a talking point between the learner and LP in order to raise self-confidence and support learners in thinking about their own learning and progress. Learners can choose between working with a digital version of their Maths Map on the Digital Tool or a 'sticky-note' hard copy version made from folded card (see below).



#### ***Privacy board or mini learning environment Maths map (sticky note version)***

The Maths Map is made up of three categories: 'things I can do', 'things I am getting better at' and 'things I have stated working on'. Putting a large number of the 'secured' objectives from diagnostic assessment within the 'things I can do' category means the learner recognises immediately that they can already 'do' lots of maths and therefore helps give them a positive start to their programme. Learning objectives are moveable across the Maths Map and are added to as new objectives are selected for lessons. Each week the LPs take a few minutes to look at the map alongside the learner, think about progress over the last few lessons and reflect on this by moving statements across to the appropriate section of the map. LPs encourage learners to also think about 'learning to learn' behaviours and include these statements on the Maths Map where applicable. These include statements such as 'I can choose a resource that will help me' or 'I can explain what I did'.

Each participating school is also provided with a resource box containing resources that directly relate to the suggested activities for each objective on the Digital Tool. These include the following: a set of

Numicon™ shapes, bead strings, number lines and cards, base-10 rods, counters, treasure coins, digit cards, place-value arrow cards, dice, playing cards, a soft football, stationery set (play shop), sticks/straws, coins, and base boards—for example, bus base board, ladybird board, 100 square, hundreds/tens/ones board, base-10 calculation board, coins calculation board, treasure chests, and an array board.

### **Diagnostic lessons**

Every Maths Counts programme starts with a set of diagnostic lessons to establish what the child (known in the intervention as ‘the learner’) can already do and to identify misconceptions or gaps in their knowledge of basic concepts of number. The diagnostic lessons are conducted by maths leads (MLs) on a one-to-one basis. This takes place as and when time permits for the MLs and the learners, but all diagnostic lessons have to be completed before delivery of the programme can begin. A full assessment of the child’s starting point involves five to seven ‘scripted’ diagnostic lessons. Each diagnostic lesson lasts approximately 30 minutes. These diagnostic lessons determine what the children can already do and what aspects of maths need to be addressed. This information is then uploaded onto the Digital Tool and used by the Learning Partners to plan each lesson.

### **Maths counts lessons**

#### *When*

Maths Counts lessons are conducted at least three times a week for a minimum of ten weeks during curriculum time. When the lessons take place is decided between the ML and the class teacher, but generally schools rotate the class lessons missed to avoid learners missing the same lessons each week. The minimum number of sessions expected is 30 and LPs are expected to find the time to make up for any lessons that are missed. In this trial, the control pupils received their usual lessons in their normal classes while the treatment children had MC sessions.

#### *Where*

MCs lessons are conducted outside the regular classroom. This can be in the library, in the corridor, or in special rooms. Since these can be open spaces, Maths Counts lessons are conducted using the personalised privacy board, which creates a familiar work space for the learners.

#### *How*

LPs use the Digital Tool to view the progress of their assigned learners and find the objectives that remain unsecured and need to be worked on. Within each objective on the Digital Tool there is a menu and details of activities and key vocabulary directly linked to this learning goal. Although lessons are planned to meet the needs of the individual learner, the episodic lesson structure is the same for all learners. Each lesson begins with ten minutes of key skill practice which may include tasks requiring basic recall and reinforcement of knowledge and prior learning, followed by 20 minutes of key learning activities which build on previous work and introduce new knowledge and skills. Lessons are planned on the Digital Tool and can be saved and printed. Progress is regularly reviewed via the Maths Map.

Teaching is focused on gaps in a learner’s understanding and builds on what they already know. LPs are encouraged to employ a positive scaffolding framework approach to their interactions where prompts and cues help learners to arrive at the answers themselves or to self-correct. Learners are encouraged to ‘have a go’ and not to be afraid of making mistakes. Throughout the lesson, learners are actively engaged in using the resources. For each learning objective the Digital Tool suggests activities and resources to use. For example, throwing and catching the soft football in order to count in sequenced steps; using straws, base 10 or Numicon to secure place value skills or playing shop using coins to purchase items to develop basic money skills.



LPs can also offer home learning activities, selecting those that will meet the needs and interests of the learner. Once set-up, the LP can print off the lesson plan and home learning activities. For the Maths Counts trial, home learning activities were optional and were not used by all schools/pupils.

#### *Assessing the objective*

Once the child shows understanding across more than one activity for a learning objective, the LP secures that objective on the Digital Tool, identifying it as 'secure at' and dating it. LPs are encouraged to be confident in their decisions to secure objectives.

At the end of the Maths Counts programme (that is, after 30 sessions) the learner receives a certificate. This is printed off from the Maths Count website as a celebration of their success.

#### *After the lesson*

LPs are recommended by the developers to spend ten minutes after each lesson making notes on the previous session and considering how to move forward with the next lesson. The intention is that this reflection and planning process is more effective while the previous session is still fresh in their minds.

See Appendix B for the TIDieR checklist of the Maths Counts intervention. Further information about the intervention is available at the Maths Counts website: <http://mathscounts.co.uk/>

### **Maths Counts training and support**

Prior to the delivery of the programme the project team conducts two full-day training sessions. The first training session is to train MLs to use the diagnostic assessment and the Digital Tool. The second session is specifically for the training of LPs. It outlines the theory behind the intervention, suggests how the resources can be used, and explains how each lesson is planned. MLs and LPs attend both training days.

### **CPD workshops**

As part of the intervention, LPs also receive four planned Continuing Professional Development (CPD) workshop sessions delivered by their MLs. Detailed plans and activities for each of these sessions are contained in a handbook compiled by the project team. These take place during the course of the intervention and include specific training linked directly to issues likely to be faced by LPs during their teaching. These are titled 'working memory and the Connections Model', 'making the best use of manipulatives' (such as Numicon), 'questioning and exiting the programme', and 'teaching multiplication and division'.

It is suggested that these workshops are delivered at two-weekly intervals during the course of the intervention delivery. Each workshop includes a 15-minute review of the programme and a one-hour training session. The review time secures a formal and regular opportunity for LPs to consult MLs about specific issues they may be encountering with their learners.

### **Background evidence**

Numbers Count drew much of its pedagogical rationale from 'What Works for Children with Mathematical Difficulties' (Dowker, 2004), a review commissioned by the DfE for the then National Strategies. The underpinning principles and pedagogy for the Maths Counts programme are derived from the Every Child Counts (ECC) initiative, which was formed in 2007 as a partnership between the Department for Children, Schools and Families and private funders. In 2008, Edge Hill University was appointed through public tender as the Higher Education Institution commissioned to develop the teacher-led Numbers Count (NC) intervention that became the core of ECC and upon which Maths Counts has been modelled.

Under the ECC partnership, targeted schools were partially funded to train specialist Numbers Count teachers. When this targeted public funding for ECC was discontinued under the coalition government in 2010, Edge Hill University took over ECC as a 'not for profit' enterprise and continued to provide Numbers Count training to schools as part of a range of pedagogical interventions in mathematics and literacy.

In 2015, a group of teachers in the Mead Academy Trust, one of whom had been trained as a Numbers Count teacher, decided to apply for funding from the Education Endowment Foundation to develop a mathematics intervention. This intervention was named Maths Counts (MC) and it adopted many elements of Numbers Count. Two important distinguishing features of Maths Counts in comparison to Numbers Count are that it is delivered by teaching assistants rather than by teachers and that it uses a digital platform to assist with the planning, recording, and monitoring of lessons. Although developed by the Mead Academy Trust, Maths Counts has benefited from the support of Edge Hill University since early 2017.

Edge Hill University reported on its website that since 2008 over 50,000 children have been supported by 2,800 trained Numbers Count teachers in 2,500 schools (Edge Hill University, 2018). It reported that children made an average of 17 months of gains in four months (four times the expected progress) as measured by schools' use of the standardised Sandwell Early Numeracy Test, and that 73% of these children achieved the national expectations for their age group at KS1 and KS2 as measured by teacher assessments and national tests. Furthermore, 95% of these children were reported by their teachers to be showing more confidence and interest in learning mathematics in class after NC. Crucially, however, the NC evaluations did not compare the progress of these children with similar children not receiving NC.

The first large-scale independent evaluation of Numbers Count was commissioned in 2009 by the DfE (Torgerson et al., 2011). This was a randomised controlled trial involving 522 pupils from 53 schools across England. It reported a short-term impact of NC on children's maths attainment, measured using the standardised Progress in Maths test (PiM), when compared to no intervention (ES = 0.33). This was based on post-test scores only, but the intervention group was already ahead at pre-test based on the Sandwell Early Numeracy Test. It is not clear what the gain scores are. There is thus some evidence that the individualised approach to maths teaching can help raise the maths attainment for the weakest children.

Other studies also suggest that interventions that provide data and feedback on maths performance to teachers and pupils (an approach proposed by Maths Counts) are more effective than those focused solely on the quality of teaching. This is supported by a review of 15 rigorous RCTs on maths teaching interventions for low-achieving pupils (Baker et al., 2002). More generically, there is already evidence that training TAs more rigorously to help with pupils underachieving in maths can be beneficial (Holmes and Dowker, 2013). A similar intervention, but with a literacy focus, demonstrated the usefulness of TAs in working with small groups of pupils for catch up (Gorard et al., 2015). However, no such evaluations have been conducted of Maths Counts.

### **Evaluation objectives**

The aim of this evaluation is to answer the main research question:

- How effective was the individualised Maths Counts programme in improving the maths skills of primary school children struggling in maths compared with a 'business as usual' control group?

A secondary objective was to see if such an approach also improved children's attitude towards maths.

### **Ethical review**

Once schools had identified children eligible for the intervention, opt-out consent (see Appendix C) was sought from parents through the schools for children to take the InCAS maths assessment, and for the school to share pupils' background information (which includes details such as date of birth, gender, ethnicity, free school meal status, and English as an additional language) with the evaluation team (Durham University) and the assessment provider (Centre for Evaluation and Monitoring). A Memorandum of Understanding was signed by all parties involved in the trial agreeing to comply with the requirements of the trial and with data security and data protection guidelines (see Appendix D).

The evaluation was conducted in accordance with the British Educational Research Association's ethical guidelines and Durham University's ethics committee research guidelines. These guidelines ensure that all pupil and assessment data is treated in the strictest confidence and that no individuals or schools are identified or identifiable. All results are reported in aggregated form. The data is anonymised and shared by Durham University with the Education Endowment Foundation data archive. Ethical approval was granted by the Durham University Ethics Committee on 18 January 2016.

### **Project team**

The intervention was developed by members of the Mead Academy Trust. This included:

Nicola Theobald—Project Lead, May 2015 to April 2016

Sarah Couzens—Project Lead, April 2016 to September 2017

Sheila Claridge—Maths Count programme developer, trained Numbers Count teacher

Jayne Bullock—project co-ordination/school liaison

Lyssy Bolton—Executive Head of the Mead Academy Trust/project proposal and oversight

Lindsay Palmer—Headteacher at the Mead Academy Trust; project and budget oversight

Tracy Boulton—Headteacher at Castle Mead Primary; maths lead for pilot phases 1 and 2; project oversight

Lucy Beck—web design

Lisa Freeman—18a Productions; Digital Tool developer

Cath Walker—maths lead at The Mead Primary from Jan 2017; project lead assistant

Becky Millard—maths lead at pilot phases 1 and 2

Mark Long and Pam Robertson—additional Maths Counts Trainers for Bristol and Somerset hubs.

The project delivery team recruited schools to pilot phases and the trial, conducted the training of maths leads and Learning Partners, and compiled the teaching and learning resources and the workshop CPD training manual. An external software developer (18a Productions) was engaged to develop the Digital Tool in close liaison with the Maths Counts programme developer and the project delivery team.

### **Evaluation team**

The independent evaluation was led by Durham University. Professor Stephen Gorard managed the evaluation, with specific focus on the design of the trial and the impact analyses. Dr Beng Huat See managed the project including designing the process evaluation tool and communications with the developer and the schools. Dr Rebecca Morris collected data and supported engagement with schools, and led the process evaluation. Dr Nadia Siddiqui supported the research team in the development of final report. The evaluation team was also supported by two postgraduate ad hoc researchers, Laurence Droy and Eszter Newmann, who completed a substantial number of school observation visits.

**Trial registration**

The evaluation team made the decision not to register the trial since the protocol and the analysis plan have been published prior to the analysis of the data. The full report including all of the findings will be published in its entirety on the EEF website. This accords with the principles of trial registration, that is, to inform the field that a trial has been conducted, that the trial adheres to the pre-trial protocol on outcomes and analysis, and that all results (both positive and negative) are published. Since this trial already conforms to all these requirements, the evaluation team considers that registration of the trial is not necessary.

## Methods

### Trial design

The main trial was a one-year, two-armed efficacy trial. Pupils identified as eligible (see below for eligibility criteria) were randomly assigned to either Maths Counts or 'business as usual'.

Pupils were individually randomised within schools. This should reduce post-allocation demoralisation as all schools would be effectively intervention schools. Whilst individual randomisation within schools runs a slight risk of diffusion, this was minimised as the Digital Tool was password protected, so only treatment pupils' progress and the appropriate activities as ascertained by the tool could be accessed by LPs. Also, the programme begins with a diagnosis of needs and suggests the appropriate level and activities to be used with an individual child. Since control pupils were not diagnosed, their learning needs were not determined. There were therefore no identified activities for LPs to use with them. Further, part of the process evaluation was to assess the possibility of contamination either by friendship groups or family.

Although the evaluation was not designed as a waitlist trial, schools were told that they could continue the intervention with the control pupils after the trial. This was to encourage school commitment to the programme. No extra cost was incurred as the Learning Partners (teaching assistants) and maths leads had already received training and all schools were also gifted with the box of resources. The developers have also allowed schools to continue with the use of the Digital Tool. This was possible since there were no registration costs involved.

### Participant selection

#### Schools

The recruitment of schools was led by the project delivery team. For the pilot, they targeted schools within the Teaching School Alliance and neighbouring schools (see Appendix A).

For the main trial, the schools recruited came from four main regions: London, Somerset, Bristol and Wiltshire. Schools recruited were those with above the national average percentage of children eligible for Free School Meals (FSM). It is not possible to put a figure on the number of schools that were approached by the developers as no individual schools were approached as such. Schools were recruited largely through promotional activities via three outlets:

- interest shown from promotion on the EEF site;
- information letter sent to Wiltshire schools; and
- professional liaison with a representative of eligible groups of schools, such as Diocese schools with subsequent internal promotion prompting interest.

#### Pupils

Pupil participants were those from Years 3 to 6 identified as eligible. Eligibility was assessed using a combination of teacher judgements of which pupils were deemed to be unlikely to meet the Year 2 Programme of Study and the criteria in the Ofsted framework grade indicators for pupil outcomes. Priority was given, in no particular order, to:

- pupils at risk of not achieving the nationally expected levels;
- lowest attaining pupils;

- younger Key Stage 2 pupils were also given priority as they were deemed to have most to gain from earlier intervention; and
- Pupil Premium pupils.

Each school was required to identify at least eight eligible pupils to participate in the trial. An average of four pupils per school would receive the intervention with a further four pupils constituting 'control' pupils. Since some of the schools were large primaries and had more than one maths lead, they were able to support more than two LPs and hence more than four learners. Once eligible pupils were identified, opt-out consent was sought from parents via the school (see Appendix C for opt-out consent form). Eligible pupils were then individually randomised within the school to either receive the Maths Counts intervention or to 'business as usual' teaching.

## Outcome measures

### Primary outcomes

Given the year groups involved in the trial, no official outcome measures such as KS2 results were available for all pupils within a one-year trial. Initially the outcome measure of choice was the GL Assessment's Progress in Maths (PiM). However, during the pilot phase the developers decided that PiM would not be suitable for the kind of children they were supporting. They then chose the CEM InCAS assessment (<http://www.cem.org/incas>) which was deemed to be more in line with what they wanted to measure. InCAS consists of three modules: General Maths, Maths Attitude and Mental Maths. The primary outcome measure for this trial is General Maths. This includes counting, place values, fractions, patterns, problem-solving, measures, shapes and space and data handling. The choice of test was agreed by all parties including the EEF and the MC team. Another advantage of InCAS is that it was more independent of the intervention than the Sandwell test, which was also used as an optional assessment for the intervention.

As the test is adaptive, only the age-standardised scores are available (according to the assessment provider), so it was decided that the primary outcome for this trial should be the age standardised test of General Maths scores

Pupils' prior KS1 point scores in maths were used as the pre-test score and also to check for initial balance between groups. This data was obtained from the DfE using pupils' UPNs and school identifiers, but with UPN identifiers later removed for data protection. A pre-test was originally planned, however, the EEF advised the use of KS1 results as pre-test scores partly to minimise the burden of testing.<sup>1</sup>

The use of KS1 scores resulted in some comparability issues. Specifically, pupils in Year 4, Year 5 and Year 6 had point scores available, while pupils in Year 3 had ordered categorical outcomes. This is because the approach to describing the attainment of pupils in England changed from the use of levels to the use of four descriptive categories, which has changed the nature of the data available for Year 3 pupils. As a result of this difference in baseline between Year 3 and the other year groups, the results for the Year 3 pupils are analysed separately as well as combined with the rest of the trial cohort (see Subgroup Analysis below). This was agreed with the EEF and published in the statistical analysis plan (SAP).

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<sup>1</sup> [https://v1.educationendowmentfoundation.org.uk/uploads/pdf/Pre-testing\\_paper.pdf](https://v1.educationendowmentfoundation.org.uk/uploads/pdf/Pre-testing_paper.pdf)

## Secondary outcomes

The secondary outcomes were 'Mental Arithmetic' and 'Attitude towards Maths' measured using the subscales on the digital CEM InCAS test. Scores for 'Attitude to Maths' were collected via the maths-only questions in the attitudes subscale of the CEM InCAS test. This use of the maths-only attitude was approved by CEM (the test developer).

## Other data

Pupils' EverFSM6 status was obtained from the National Pupil Database and used for subgroup analyses. Other background characteristics such as age, date of birth, sex, ethnicity, first language, and Special Educational Needs (SEN) status were also collected, where possible, from schools to establish equivalence between groups.

## Sample size

The sample size calculation was based on the assumption that there would be 30 schools and four year groups (Years 3, 4, 5 and 6). The project developers envisaged that there would be an average of about three eligible pupils per class. Assuming 1.5 classes per year group and three eligible pupils per class, there would be 18 pupils per school, giving a total sample of 540 or 270 per arm.

Traditional power calculations are based on the invalid approach of significance testing (Gorard et al., 2017). They are not included here. Instead, we calculate the sample size needed for any 'effect' size to be considered secure by considering *a priori* the number of 'counterfactual' cases needed to disturb a finding (Gorard and Gorard, 2016). This 'number needed to disturb' (NNTD) is calculated as the 'effect' size multiplied by the number of cases in the smallest group in the comparison (that is, the number of cases included in either the control or treatment group, whichever is smaller). This approach allows for estimating ES and sample size using the formula as shown.

$$\text{NNTD} = \text{ES} \times n$$

$$\text{Therefore, } n = \text{NNTD} / \text{ES}$$

This is a useful way of interpreting the effect size (and its variability as represented by the standard deviation used to compute the 'effect' size) taking into account the sample size. It can then be extended to compare this sensitivity directly to other more substantial sources of error (than chance), such as the number of missing values/cases. The number of cases actually missing a value can be subtracted from the NNTD to give an estimate of how large the 'effect' size would be even in the extreme situation that all missing cases had the 'counterfactual' score hypothesised in the NNTD calculation. Here the 'counterfactual' score is one standard deviation away from the mean of the group with the largest number of cases. The standard deviation would be added if the mean of the smaller group (in scale) were smaller than the mean of the larger group, and subtracted if the mean of the smaller group was the largest (Gorard et al., 2017).

Based on Gorard et al. (2016), NNTD of 50 can be considered a strong and secure finding. Using this as a working assumption, the number of cases needed in each group (assuming equal size) to detect an 'effect' size of 0.2 (which is typical for an education intervention) will be 250 (50/0.2). This is assuming no attrition.

In this trial, 35 schools and a total of 305 pupils were recruited with an average of 8.7 eligible pupils in each school. The achieved sample can largely be explained by the fact that the delivery team had limited

capacity to support a larger number of schools, and this was agreed by the EEF. This makes the trial less robust than planned. With 152 cases in the smaller group, to achieve an NNTD of 50 would require the underlying effect size being sought to be 0.33 or greater.

The NNTD calculation concerns the security of a difference and so is relevant to internal validity only. Issues such as clustering, concerned with whether the result may also occur among cases not in the RCT, are therefore irrelevant. In addition, as pupils were individually randomised within schools and analysis was of all pupils in the two groups and not by schools, clustering effects, if there were any, should be evenly spread between the two groups across all schools.

To ensure all pupils were tested, regardless of whether they had left the school, the developers offered school leavers' destination schools an incentive payment of £200 to complete the InCAS assessment. Details of leavers can be seen in the participant flow diagram.

## Randomisation

Pupils identified as eligible were randomised at the individual level within schools to one of two groups: Maths Counts or 'business as usual'. This was carried out by the lead evaluator using a random number generator programme (random.org) in the presence of colleagues in the School of Education. A total of 305 pupils were identified. Of these, 152 were randomised to receive the Maths Counts intervention and 153 to the 'business as usual' control.

## Analysis

Analysis was conducted independently of the process evaluation results. This was to avoid either analyses being unconsciously influenced by the other.

### Primary intention-to-treat (ITT) analysis

The primary ITT analysis was conducted by comparing the main outcome measure (age standardised scores of InCAS General Maths) between the treatment and the control groups. The results are presented as Hedge's  $g$  'effect' sizes by dividing the difference in the means of the age standardised scores of InCAS General Maths (using the compare means option in SPSS) between treatment and control by the overall standard deviation of the test scores.

In addition, a gain score analysis was conducted as specified in the SAP. As there was a substantial imbalance in the pre-intervention scores, equal to an effect size of +0.13 between groups and this is above the agreed threshold of 0.05 set out in the SAP, the gain scores form the headline finding. They are presented as 'effect' sizes based on gain scores calculated using the difference in the mean gain scores made between KS1 maths point scores and descriptive measures and the InCAS General Maths test by the two groups.

For comparability the KS1 maths scores and descriptive measures and InCAS General Maths scores were converted to Z scores.

While KS1 point scores were available for Years 4, 5 and 6, the KS1 scores for Year 3 pupils were in descriptive categories (a system brought in after the trial was defined). To combine all baseline data points we converted the descriptive measures for the Year 3 cohort to a score equivalent to the National Curriculum levels (Table 3). This was the system used by some of the schools in the trial in making comparisons between the old and new grading system. For example: If level 2b is the expected level for Year 3 pupils, the new grading WTS (working towards expected standard) will be equivalent to level 2c and the new PKF (pre-key stage foundation for the expected standard) will be equivalent to level 1 (achieved level 1) and so on (see table below). These grades were then converted to the point score equivalent for each grade.



**Table 3: Mapping of new and old KS1 point scores to levels**

OLD NC level	New	Point scores
<b>A = absent</b>	A	
<b>D = disappplied from NC</b>	D	
<b>W (Working towards level 1)</b>	BLW = Below—corresponds with P-scales or NOTSEN	3
<b>1</b>	PKF = Pre-Key stage—Foundations for the expected standard	9
<b>2c</b>	WTS = Working towards expected standard	13
<b>2b</b>	EXS = working at the expected level	15
<b>2a</b>	GDS = Working at a greater depth within the expected standard	17

**Missing data**

Dong and Lipsey (2011) demonstrated that any missing values can create bias, even if attrition is balanced between comparator groups. And where such attrition is not random (as is most often the case) it can bias the estimate of the treatment effect, and the bias can still be large even when advanced statistical methods like multiple imputations are used (Foster and Fang, 2004; Puma et al., 2009). Such bias can distort the results of statistical significant tests and threaten the validity of any conclusion reached (Shadish, Cook and Campbell, 2001; Campbell and Stanley, 1963; Little and Rubin, 1987). We therefore present differences in pre-test scores (KS1 maths) between cases dropping out from both groups (where these are available) and compare the number of missing cases to the number of counterfactual cases needed to disturb (NNTD) the finding (Gorard and Gorard, 2016). The number of counterfactual cases will help determine whether the number of missing cases is large enough to alter/explain the findings. It is a measure of how stable the result is after attrition.

**Fidelity analysis**

Two analyses were carried out. The first compared the outcomes of pupils with the actual number of sessions they attended (dosage). The number of sessions were used as a continuous variable in the analysis. Data on the number of sessions conducted was collected from the Digital Tool, and provided by the developers who had access to the Tool.

To estimate the effects for the subgroup of treatment students who complied with their treatment assignment the Complier Average Causal Effect (CACE) analysis was performed (Nicholl, undated). Comparison is made of the average outcome of treatment pupils who complied with control pupils who would have complied if given the treatment (assuming same rate of compliance as for the actual treatment group). Specifically, compliance was measured using the threshold of 30, which is the minimum number of sessions recommended. Essentially it is a comparison of what actually happens with what might have happened (Ye et al., 2018).

Given that we know the overall results for both groups and the data for those in the treatment group who complied and who did not comply (cells labelled A to K in Table 4), we can calculate the average outcome for those in the control group who would have complied if given the treatment. We assume

that because of randomisation, the proportion of compliers in both arms of the trial is the same (on average), and the average outcome for those in the control group who did not comply (I) will be the same as the outcome of non-compliers in the treatment group (D). We may conclude:

- proportion in treatment group who complied is A/E;
- number in control group who would have complied (G) will be A/E\*J
- number of non compliers in control group (H) = J-G
- the average outcome for compliers in the control group ( $x$ ) is calculated thus:

$$x = ((K*J-H*I)/G)$$

**Table 4: Estimation of CACE**

Participants	Compliers		Non-compliers		All	
	N who complied	Mean	N who did not comply	Mean	Total N	Mean
<b>Treatment</b>	A	B	C	D	E	F
<b>Control</b>	G = A/E*J	$x$	H = J-G	I	J	K

### Secondary outcome analyses

Similar analyses were conducted for the secondary outcomes (Mental Arithmetic and Attitude to Maths) as for the primary outcomes. As the groups were not balanced at pre-test (KS1 scores), comparisons were made of the mean gain scores between KS1 maths point scores and the Age Standardised scores for the InCAS Mental Maths and Attitude to Maths between the two groups. These were converted to Hedge's g effect sizes.

### Additional analyses

Because of the differences between baseline data for Year groups (that is, Years 4, 5 and 6 with levels and Year 3 with descriptive measures) we also analysed the two cohorts separately by converting the descriptive measures into scores equivalent to the NC levels.

For Years 4, 5, and 6, a simple pre- post-test comparison of mean scores was used to determine the effect size using KS1 maths point scores for the pre-test. For the Year 3 cohort—because the pre-test scores are four skewed categories and the post-scores are normal interval scores—the results are shown as the mean post-scores for each initial category. The two lowest band categories (BLW and PKF) contained few pupils, and these are combined into one category (see earlier discussion).

In addition, three separate regression analyses were performed: one for Year 3, one for the other year groups, and one combined. For Years 4, 5 and 6, a one-step multiple regression analysis was conducted using KS1 scores and treatment group membership as the predictor, with post-test scores (InCAS General Maths assessment) as the dependent variable. For the Year 3 regression, three dummy input variables representing the four categories of pre-test (the lowest two categories are combined because of the small number of cases) and treatment group were used as predictors with post-test scores (InCAS General Maths assessment) as the dependent variable.

A one-step multiple regression analysis was also conducted using the combined scores as the converted KS1 scores and the treatment group as predictors, and the InCAS General Maths scores as the dependent variable.

### Subgroup analyses

The main analyses were repeated with only those pupils identified as EverFSM6 eligible (using the Spring 2017 record).

### Effect size calculation

'Effect' sizes for attainment outcomes were calculated as Hedges'  $g$  based on the difference between mean gain scores and post-test scores for each variable, divided by their overall standard deviation. Gain scores are preferred when the groups were clearly unbalanced at the outset ('effect' size of 0.05 or more).

'Effect' sizes for pre-test categorical variables were based on post odds ratios (see p. 26). The ratios compare the proportion of pupils in the treatment group gaining the specified outcome with the proportion in the control group. This is a standard measure of difference between two categorical variables with strong compositional invariance (Gorard and Taylor, 2002).

All are presented with the number of counterfactual cases needed to disturb the results.

We do not report 'confidence intervals' as they are misleading, but an interested reader can compute them if they wish as the number of cases per group, and the effect size for each comparison, are presented.

## Implementation and process evaluation

### Aims

There were four broad aims for the process evaluation. These were:

1. to assess the fidelity of the implementation of the programme—to observe the extent to which Learning Partners and maths leads deliver the intervention as they have been trained (any departure from this, which could impact on the effects of the trial, will be noted; for this reason we attended all of the training sessions and visited a sample of schools to observe the delivery of the programme);
2. to identify aspects of the programme that may have facilitated change and improvement so that if the programme is found to have positive effects we can suggest reasons for this;
3. to identify challenges faced in the implementation of the programme, and the barriers to effective delivery; and
4. to find out about the perceived impact of the programme:
  - Do the teaching staff (this could be LPs, MLs and school leaders) think that the children they are supporting have made any progress?
  - Does the programme shape their teaching practice?

### Design

A sample of ten schools (at least one from each hub) was selected at random as case study schools. The schedule of visits was agreed with the developers and the maths leads.

Each of the ten schools would be visited twice, once at the beginning and once at the end of the trial, to register changes in attitude and behaviour of teaching staff. However, two other schools agreed to our visit so these were visited too at the beginning of the trial. Although they were not the case study schools, data collected from visits to these schools is added to our process evaluations. In general these visits took place between January and March 2017.

For the convenience of schools, we arranged the second round of visits to coincide with the day the post-test would be administered. However, just four of the initial 12 schools were able to accommodate us for the second visit. This was either due to Ofsted inspections, SATs mock exams, staff absence or in one case, school building work. In addition we visited two other schools (not the same ones visited in the first round) with the project team as part of their support visits. The second round of visits (scheduled towards the end of the trial) was specifically to assess:

- the experience of pupils and teaching staff;
- their perceptions of the programme;
- perceptions of pupil progress;
- whether the school would continue with the programme after the trial and in what form (one-to-one or small group);
- the leadership support and if they will still get the support to continue the programme after the trial;
- the challenges faced;
- whether the training (for MLs and LPs) was adequate to enable delivery of the programme; and
- perceptions of the CPD workshops conducted by the maths leads.

In addition, evaluators also attended the two staff training events at each of the four hubs. This was to gather information about the intervention and observe how LPs and MLs were trained in order to assess, during school visits, whether the programme was delivered in line with the training.

## Data collection methods

### *Observations*

Fieldwork at the ten case study schools was conducted to observe the delivery of Maths Counts sessions, the training of maths leads and Learning Partners, the delivery of CPD workshops by MLs, and the test administration. These were as non-intrusive as possible. All visits were scheduled well in advance and with the consent of maths leads and other relevant staff in the school. Interviews with staff and focus groups with pupils were also arranged with the MLs to assess participants' perceptions of the intervention and to provide an opportunity for them to advise on improvements and issues for any future scaling up.

There was no structured protocol for observations and interviews as such in order to have the freedom to capture everything that we saw, heard and experienced. From experience, a structured protocol may constrain what is observed and heard and may also encourage researchers to stick strictly to the protocol and thus ignore potentially relevant observations. Although we did not have any formal observation and interview protocols as such, we did have a broad brief on what to look for on these visits as summarised below.

### *Observation of the sessions –what to look out for*

1. Observe how the sessions are conducted. Are there any departures from the protocol?
2. How do the LPs engage with the pupils?
  - What's their body language like? Friendly, approachable?
  - Tone of voice—encouraging, positive, supportive?

- How do they use the manipulatives?
  - Note anything positive or negative—for example, did they seem impatient or correcting mistakes a lot of time?
  - What kind of questions do they ask? And how do they ask questions—, for example, is it open ended and how do they guide the child to arrive at the right answer?
  - How do the LPs respond to the child—for example, if the child looks bored or reluctant to be involved?
  - Were the children punctual for the session?
3. How do the pupils respond to the lesson?
- What's their body language like?
  - Are they engaged, interacting with the LP?

### *Interviews*

In addition to observations, feedback was also collected from pupils and teaching staff via face-to-face interviews across 12 schools. These were in the form of informal chats with pupils and LPs (or MLs if available). The brief for these interviews were to:

1. Look out for the possibility of contamination or diffusion. Ask, for example:
  - Is the school also using other interventions to support struggling pupils?
  - What support do control pupils get?
  - Do any of the LPs also support the control children? If so, how was this conducted?
2. Barriers and facilitators
  - Find out what hinders the effective implementation of the programme (for example, time to prepare lesson, access to computer, quiet space to conduct the lessons, management support, or time-tabling).
  - What did the school find most challenging when implementing the intervention?
  - Was there any resistance from LPs (for example, were they not excited about the programme or dubious about its efficacy)? Find out what LPs and MLs think are the key factors that enable them to successfully deliver the lessons.
  - How many sessions have been conducted? How did they go?
3. Perceived and potential impact
  - Find out what pupils and teaching staff like about the programme and what they don't like.
  - Find out if any activities were sent home to parents to support home learning.
  - Do they think the intervention has had benefits? What aspects of the intervention do they think were the most beneficial?
  - Do they plan to carry on using the intervention techniques or materials in some form after the trial? Why?
  - If they plan to carry on using aspects of the intervention, in what form will this be (one-to-one sessions, small group sessions, and so on)?
4. Improvements
  - Ask them how they think the programme could be improved (for example, different support, different training, different activities, different schedule, and so on).
  - Any lessons learnt or feedback?

### *Fidelity Measures*

The fidelity to the protocol of the intervention was further assessed by the project delivery team in their monitoring and support visits. The delivery team selected six schools which they thought needed support based on the information taken from the Digital Tool showing the number of sessions delivered and the number of objectives secured for each child. Evaluators shadowed two of these visits. These two schools were in addition to the ten case study schools selected for the observations. This offered a chance to observe how the delivery team supported these schools. It also provides additional data for the process evaluation. At these support meetings the delivery team discussed with the MLs and LPs challenges faced in the implementation of MC as well as the strengths of the programme. They also collected feedback from the pupils. Feedback from five of these support visits (including the two we saw) was shared with the evaluation team.

Instead of the planned teacher survey, the delivery team convened a review and feedback session for schools to share their views of the intervention and the trial in general (see Appendix E). The developers felt that the face-to-face and interactive session would allow for more scope for views from LPs and MLs. This presented an opportunity to gather additional feedback from the schools about the programme. Evaluators attended these review sessions at two of the hubs, and information collected added to the data used in the process evaluation. Where schools were unable to attend the workshop, views were sought via a questionnaire sent electronically and responses shared with the evaluation team.

The delivery team monitored the regularity and the quality of the sessions conducted via the Digital Tool where they could view the number of lessons planned and the number of objectives secured for each learner. See Appendix F for an example of the Digital Tool activity log.

### *Observation of test administration*

The evaluation team also observed the administration of the test in schools. This was necessary because the teaching staff were no longer blind to treatment allocation and so there was a possibility of unconscious bias towards Maths Counts children. Observations explored, for example, whether staff adhered to the assessment protocols. In total we visited four schools. These visits focused on:

- How the test was administered—for example, did the children take the test two at a time or one by one, and did the control and treatment children take the test separately?
- Whether there were any issues during the test, for example, technological problems, or children finishing the test too early, or refusing to participate.
- How long the children (on average) took to complete the test.
- Were there any irregular administrative or assessment practices occurring—for example, staff giving additional help to some students?

Ad hoc interviews were also conducted with the test administrators (these included teaching assistants, MLs, or senior members of staff). As this was the first time that the CEM InCAS assessment had been used by the evaluation team, these interviews also sought to find out about users' experiences, which could inform future trials. Questions on this topic included:

- How did the test go?
- What was your experience with using InCAS?
- Did you have any difficulties in registering and setting up the test?
- Were the test instructions/guidelines given and the training provided helpful?

## Costs

The cost of running the intervention is estimated on the assumption that there are four children per school and is based on information provided by the project team. The cost includes:

### Cost of delivering the intervention:

- resource box and the privacy board.

### Cost of staff training:

- printing and photocopying of handouts and training guidance;
- CPD materials;
- ongoing support and monitoring of the Digital Tool (this would depend on the amount of support a school would need and likely to be charged per hour); and
- cost of travel and subsistence for the project team to deliver the 2.5 days of training to schools (this was estimated by the evaluators based on previous projects).

### Staff time:

- school staff time spent in training to deliver the intervention;
- school staff time spent on preparation for the delivery;
- school staff time spent on delivering the intervention;
- time spent on CPD training by MLs for LPs;
- half day supply cover to release staff for initial briefing; and
- two and a half days supply cover for MLs and LPs to attend training and follow-up sessions.

## Timeline

Table 5 outlines the overall timeline for the full evaluation, including development and pilot phases.

**Table 5: Evaluation timeline**

Date	Activity
May 2015–September 2015	Development phase.
September 2015–December	Pilot phase 1: develop and test the intervention with three schools in the Mead Academy Trust using a paper based version of the Digital Tool; develop and set up a website.
January 2016–April 2016	Pilot phase 2: develop the early version of the Digital Tool; develop the training of maths leads and Learning Partners and the delivery of the programme.
March 2016–July 2016	Recruitment of schools to the trial.
August 2016	Memorandum of Understanding and agreement to the evaluation signed.
September 2016	Leadership briefing conducted in the four hubs.
October 2016	First training session for maths leads and Learning Partners; maths leads introduced to the project and trained to conduct the diagnostic test; observation of training session.
October 2016–December 2016	Schools identify eligible pupils; randomisation of pupils; maths leads conduct diagnostic lessons with treatment pupils and upload pupil data onto the digital tool.
January 2017	Second training session for Learning Partners and maths leads; Learning Partners introduced to the lesson planning using the Digital Tool and lesson delivery; observation of training.
January–March	Schools register for the InCAS assessment .
January–March 2017	Delivery of Maths Counts; case study site visits to observe delivery sessions and collect teacher and pupil feedback.
April 2017	Evaluation week: pupils take the InCAS assessment; follow-up pupils who have left schools to set up the tests; assessment completed.
May 2017	Feedback and review week: collect feedback from teachers on their experiences of Maths Counts.
June 2017	Put in request for NPD KS1 data.
September 2017	NPD data received; preliminary impact evaluation analysis conducted; process evaluation report completed.
December 2017	Re-analyse impact data taking account of the different KS1 scores for the Year 3 and the other age groups.



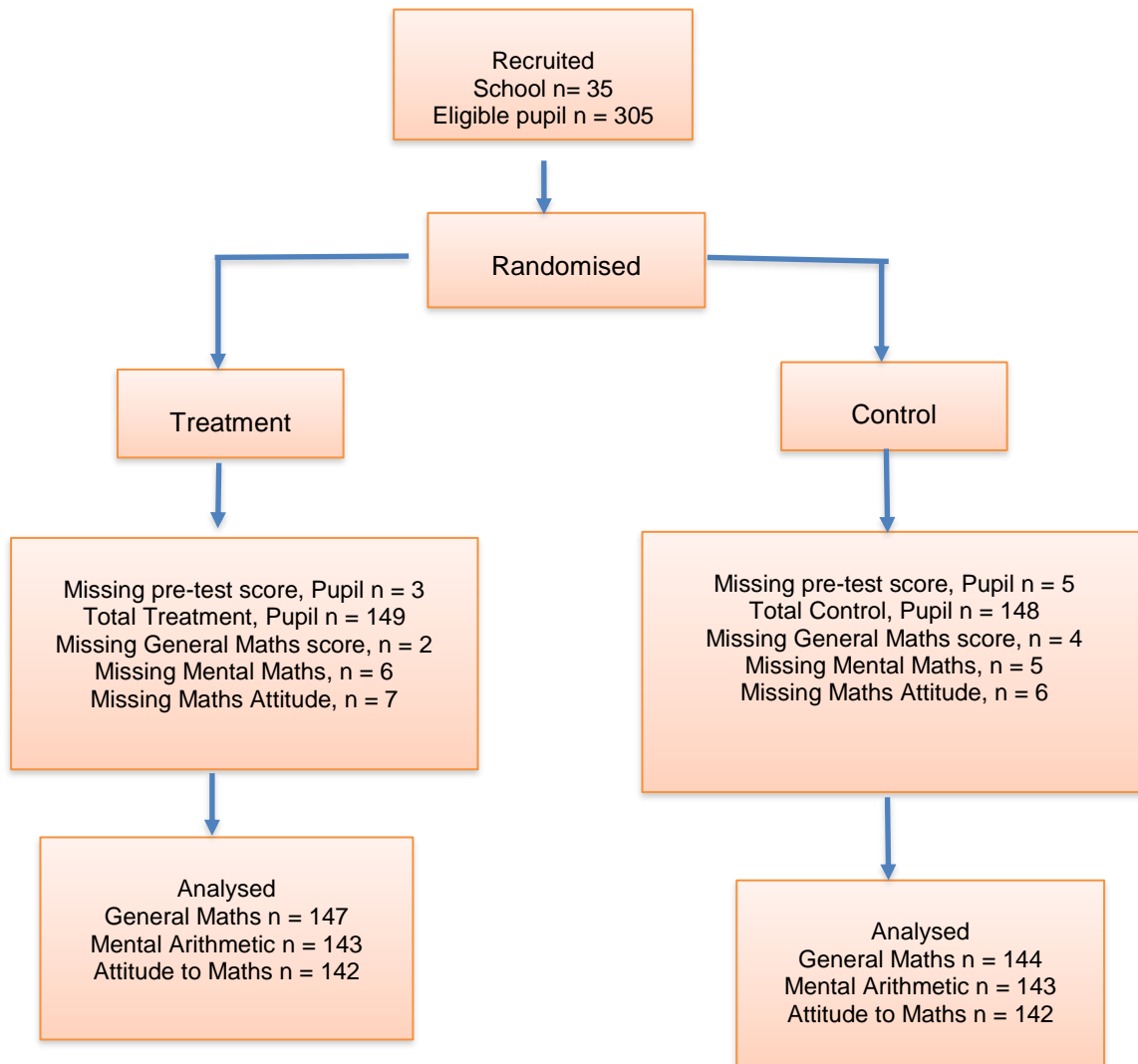
## Impact Evaluation

### Participants

In total, 35 schools were recruited to the trial (see Figure 2). It is difficult to estimate the numbers of schools that were approached. The project team explained that schools were contacted via professional links who circulated alerts about the Maths Count trial in Somerset, BANES, Dorset, and Wiltshire through blanket send-outs. School leaders in the Inspire partnership in Woolwich, DSAT (Diocese of Salisbury Academy Trust) and the CLF (Cabot Learning Federation Teaching School Alliance) in Bristol directly targeted schools in their area that they felt may benefit from the intervention. Interested schools then contacted the project team and expressed interest; 42 schools were considered as eligible and directly approached, of that number, 35 were signed up. No school dropped out.

An average of 8.7 pupils were identified as eligible from each school giving a total of 305 pupils. Of these, 152 were randomised to receive the Maths Counts programme while the other 153 formed the control continuing with business as usual. Twelve children left their trial schools during the course of the evaluation; ten were followed up to their new school, of which one did not complete the test as the school was unable to administer the test. Two could not be tracked, of which one was home-schooled and one moved to the Caribbean. Both were treatment children. An incentive payment of £200 was offered to the school leaver's destination school as a token of goodwill for their assistance in setting up the assessment for the children.

**Figure 1: Participant flow diagram**



As shown in Figure 1, 305 pupils were initially listed to be in the trial. Of these, eight did not have pre-test scores, meaning that there were 297 randomised pupils with pre-test scores. Some were also missing post-test scores for some modules, including six cases with no General Maths scores. The headline figures are therefore based on 291 cases. One possible explanation given by the test supplier is that the pupil had either not completed the assessment or the school had used a non-web version and had not returned the results. Another possibility is that there was a malfunction in the system. For example, in one school a child had clearly taken the test, but no scores were recorded.

**Table 6: Minimum detectable effect size at different stages**

Stage	N [schools/pupils] (n=intervention; n=control)	Correlation between pre-test (+other covariates) and post-test	Power	Alpha	Minimum detectable effect size (MDES)
<b>Protocol</b>	540 (270; 270)	0.4	80%	0.05	0.21
<b>Randomisation</b>	305 (153; 152)	0.4	80%	0.05	0.29
<b>Analysis (i.e. available pre- and post-tests)</b>	291 (147; 144)	0.4	80%	0.05	0.29

*Note: although at least one pre- and post-intervention score is available for 297 cases, the headline findings are based on 291 cases (see Figure 1). Alpha, power and MDES are presented here as required by the EEF. MDES calculated using Powerup tool.*

### Pupil characteristics

Table 7 shows that the schools that took part in the trial are more likely to be academies compared to all other primary schools in England. In terms of their Ofsted ratings, schools are comparable to the national average although they are marginally more likely to be rated ‘good’ or ‘outstanding’. They also tend to be smaller schools although there are a couple of large academy trust schools. The trial schools are also, on average, lower performing compared to the national average. Only 76% of pupils in these schools achieved the expected level 4 or above at KS2 in reading, writing and maths compared to 80% for all primary schools in the country. Compared to the national average, the trial schools also have proportionately more disadvantaged children (higher proportion of FSM and SEN). However, they are less likely to have children for whom English is an additional language. This is probably because of the geographical location of the schools, being largely concentrated in the South-west of England, a predominantly White British area.

Note that the figures for school and pupil characteristics are based on the DfE 2015 School Performance Tables because the school recruitment started in January 2016. Therefore, the 2015 figures were the most up to date and reflect the schools recruited at the time.

**Table 7: Comparison of trial schools and all primary schools in England (based on 2015 School Performance tables)**

Variable	All primary schools (N = 16,766)		Trial schools (N = 35)	
<b>School-level categorical variables</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
<b>Academy converter</b>	1,590	9.5	10	28.6
<b>Academy sponsor</b>	757	4.5	6	17.1
<b>Community</b>	8,124	48.5	8	22.8
<b>Voluntary controlled</b>	2,233	13.3	7	20.0
<b>Voluntary aided</b>	3,270	19.5	3	8.6
<b>Foundation</b>	699	4.2	1	2.8
<b>*Ofsted Rating</b>				
<b>Outstanding</b>	93/1,034	8.9	3	8.6
<b>Good</b>	641/1,034	61.9	25	71.4
<b>Requires improvement</b>	268/1,034	25.9	4	11.4
<b>Inadequate</b>	41/1,034	4.0	0	0
<b>No information</b>	-	-	3	8.6
<b>School-level (continuous)</b>	<b>n</b>	<b>[Mean/Mode]</b>	<b>n (missing)</b>	<b>[Mean/mode]</b>
<b>Size of schools</b>	16,677	298 (201-300)	35	318 (101-200)
<b>Pupil-level (categorical)</b>	<b>All Primary schools</b>	<b>Percentage</b>	<b>Trial schools</b>	<b>Mean (%)</b>
<b>Proportion achieving level 4 and above in reading, writing and maths</b>	116,766	80.0	34 (1 school has no data)	76.0
<b>Proportion of pupils eligible for FSM</b>	116,766	15.6	35	17.2

<b>Proportion of pupils with SEN support</b>	116,766	13.0	35	16.5
<b>Proportion of pupils with EAL</b>	116,766	19.4	35	14.4

Data for all school characteristics relates to January 2015 and was downloaded from the Department for Education 2015 Performance Tables. ([http://www.education.gov.uk/schools/performance/download\\_data.html](http://www.education.gov.uk/schools/performance/download_data.html)). Ofsted ratings for intervention schools are taken from the latest inspection reports.

\*National data for Ofsted ratings is based inspections completed between 1 Jan 2015 and 31 March 2015. (<https://www.gov.uk/government/statistics/maintained-schools-and-academies-inspections-and-outcomes-january-2015-to-march-2015>)

**Table 8: Comparison of pupil baseline characteristics in intervention and control schools**

Variable	Intervention	Control		Total
Characteristics of pupils at randomisation (total 305)	Mean	Mean		
<b>Age (in years)</b>	7.66	7.68		305
<b>Proportion of boys</b>	52.0%	50.3%		305
<b>Proportion of pupils eligible for FSM</b>	36.2%	40.5%		305
<b>Proportion of pupils with SEN</b>	52.6 %	54.9%		305
<b>Proportion of pupils whose first language is not English</b>	18.4%	13.7%		305
<b>Proportion of pupils who are not White British</b>	26.3%	29.4%		305
<b>Proportion in Y3</b>	54.6%	51.0%		161
<b>Proportion in Y4</b>	28.9%	34.0%		96
<b>Proportion in Y5</b>	13.2%	9.8%		35
<b>Proportion in Y6</b>	4.3%	5.2%		13
<b>Mean KS1 maths performance (total 297)</b>			<b>Effect size</b>	
<b>Combined for Y3, Y4, Y5 and Y6</b>	11.67	11.34	+0.12	297
<b>Y4, Y5, Y6</b>	11.21	10.69	+0.18	137
<b>Y3</b>			<b>Odds ratio</b>	
<b>Proportion achieving expected level</b>	7.2%	9.1%	0.75	160
<b>Proportion achieving below expected level</b>	24.1%	27.3%	0.85	160
<b>Proportion working towards expected level</b>	68.7%	63.6%	1.25	160

\*Eight pupils do not have KS1 results.

The Key Stage 1 maths point score is used to measure the performance of pupils for each subject. The point scores for maths at KS1 (age seven) range from 3 to 17 where 15 means that the child is working

at the expected level for their age, 17 means that the child is working above expected level and 13 indicates that the child is working towards the level expected for their age. Scores of 3 and 9 indicate that the child is working below their age-expected level.

Over half of the pupils are in Year 3 (Table 8). Compared to the control group, Year 3 pupils in the intervention group are 1.25 times more likely to be working towards the expected level but less likely to be achieving the expected level. Overall, intervention children are ahead of control children at pre-test.

## Outcomes and analysis

### Missing cases

There were eight cases with post-scores that were missing any pre-score, and these are excluded. Table 9 shows the number of pupils with pre-test scores (KS1) for each of the three maths modules of the InCAS assessment.

**Table 9: Number of pupils with pre-test scores by year groups for the three modules**

Pre-test	General Maths		Mental Maths		Maths Attitude	
	Treatment	Control	Treat	Control	Treat	Control
<b>Overall N = 297</b>	149	148	149	148	149	148
<b>Y3 (n = 160)</b>	81	75	80	75	80	75
<b>Y4, 5 and 6 (n = 137)</b>	66	69	63	68	62	67
<b>Total Analysed</b>	147	144	143	143	142	142

Table 10 shows the pre-scores for any cases among the 297 who are missing one or more post-test scores. When means of those cases missing scores from the treatment group are compared to those in the control group, the pupils missing from the treatment group have slightly higher average pre-scores than those missing from the control. However, overall the missing data is above average to high for both groups (with mean missing scores for both groups well above the mean scores for all pupils in Table 11). The maximum missing is 4% for the Maths Attitude scores, and the headline finding for General Maths has only 2% missing data. There is no reason to believe that these cases have influenced the overall result (see NNTD analysis below).

**Table 10: Pre-scores for cases missing post-test scores**

	Treatment missing N	Treatment mean	SD	Control missing N	Control mean	SD
<b>General Maths</b>	2	13.00	0	4	12.5	2.52
<b>Mental Maths</b>	6	12.67	1.97	5	10.60	2.19
<b>Maths Attitude</b>	7	13.00	2.00	6	11.33	2.66

\* The missing cases include pupils who have taken the test but whose scores were not recorded due to a glitch in the digital test (see Figure 1 for details on numbers missing post-test scores for each of the module) and pupils who did not have KS1 results.

### Headline findings

As the groups were not balanced at pre-test (ES of +0.13), using the post-test scores only would be misleading. Therefore, the gain score result was used for comparison (Table 11), but for the benefit of the readers we also present both the pre-test and post-test scores.

**Table 11: Comparison of pre, post, and standardised gain scores for General Maths (age equivalent), all pupils**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	147	11.65	2.70	-	7.71	1.07	-	0.08	1.19	-
<b>Control</b>	144	11.31	2.62	-	7.50	0.97	-	-0.05	1.00	-
<b>Overall</b>	291	11.48	2.66	+0.13	7.61	1.03	+0.20	0.01	1.10	+0.12

Note: the pre-intervention scores (KS1) use a different scale to the post-intervention scores (InCAS test).

For General Maths, the results (Table 11) suggest a small positive difference in favour of the treatment group. Significance tests and confidence intervals are not presented here. Both are based on the strict assumption that there is no missing data. And even if this condition was met they would still not be appropriate because they only tell us the probability of observing the results we get assuming that there is no difference between the groups (Colquoun, 2014, 2016; Gorard, 2016). Our analysis is concerned with whether there is, in fact, a substantive difference between groups, as far as we can judge and given the missing data. Therefore, instead we calculate the Number Needed to Disturb (NNTD), which is defined as the number of counterfactual cases needed to alter the finding. By comparing the number of missing cases to the number of counterfactual cases needed to disturb the finding, we can determine whether the number of missing cases is large enough to alter/explain the findings. It is a measure of how stable the result is after attrition (a test of sensitivity).

The number of counterfactual cases needed to disturb this finding would be 17. This means that it would take 17 missing cases to eliminate the effects, whereas the number of missing cases here is only six. Therefore, it is not possible for this result to be created solely by the missing data. Nevertheless, the ES is small given the overall cost of the intervention (below).

### Secondary outcomes

For the two secondary outcomes (Mental Maths and Maths Attitude), the two groups are again unbalanced in terms of KS1 maths scores (Tables 12 and 13). Maths Counts appear to have a small benefit for the treatment group in terms of Maths Attitude. However, there is a small negative result for Mental Maths.

**Table 12: Comparison of pre, post, and standardised gain scores for Mental Maths (standardised), all pupils**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	143	11.63	2.71	-	84.45	16.17	-	-0.014	1.26	-
<b>Control</b>	143	11.36	2.63	-	83.69	17.97	-	0.043	1.42	-
<b>Overall</b>	286	11.50	2.67	+0.10	84.07	17.06	+0.04	0.015	1.34	-0.04

Note: the Mental Maths scores were provided by CEM as not age-equivalent, and so are on a different scale to the General Maths scores

**Table 13: Comparison of pre, post, and standardised gain scores Maths Attitude (age equivalent), all pupils**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	142	11.61	2.71	-	46.27	45.75	-	0.044	1.40	-
<b>Control</b>	142	11.34	2.62	-	37.72	48.64	-	-0.036	1.45	-
<b>Overall</b>	284	11.47	2.66	+0.10	41.99	47.33	+0.18	0.004	1.43	+0.06

Note: the Maths Attitude scores were provided by CEM as not age-equivalent, and so are on a different scale to the General Maths scores

### Additional analyses

Additional analyses were performed for the Year 3 and other year groups separately. This was felt necessary because the KS1 assessment for Year 3 had a different grading system (without levels) to that of the Year 4, 5 and 6 (maths point scores) pupils, which could affect the interpretation of results.

#### Results for Years 4, 5 and 6

Tables 14, 15 and 16 show the results for the same outcomes as Tables 11 to 13 but for Years 4, 5, and 6 pupils only. These were the last cohorts in England to have KS1 scores recorded as points. As above, their KS1 results were unbalanced at the outset and so the gain scores are the most appropriate outcomes to consider. These older year groups showed less benefit from the intervention than the headline figures for all pupils, in terms of any of these outcomes.

**Table 14: Comparison of pre, post, and standardised gain scores in General Maths for Years 4, 5 and 6 only**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	66	11.21	3.06	-	7.92	1.05	-	-0.20	1.08	-
<b>Control</b>	69	10.65	2.66	-	7.72	0.92	-	-0.24	0.84	-
<b>Overall n (missing)</b>	135 (2)	10.93	2.86	+0.20	7.82	0.99	+0.21	-0.22	0.96	+0.04

**Table 15: Comparison of pre, post, and standardised gain scores in Mental Maths for Years 4, 5 and 6 only**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	64	11.19	3.06	-	82.78	14.97	-	0.06	1.33	-
<b>Control</b>	68	10.71	2.71	-	81.07	17.62	-	0.14	1.43	-
<b>Overall n (missing)</b>	132 (5)	10.94	2.88	+0.17	81.90	16.35	+0.10	0.10	1.38	-0.06



**Table 16: Comparison of pre, post, and standardised gain scores in Maths Attitude for Years 4, 5 and 6 only**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	62	11.10	3.06	-	34.77	50.24	-	-0.01	1.54	-
<b>Control</b>	67	10.70	2.68	-	34.32	50.94	-	0.13	1.58	-
<b>Overall n (missing)</b>	129 (8)	10.89	2.87	+0.14	34.54	50.41	+0.01	0.65	1.56	-0.09

*Results for Year 3*

It is interesting to see how the post-scores vary by each category of the KS1 results for Year 3 (Tables 17 to 19). The gain score here is still partly based on the point score 'equivalent' at KS1, but the gain results are anyway similar to the post-score effect sizes. The highest KS1 attainers (EXS) made less progress in the treatment group, just as their older peers did. It is the modal KS1 attainers (WTS) and especially the very lowest attainers (PKF and BLW) who made the greatest gains overall and were, in effect, driving the headline result. In summary, Maths Counts appears to work best, if it works, with the youngest and weakest pupils, but did not work as well for the rest or for Mental Maths.

**Table 17: Comparing results in General Maths for Year 3 pupils achieving EXS at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	6	7.73	1.15	-	-0.64	1.17	-
<b>Control</b>	7	7.86	0.68	-	-0.61	0.68	-
<b>Overall n (missing)</b>	13 (1)	7.80	0.89	-0.14	-0.62	0.89	+0.03

*EXS: achieving above expected level.*

**Table 18: Comparing results in General Maths for Year 3 pupils achieving WTS at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	55	7.61	0.98	-	-0.02	0.81	-
<b>Control</b>	47	7.50	0.97	-	-0.12	0.92	-
<b>Overall n (missing)</b>	102 (2)	7.56	0.97	+0.11	-0.07	0.86	+0.12

*WTS: working towards expected standard.*

**Table 19: Comparing results in General Maths for Year 3 pupils achieving PKF or BLW at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	20	7.32	1.27	-	1.49	1.43	-
<b>Control</b>	21	6.67	0.80	-	0.95	1.13	-
<b>Overall n (missing)</b>	41 (1)	6.99	1.09	+0.60	1.21	1.30	+0.42

*PKF: pre-key stage foundation for the expected standard.*

*BLW: working below standard.*

The results for Year 3 pupils in Mental maths are volatile, with only the modal group achieving just below the expected level showing gains (Tables 10–22).

**Table 20: Comparing results in Mental Maths for Year 3 pupils achieving EXS at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	6	90.56	10.84	-	-0.93	0.63	-
<b>Control</b>	7	94.86	21.05	-	-0.68	1.22	-
<b>Overall n (missing)</b>	13 (1)	92.87	16.60	-0.26	-0.79	0.97	-0.26

*EXS: achieving above expected level.*

**Table 21: Comparing results in Mental Maths for Year 3 pupils achieving WTS at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	55	86.35	17.23	-	-0.42	1.00	-
<b>Control</b>	47	83.72	18.06	-	-0.57	1.05	-
<b>Overall n (missing)</b>	102 (2)	85.11	17.59	+0.15	-0.49	1.02	+0.15

*WTS: working towards expected standard.*

**Table 22: Comparing results in Mental Maths for Year 3 pupils achieving PKF or BLW at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	20	81.33	18.85	-	1.02	1.22	-
<b>Control</b>	21	79.70	44.01	-	1.45	1.16	-
<b>Overall n (missing)</b>	41 (1)	80.50	33.73	+0.05	1.24	1.20	-0.36

*PKF: pre-key stage foundation for the expected standard.*

*BLW: working below standard.*

As with the General Maths finding, improvements in Maths Attitudes for Year 3 pupils are all positive, lowest for the highest attaining pupils at prior KS1 and highest for the lowest attainers at KS1.

**Table 23: Comparing results in Maths Attitude for Year 3 pupils achieving EXS at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	6	23.46	54.67	-	-1.72	1.16	-
<b>Control</b>	7	18.68	46.06	-	-1.82	0.98	-
<b>Overall n (missing)</b>	13 (1)	20.88	48.08	+0.10	-1.77	1.02	+0.10

*EXS: achieving above expected level.*

**Table 24: Comparing results in Maths Attitude for Year 3 pupils achieving WTS at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	55	57.47	37.73	-	-0.25	0.80	-
<b>Control</b>	47	44.87	47.59	-	-0.51	1.01	-
<b>Overall n (missing)</b>	102 (2)	51.60	42.85	+0.29	-0.37	0.91	+0.29

*WTS: working towards expected standard.*

**Table 25: Comparing results in Maths Attitude for Year 3 pupils achieving PKF or BLW at KS1**

	N	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	20	7.32	1.27	-	1.49	1.43	-
<b>Control</b>	21	6.67	0.80	-	0.95	1.13	-
<b>Overall n (missing)</b>	41 (1)	6.99	1.09	+0.60	1.21	1.30	+0.42

*PKF: pre-key stage foundation for the expected standard.*

*BLW: working below standard.*

### Subgroup analysis

#### *Headline findings for EverFSM6 pupils only*

Across all age groups, and irrespective of prior attainment, the outcomes for EverFSM6 pupils are all negative or neutral (Tables 26–28). There is no evidence that this intervention benefitted disadvantaged pupils on any of the outcome measures; in fact, there appears to be a negative impact on pupils eligible for free school meals. However, these results should be interpreted with caution as the subgroup was very small (N = 133).

**Table 26: Comparison of gains scores and post-test scores in General Maths for EverFSM6 pupils**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	67	11.33	2.86	-	7.51	1.04	-	-0.09	1.24	-
<b>Control</b>	66	10.70	2.92	-	7.50	0.99	-	0.07	1.09	-
<b>Overall n (missing)</b>	133 (4)	11.06	2.89	+0.22	7.50	1.02	+0.01	-0.01	1.17	-0.14

**Table 27: Comparison of gains scores and post-test scores in Mental Maths for EverFSM6 pupils**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	63	11.22	2.88	-	83.45	16.73	-	0.08	1.22	-
<b>Control</b>	65	10.94	2.98	-	81.66	17.95	-	0.08	1.43	-
<b>Overall n (missing)</b>	128 (9)	11.08	2.92	+0.10	82.54	17.31	+0.10	0.08	1.32	0.00

**Table 28: Comparison of gains scores and post-test scores in Maths Attitude for EverFSM6 pupils**

	N	Pre-score mean	SD	ES	Post-score mean	SD	ES	Gain score	SD	ES
<b>Treatment</b>	64	11.31	2.88	-	47.94	46.89	-	0.19	1.40	-
<b>Control</b>	65	10.81	2.95	-	44.89	43.68	-	0.31	1.36	-
<b>Overall n (missing)</b>	129 (8)	11.06	2.92	+0.17	46.42	45.18	+0.07	0.25	1.38	-0.09

### Regression analyses

Additional regression models were created using General Maths as the outcome and prior attainment and membership of the treatment group as predictors. The first model is for all pupils, the second for Year 3 only using dummy variables for the KS1 categories, and the third for Years 4, 5 and 6 using KS1 point scores.

All results yield reasonable but lower than expected R-score correlations between the predictors and the InCAS test scores (Tables 29, 30). For all three models, the best predictor is, as is usual, prior attainment. For all pupils, the coefficient for the treatment group yields the same substantive result as the gain score analysis in Table 11 (ES of +0.09). Similarly, for the Year 3 pupils, there is a slightly larger effect size than for the overall result just as there is for the gain score in Table 17, and a smaller impact for Years 4, 5 and 6 separately. The regression analysis is, in substance, just a more complex way of presenting the gain score outcomes.

**Table 29: Regression results for General Maths**

Outcome	Raw means				Effect size	
	Intervention group		Control group		n in model (intervention; control)	Coefficient for treatment group
	n	Mean (unadjusted)	n	Mean (unadjusted)		
<b>General Maths</b>	147	11.65	144	11.31	291 (147;144)	0.09

**Table 30: Coefficients from regression for General Maths (age equivalent)**

	All pupils	Year 3	Years 4, 5, 6
<b>R</b>	0.31	0.29	0.50
<b>Coefficient for KS1 maths points</b>	0.30	-	0.49
<b>Coefficient for BLW/PKF</b>	-	-0.35	-
<b>Coefficient for WTS</b>	-	-0.12	-
<b>Coefficient for Treatment group (ES)</b>	0.09	0.11	0.06

N = 291.

### A word of caution in interpreting the results

Because of the different grading system employed for the Year 3 pupils, the pre-test scores are not exactly comparable to the other year groups. Disaggregating the analysis by year groups creates an even smaller sample for each analysis. Breaking down the sample even further by EverFSM creates a smaller number again and thus the results of any such sub-analysis will not be as stable as the headline.

### Fidelity analysis

Two analyses were carried out to check for the impact of fidelity to treatment (as opposed to intention to treat). The first uses the number of sessions that children actually received as recorded on the Digital Tool. The second uses the Compliance-Average Causal Effect.

The mean number of sessions received is 30.8 with a mode of 34. Of the treatment group, 58 learners did not achieve the minimum number of 30 sessions recommended; 94 learners received the recommended 30 lessons with a large percentage well in excess of this number. Two learners did not receive the intervention because their LP left and no replacement could be found. One treatment child left school before the programme started so did not receive the intervention; one left in the middle of the course (so had only 11 sessions); one child was excluded (so had only 15 sessions); another's complex needs prevented him from accessing the lessons as regularly as hoped; and for three children there was an interruption when their LP left and a replacement had to be found and trained. These three children received 25, 20, and 18 sessions. For the remainder, the most common reasons for the low dosage were the result of pupil absences. There were also staff absences due to illness which could sometimes affect the number of lessons delivered. It is important to note, however, that this monitoring was based on the number of lessons planned on the tool and did not take into account the fact that

some lessons could potentially have been repeated by LPs. But in general, the number of lessons planned reflected the number of lessons delivered.

There is a small positive correlation between post-scores and gain scores in General Maths and the number of sessions each pupil attended (Table 31). The more sessions attended on average the higher a pupil's maths score is (and vice versa). It is difficult to say if this is a causal mechanism because pupils who missed sessions or who are regularly absent may have other issues which contribute to their attainment (and which are not investigated within the scope of this project). There may also be the increased likelihood of issues in relation to motivation or confidence for these children.

**Table 31: Correlation between number of sessions attended and General Maths (age equivalent), all pupils**

	General Maths post-scores (n=291)	Gain
<b>Dosage</b>	+0.13	+0.09

To estimate the treatment effects where not all pupils in the treatment group receive the recommended dosage, a simple Compliance-Average Causal Effect (CACE) was carried out using the minimum number of 30 sessions as the threshold. Given that the overall results for both groups and the data for the treatment group who complied and who did not are known, it is possible to estimate how many of the control group would have complied (if given the treatment) and what their outcomes might be (Table 32). We assume that because of randomization the proportion of compliers in both treatment and control group would be the same on average, and the average outcome for those in the control group who did not comply will be the same as the outcome of non-compliers in the treatment group (7.64). Thus:

- proportion of treatment group who complied is  $90/147 = 61\%$  (0.61); therefore
- number in control group who would have complied is  $0.61 \times 144 = 88$ ;
- the number in control group who did not comply will be  $144 - 88 = 56$ ; which means that
- the average outcome for those in the control group who would have complied if given the treatment is calculated thus:  $((144 \times 7.50) - (56 \times 7.64)) / 88$ .

**Table 32: CACE compliance based on 30+ sessions and General Maths post-score (age equivalent)**

	30+ sessions		<30 sessions		Overall	
	N	Mean	N	Mean	N	Mean
<b>Intervention</b>	90	7.76	57	7.64	147	7.71
<b>Control</b>	88	7.41	56	7.64	144	7.50

Using the overall standard deviation from Table 11, the effect size based on compliers would be +0.34, with NNTD of 49. This is larger than the overall post-intervention headline ES of 0.20, and gives more weight to the idea that the intervention, conducted as intended, was effective (at least with some groups). To check this, the CACE process was repeated with the gain scores (Table 33). Again using the overall SD for gain scores from Table 11, this shows a complier ES of +0.19, larger than the headline figure, suggesting more strongly that the difference could be due to the intervention.

**Table 33: CACE compliance based on 30+ sessions and General Maths gain score**

	30+ sessions		<30 sessions		Overall	
	N	Mean	N	Mean	N	Mean
<b>Intervention</b>	90	+0.12	57	+0.02	147	+0.08
<b>Control</b>	88	-0.09	56	+0.02	144	-0.05

## Cost

The cost of running the Maths Counts programme is estimated at around £125 per pupil per year over three years. The training cost is an initial start up cost, and once trained, the Learning Partners (LPs) and maths leads (MLs) can in turn train other teachers or teaching assistants. Each school is provided with a CPD manual for the MLs to use with the LPs. Ongoing support and monitoring was provided by the project team only for the trial. This does not form part of the intervention. Schools can continue using the programme with minimal costs as the box of resources and the privacy board (learning environment) can be used repeatedly with different children. Table 34a gives a breakdown of the cost items.

**Table 34a: Cost estimation over three years**

Item	Type of cost	Cost	Total cost over 3 years per school	Total cost per year over 3 years per pupil
<b>Cost of delivering the interventions</b>				
<b>Resource box</b>	Cost of delivery cost per school	£100	£100	£8.3
<b>Individual privacy board*</b>	Cost of delivery per school	£12	(£12 X 2) = £24	£2
<b>Cost of staff training</b>				
<b>Trainers' fees</b>	Start up cost for school	£500 per day	(£500 X 2.5 days) = £1,250	£104.2
<b>Printing and photocopying of handouts and guidance sheets</b>	Start up cost for school	£25 per teaching staff	(£25 X 3) = £75	£6.25
<b>CPD folder and workshop materials</b>	Start up cost for school	£50 per school		£4.20
<b>Total</b>			£1,499	£125

\* Privacy boards could be used for more than one pupil – so two per school to start with

In line with the EEF cost reporting, we present a breakdown of the costs over three years (Table 34b).

**Table 34b: Cost per pupil over three years**

	Year 1	Year 2	Year 3	Over 3 years
<b>*Cost of delivering the intervention</b>	£31	-	-	31
<b>Printing and photocopying</b>	£6.25	£6.25	£6.25	£18.75
<b>*Cost of training</b>	£325			£325
<b>Total</b>	£362.25	£6.25	£6.25	£374.75

\* Cost of training and cost of resources for delivering the intervention are one off investments incurred in the first year.

This works out to £125 per pupil per year over three years. In addition, schools might want to consider the cost for covering teachers for the 2.5 days of training.

### Staff time

In addition to the cost directly related to the intervention, there is also the staff time. On average each LP spent about two hours per child per week implementing the intervention, which includes planning time. For ML, five hours in total were scheduled for delivery of CPD sessions to LPs, and eight hours at the start of the programme to conduct diagnostic assessments of the pupils. Table 34c gives the total time amount of time staff spent on the programme. Staff time is outlined below:

1. School staff time spent in training to deliver the intervention  
Maths leads (teachers) and Learning Partners (teaching assistants) attend two whole days of training before delivering the programme. Maths leads are also required to attend an initial half day briefing session before training begins.
2. School staff time spent on preparation for the delivery  
Maths leads require half a day per pupil to undertake the initial diagnostics and load information onto the Digital Tool and a further half day to review progress at the end of a cycle of intervention. Learning Partners require an additional 30 minutes each week for lesson planning per pupil.
3. School staff time spent on delivering the intervention  
LPs need to spend 30 minutes three times a week to deliver the intervention to each pupil.
4. Time spent on CPD training by MLs for LPs  
Maths leads and Learning Partners also require an additional 75 minutes to deliver/receive four CPD training sessions at fortnightly intervals during an initial ten-week period. Such CPD training would not need to be repeated if a Learning Partner continued with the cycles of the programme with the same or other pupils, but would need to be repeated if new Learning Partners were to be delivering the programme.



**Table 34c: Staff time for running the intervention**

Staff time per LP per child for the whole trial	Time spent	Total
Training	2 days initial training (6hr per day)	12 hours
Delivery of sessions	90 min per week for 10 weeks	15 hours
Attend CPD	Four sessions at 75 min each during the intervention*	5 hours
Lesson planning	30 min per week for 10 weeks	5 hours
<b>Staff time per ML for whole trial</b>		
Training	2½ days training (6h per day)	15 hours
Conduct diagnostic, load data on Digital Tool, review progress	1 day per pupil (8h)	8 hours
Delivery of CPD	Four sessions at 75 min each during the intervention	5 hours

*\*Not all schools were able to complete the four CPD sessions due to time constraints. Refer to the Process Evaluation section on barriers to delivery.*

Total staff time spent on a ten-week intervention for each LP to support a child is therefore

37 hours. Total time spent by each ML over the ten weeks is 28 hours.

## Implementation and process evaluation

### Fidelity of implementation and extent to which schools delivered Maths Counts as trained

Data for the process evaluation was collected from 12 schools from observations of the MC sessions and interviews with pupils and teaching staff. Six of these schools were visited twice while 12 were visited only once (at the beginning) because schools could not accommodate the evaluation team at the end of term due to other school activities going on at the same time. Face-to-face interviews were conducted with 12 MLs, 15 LPs, and 12 pupils across the 12 schools. Additional feedback was collected from all the other participating schools at the end of the trial from the review and feedback sessions organized by the project team. Teaching staff who were unable to attend the review sessions sent their feedback by emails to the project team. These were shared with the evaluators.

Observation visits were made to four training sessions for Learning Partners and two sessions for maths leads.

#### Pre-intervention training

Maths Counts is a ten-week intervention which requires one-to-one teaching for the children involved. As such, it was important that designated and trained Learning Partners (LPs) were available and had the time to plan and conduct the three sessions of teaching per week per pupil. In the majority of schools that we visited this did appear to be the case. Maths leads had selected LPs and most attended all of the required training. Across the four hubs, all MLs and LPs attended at least one training session. Table 35 below shows the number trained at each of the hubs.

**Table 35: Number of MLs and LPs trained in each hub**

	Maths leads (n)	Learning Partners (n)
<b>Bristol hub</b>	10	18
<b>London hub</b>	10	18
<b>Somerset hub</b>	11	20
<b>Trowbridge hub</b>	10	20
<b>Total</b>	41	76

Feedback from schools suggests that the training was clear and informative, but teaching staff would welcome some demonstrations on how to teach concepts like multiplication and division. They also suggested having a practical session where they could try out the Digital Tool and create lesson plans.

#### Diagnostic testing

Diagnostic testing prior to the intervention starting was important in ensuring that the ten-week cycle of lessons was well-targeted at the children's needs. The diagnostic test was carried out by maths leads in schools; subject-specific expertise and oversight was deemed important at this stage as the subsequent intervention sessions would all be based on accurate judgements made during the diagnostics. The development team provided in-depth training on carrying out the diagnostic tests, emphasizing the need for these to be conducted thoroughly and for the results to be recorded accurately. When we spoke to MLs, many commented that this was a useful process in terms of getting to know the needs of the children. Again, the only drawback noted was the considerable time required

on these per pupil. In feedback provided to the developers, two schools noted that they thought the diagnostic testing should be carried out by the LPs.

### Number of sessions planned and delivered

The Maths Counts intervention runs for a ten-week cycle with an expectation that at least 30 half-hour sessions will be delivered within this period. Ideally, this would involve three sessions per week; however, the developers were clear that there was flexibility in this, and understood that, for various reasons (such as staff or learner absence or school trips), some weeks may include more or fewer sessions. In order to track the planning and delivery of sessions, the development team used information collated from the Maths Counts Digital Tool. This enabled them to see the number of sessions planned, the number of times that LPs had logged-on to the system for any reason, and the numbers of learning objectives being secured by each learner. The information on the number of lessons planned was used as an indicator of the number of sessions delivered to each pupil (see Table 36). While this may not be an exact or ideal proxy, it is helpful for gaining an understanding of the extent to which each learner engaged with a Maths Counts session. The delivery team used this as a measure of the regularity and the number of sessions conducted (cf. Appendix F).

The table below indicates the number of learners per hub who had at least 30 sessions planned for them in the ten-week period, and the number of learners with less than 25 sessions planned.

**Table 36: Number of sessions planned for learners in each hub**

	Learners with at least 30 sessions planned	Learners with less than 25 sessions planned	Total number of learners in hub
<b>Bristol hub (mean = 31)</b>	21	4	36
<b>London hub (mean = 27)</b>	18	9	32
<b>Somerset hub (mean = 31.5)</b>	26	7	44
<b>Trowbridge hub (mean = 33.2)</b>	30	3	40
<b>Total</b>	95	23	152

*Note: four learners did not receive the intervention but were included in the ITT analysis. Two learners did not receive the intervention because their LP left and no replacement could be found. One treatment child left school before the programme started so did not receive the intervention.*

In each of the hubs, the majority of pupils who were allocated to receive Maths Counts had at least 30 sessions planned for them. However, it is clear that a considerable proportion of pupils did not reach this target. In London, nearly half of the 32 pupils did not receive 30 sessions and nine received less than 25 sessions. In the other hubs between a third and a quarter of pupils did not hit the 30 session target, although most children did receive 25 or more. There were a range of explanations given for this including: children leaving school; LPs leaving their job or being absent; LPs being required to take on other roles; other school-based activities taking precedence; and children having complex needs which meant that they were not always in school or available for MC sessions.

Where numbers of sessions being planned or LP engagement with the online tool was deemed to be low by the developers, additional support was provided, such as a visit to the school or a phone call to discuss the issues. The Maths Counts team made frequent contact with schools to check whether

additional training was needed in relation to planning. Yet even with this support the figures highlight the challenge of providing an intensive programme involving a substantial number of sessions across a relatively short time period. It is quite possible that receiving fewer sessions across the period may have had an effect on learners' achievement within the post-test assessments.

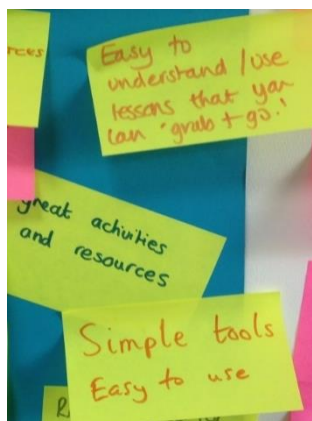
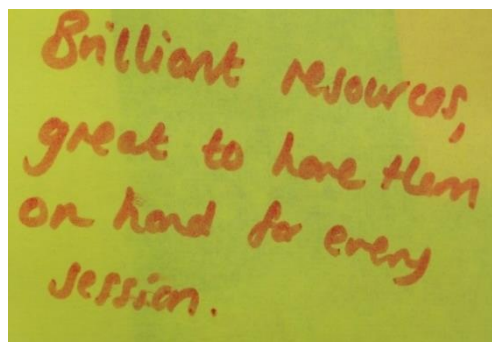
### School environment and resources

Schools organised the physical space for intervention delivery according to what was possible in their particular settings. A key facet of the intervention is the provision of a supportive learning environment which allows the one-to-one delivery to take place with limited disruption and with the use of relevant resources to hand. Some schools had a designated room for this while others used spaces within libraries or IT rooms, or in communal spaces within the school. In the latter cases, the privacy boards were used to create or reinforce an independent learning environment. Staff that we spoke to were positive about the privacy boards and their use as part of the intervention. Children that we observed appeared to find the resources attached to them (such as number lines) helpful during the activities and games that they were involved in. Staff also expressed the importance of leadership support in ensuring that the space and time for MC sessions were protected.

The Maths Counts programme includes a specific set of resources to support and promote learning. For the teaching, a box of manipulatives (containing beads, coins, Numicon, and so on) was provided. Having these resources collected together and only used for the Maths Counts intervention meant that access to the materials was facilitated and that they were less likely to get lost or used by others or with the control pupils. In most cases, each LP had a resource box allocated to them (and their learners). Some commented that this was very helpful in ensuring that the resources were available for use during the sessions, and that they could be easily located and transported to different classrooms or learning environments should the need occur.

The online tool was developed in order to support the use of targeted learning objectives and lesson planning. Process evaluation indicates that all the LPs were able to use this tool to generate activities and lesson plans. In addition, a 'maths map' resource was devised so that children and LPs could track progress over the course of the intervention. This was designed to celebrate children's achievements. Either online or hardcopy paper versions of the 'maths map' were used in schools. In all of the schools that we visited there was evidence of the online tool and the maths maps being used as specified by the developers. Feedback from schools suggests that teaching staff found the Digital Tool easy to navigate. They also found the range of activities engaging.

### Examples of feedback from schools about the resources



## Support in school

In addition to receiving the intervention it was also important that children participating in Maths Counts and the LPs delivering it received support from class teachers and leaders within the school to ensure better co-ordination and smooth implementation. For example, teachers needed to be aware when children and support staff would be absent from their lessons. Some LPs also commented that settling the children back in to their normal lessons was made easier if they knew what subjects and topics the children were working on at the time. LPs and MLs in two schools that we visited noted the importance of having additional support and interest in the programme from other senior leaders. This, they felt, gave Maths Counts increased status and ensured that LP time was protected and that the delivery of the programme was prioritized where possible.

## Overall fidelity of delivery

The aspects of the programme discussed above suggest that in many ways the Maths Counts intervention was delivered as intended during the course of the trial period. The delivery of training prior to the intervention beginning went as planned. Visits to schools and discussions with relevant staff indicated that LPs were using the online planning tool and resources to develop and support delivery of sessions. There was also evidence of the LPs using the supportive, positive language and subject-specific terminology that forms part of the MC programme. The primary issue that emerges in terms of fidelity is the number of sessions received by each learner. In feedback to the developers, it is clear that many schools found it difficult to fit the required 30 lessons within the ten-week window (see Appendix E). This resulted in a number of learners receiving fewer one-to-one tuition sessions. Similar issues were noted in relation to the ongoing LP CPD, with a number of schools not completing the four-session programme. These issues are examined in more detail in the section below.

## Challenges and barriers to effective delivery

### *Staff time and availability*

The two main barriers to effective delivery were time and staffing; we found these to be interlinked throughout the course of the evaluation. The Maths Counts programme requires a substantial staff time commitment throughout. In the first phases of the intervention maths leads are required to undertake detailed diagnostic testing of individual children. Learning Partners also must attend out-of-school training and are required to deliver three 30-minute sessions of Maths Counts per week for each child that they are working with. As a number of the LPs and MLs that we spoke to discussed, this is time that would otherwise be spent supporting in a classroom rather than engaging in one-to-one tuition. Sometimes LPs' time was prioritised for them by their leadership and they were required to cover lessons or undertake other duties rather than deliver Maths Counts. In two of the schools that we visited, LPs explained that this had happened on at least one occasion, and had meant the need to reschedule or skip the planned maths tuition sessions.

LPs also needed time to plan lessons, reflect upon previous teaching sessions, and ensure that children were adequately settled back in to their lesson following intervention. For some, finding time in the school day to do this was challenging. Two schools that we spoke to mentioned the use of the wider school budget to pay teaching assistants for additional hours before school or during the school day in order that time was made available to conduct Maths Counts. The MLs from these schools and some others also commented that it would be unlikely that this could continue in future due to budget cuts and the need to ensure that teaching assistants were available to work with a larger number of pupils.

The in-school CPD sessions that formed part of the Maths Counts intervention were designed to provide additional knowledge and skills to the LPs involved as well as allowing time for LPs and MLs to discuss and address any issues that arose. Four sessions were scheduled throughout the intervention. Again, finding adequate time to deliver these was a major challenge for some schools. Some MLs and LPs did see the value in the CPD sessions but others suggested that the time might be better spent on either

planning or conducting the Maths Counts sessions. Two schools that we visited felt that the CPD was unnecessary due to time issues and the existing skill levels of their LPs, and thus did not complete any of the sessions. Some other MLs questioned the timing of the CPD, suggesting that it would have been more useful if it had begun prior to the intervention starting.

#### *Staff absence and turnover*

Staff absence and turnover was one of the barriers identified as impeding optimum implementation. Illness and other reasons for absence meant that in some schools some of the scheduled Maths Counts sessions were missed. One school managed this by increasing the number of sessions from three to four per week when the LP had returned. In another school, where a LP was off for a longer period of time, another teaching assistant was asked to continue with delivering the Maths Counts tutoring. Another example involved a school being unable to recruit a teaching assistant following the departure of a trained LP; as a result two intervention children did not receive any Maths Counts sessions during the trial period.

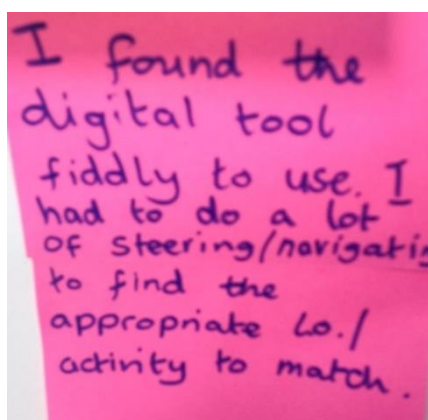
#### *Learner absence*

Learner absence was another issue which caused challenges with the delivery of the programme. We know that Maths Counts was aimed at some of the most vulnerable learners in school and this often meant that they had a range of other issues which impacted on their attendance (such as illness, special educational needs, or their home situations). In some schools this did mean that some of the identified children missed a number of scheduled sessions. Most schools did their best to ensure that children 'caught-up' by putting on additional sessions; however, this was not always possible in cases where pupils were persistently absent.

#### *Online resources*

Some schools reported that the online resources were a challenge to use. Problems included the loss of information that had been entered onto the Maths Map due to technical glitches and—as reported in the review sessions—that learning objectives and activities in computer-generated lesson plans did not match (a common complaint; see Appendix E). This created extra workload. Some LPs found that the digital platform as a whole was 'fiddly' or 'clunky' and that it needed to be more intuitive and straightforward to use.

#### **An example of the feedback about the Digital Tool**



I found the digital tool fiddly to use. I had to do a lot of steering/navigation to find the appropriate Lo./ activity to match.

### Aspects of the programme that may facilitate change

The initial training was essential to ensure that the teaching staff were familiar with the intervention, particularly the Digital Tool. They also received training in using the teaching and learning resources. This was key to successful implementation (see Appendix E). The project was also closely monitored by the project team via the Digital Tool to ensure that the required number of sessions was delivered (see Appendix F). Schools unable to achieve this were offered additional support by the project team.

Maths Counts is an intervention which requires the involvement of both qualified teachers and teaching assistants. In one school this involvement of qualified teachers was viewed as very positive by the headteacher and senior leadership team. They felt that it added credibility to the programme and encouraged quality in terms of delivery. In addition, this school also felt that the inclusion of some of the lowest attaining pupils was also a positive aspect of the intervention. They felt that other interventions often excluded these pupils but that Maths Counts offered a more personalised approach and could be carefully targeted at a wider range of learners. In another school the headteacher had been very supportive of the programme, providing additional financial resources to fund LPs attending the CPD sessions and in order to purchase individual 'privacy' boards for each participating pupil.

Maths leads that we spoke to during the course of the intervention tended to be positive about the intervention's content, aims, philosophy, and resources. The comment here from one ML were fairly typical of the wider group:

*'We have a had positive experience with Maths Counts and will definitely be running it again, though we are going to review which particular pupils it might not be suitable for, if there are complex processing issues which might need to be addressed first.'*

In some schools, organisational issues linked to staffing and time did appear to influence perceptions of the intervention (see previous section on barriers). In one school, it was felt that the staff workload requirements were not made fully clear at the start of the programme. Despite these challenges, a number of maths leads and other school leaders expressed a desire to continue delivering Maths Counts after the trial.

The CPD sessions included within the intervention were designed with the aim of supporting professional development for teaching assistants. While some of the maths leads were concerned that the CPD sessions were too basic in their content and that it was difficult to deliver them due to time constraints, a number of the LPs that we spoke to in schools and at the overall review sessions were very positive about them. Some commented that they enjoyed the opportunity to have subject-specific CPD that would have a direct impact on their tutoring in Maths Counts and perhaps in wider class-based situations. A few LPs also commented that the CPD sessions were a good opportunity to discuss the intervention and issues that had arisen with other participating staff in the school (LPs and the ML). Having protected time to do this was seen as a positive part of the intervention.

Observations of children participating in Maths Counts suggested that they enjoyed the regular teaching sessions. The majority of learners that we saw and spoke to were enthusiastic about using the resources and engaged well with the various games and activities. A number of the LPs and MLs that we talked to commented that the children valued the one-to-one aspect of the programme and that this had helped to develop their confidence, both in the Maths Count sessions but also back in the classroom. The children appeared to have developed good relationships with their LPs and responded well to the positive language which forms a key strand of the intervention.

Parents were informed of their child's participation in the Maths Counts programme and, according to school staff, were very positive about it. For instance, the evaluation team had reports that one mother was really pleased that her child could now recite her three times tables. Some LPs also said that they knew the children played some of the games and practised counting at home. Most schools said that

they had not promoted the optional 'home learning' activities although some suggested this might be something that they would do in the future if they continued with Maths Counts. This was perhaps because schools were still finding their way around the programme and wanted to get familiar with the programme first.

## Perceived impact

### Children's performance in mathematics

School leaders reported an improvement in children's maths performance as a result of involvement in Maths Counts. They felt that the intensive, one-to-one teaching sessions offered an opportunity for participating children to develop new skills while also having the space to correct previous misconceptions. A number of maths leads and Learning Partners said that the use of positive, subject-related language to reinforce key learning points was beneficial in helping to cement this knowledge. Some staff also mentioned that Maths Counts supported students who were academically weakest with their numeracy skills. They noted that while these pupils may have only made small amounts of progress overall within the ten-week programme, the fact that they were able to participate and work on their maths in this focused way was important. One staff member, commented that for one of the children in her school, participating in Maths Counts and developing their knowledge of using money could influence whether that child is able to go on and live independently in the future.

### Feelings of motivation, confidence and enjoyment

Often linked to the perceptions of improved performance was the potential for Maths Counts to motivate pupils and encourage them to feel more confident with using numbers. These outcomes were, they felt, a result of the one-to-one nature of the intervention and the ethos of creating a positive, personalised learning environment for the children. In the lessons that we observed a philosophy of 'having a go' was very much at the core, and a number of Learning Partners commented that this attitude grew over the course of the programme for the children involved. Prior to Maths Counts, some LPs felt that the children had been reluctant to fully engage with maths lessons within a class setting. However, during and after participation in the intervention, this changed and they were more likely to try and answer the teachers' questions and complete tasks.

Closely tied to issues of motivation and confidence, a number of staff discussed learners' increased enjoyment in relation to maths. They suggested that the games could be a key reason for this, particularly amongst the younger children involved in the programme. Another aspect was the sense of achievement that many were gaining from participation in the intervention; this success led to a feeling that number work could be fun and interesting. The maths map was also viewed as an important tool for promoting this sense of achievement and engagement. It provided a very visual representation of children's progress and their involvement in moving the objectives supported them in taking responsibility for their learning.

### Outcomes for different groups of learners

In terms of targeting Maths Counts at different groups of children, some staff commented that the programme better suited some more than others. Overall, staff said that they thought children from the lower end of Key Stage 2 (Years 3 and 4) would benefit more from it and would be more motivated by the kinds of activities and resources that formed the intervention. A small number of staff, particularly those working within urban schools, commented that Maths Counts was also particularly helpful for children with English as an Additional Language. This, they suggested, was probably due to the careful focus on language, repetition and reinforcement of key terms, and the use of visual stimulus to support learning. Other children who had participated and benefited from Maths Counts included those with social or emotional needs, and those with diagnosed special educational needs such as Attention Deficit



Hyperactivity Disorder (ADHD) or autism. Again, it was suggested that these children enjoyed the individual attention that they received during the sessions and that the metacognitive element of Maths Counts could help with the development of organisational skills and self-esteem.

### Professional development

For a number of the MLs and LPs involved in Maths Counts, the programme has introduced new approaches to teaching numeracy skills. These have included different resources, new pedagogical tools or ideas, and a distinctive approach to language use. In a small number of schools, staff mentioned that class teachers and other teaching assistants were interested in the methods being used and how they might be adapted for use in classroom settings and with other groups of children. There is perhaps, therefore, opportunity for some sharing of good practice between staff and consideration of how some of the successful elements of Maths Counts might be adopted on a wider basis across a school (or group of schools).

Finally, this intervention provides opportunities for teaching assistants to develop within their role. The CPD sessions were viewed by some LPs and MLs as valuable in supporting their subject knowledge development. For others, having responsibility for teaching a child was seen as positive and a change from their usual duties of supporting a class teacher in lessons. There were mixed views on this issue though; some MLs felt that the CPD sessions were not suitably targeted at the needs of more experienced LPs and that the Maths Counts programme added little in terms of professional development.

### Feedback from schools on the Maths Counts programme

It helps children to grow in confidence, not just in maths but in all areas of their learning

Great intervention for filling in individuals gaps, interactive and confidence building.

Children enjoyed the sessions and looked forward to them.

### Unintended or negative consequences

As detailed above, the main issues that schools found with the implementation of the Maths Counts programme centred on time, staffing, and funding. While providing challenges in terms of the delivery of the intervention, in some instances, they also presented negative outcomes too. Finding adequate time to carry out each of the elements of the programme was difficult for many schools. Some MLs commented that while there was value in the tasks they were undertaking (that is, the diagnostic tests, attendance at training sessions, organisation of the programme in school), this was time that otherwise would have been spent doing other work-related activities. LPs did not elaborate on what these activities could be, only in general terms. For LPs, the concern around time was also a recurring theme. Many teaching assistants were paid on an hourly rate and so finding time to carry out the Maths Counts duties within an already full day was often very difficult. Some schools tried to accommodate this by paying LPs for additional hours before or after school or during lunch time but this was not always the case, and was not viewed as a sustainable option should the intervention continue.

Closely associated with the issue above is the concern that while LPs were working one-to-one with Maths Counts students they were not participating in their usual duties, which tended to involve supporting a teacher with a whole class or with small groups within that class. Some staff raised questions about whether it was sensible to have LPs supporting such a small number of students rather than working with a wider range of students. They also claimed that the lack of a teaching assistant in lessons could lead to additional stress or workload for class teachers.

Finally, a small number of concerns were raised about children missing their mainstream lessons due to withdrawal for the intervention. Some schools ensured that their pupils did not miss their class-based maths lessons for Maths Counts. Some MLs also commented that they were careful that children did not miss other lessons that they enjoyed, such as PE—they did not want participation in the intervention to be viewed as a punishment. As mentioned above, a small number of MLs tried to deliver the sessions either before or after school so that children were not missing any other learning time. The pupils we spoke to had mixed views about this. Some were happy to miss particular lessons, others were less satisfied with this. The schools clearly felt that there were logistical challenges in scheduling the sessions and achieving a balance that worked for all involved.

### **Test administration**

The evaluation team visited four schools to observe the administration of the post-test. This was necessary as schools were no longer blind to the treatment allocation. In addition we also received feedback from teachers about the testing process during the feedback and review session. In most schools testing went smoothly. The test was administered under exam conditions and closely supervised.

In most schools the test was administered to pupils in groups of three (as suggested by the developers). In one school we observed each child had a staff member sat next to them to read the question to them when necessary. There was no evidence that treatment pupils received special attention from the staff, but the potential was there as the LPs and MLs knew who the intervention pupils were. It was also observed that a couple of pupils occasionally turned to look at the staff for confirmation. Where evaluators were not present, it is impossible to know the extent to which additional support was given to pupils.

In one school where a touch-screen computer was used, an LP accidentally touched the screen and hit the answer while reading the question to the child. It is not possible to know how widespread this kind of incident was, but it does suggest that it can happen and may invalidate the answers.

During the testing, a small number of children were observed reading the division sign ( $\div$ ) as a minus sign ( $-$ ). It was also observed that some children did not understand the multiplication sign ( $\times$ ) and could not answer simple multiplication questions such as  $1 \times 2$  or  $1 \times 14$ . One child interpreted the symbol to mean doubling. One pupil simply clicked the answers at random. For one of the modules, the answers appeared first before the questions and the child simply hit the answers before the questions appeared. We doubt that these kinds of responses were widespread but they do serve to highlight the challenges associated with interpreting results even from standardised tests.

In one school the test was delayed, meaning that the pupils had an additional couple of weeks between end of intervention and testing. The school claimed that they were not aware that they had to complete the test before the Easter break. Another school could not test all the pupils before the holiday because they underestimated the amount of time needed to do the Sandwell test (two hours per child). The school also explained that as the children had just completed the Sandwell test, they were too tired to take the InCAS test. Also the testing was conducted in the last week of term, a time when schools had a number of school trips arranged. Due to this, the school decided to continue the test after the holiday.

All these issues mean that the testing may not have been consistently conducted or participated in across schools, but since pupils were individually randomised within the school, the overall effect would be minimal.

## Formative findings

### How the programme might be improved

Maths Counts has some of the hallmarks of effective maths teaching as recommended in the recent EEF guidance report (EEF, 2017). Maths Counts builds on pupils' existing knowledge by starting with a diagnostic. It involves the use of manipulatives and resources. It is structured and is intended to develop motivation. There is also continuous CPD available for staff involved.

There could be, however, more opportunities to integrate problem-solving strategies in different contexts. The closest element that Maths Counts has to problem-solving is the 'playing shop' game where students were asked, for example, how much it would cost to buy three pencils if each pencil costs 50p.

There were also occasions we observed that pupils were able to do the calculations mentally without the manipulatives, and the use of manipulatives or physical objects actually hindered their learning. For example, while they could calculate in their head that 10 minus 7 is 3, when asked to take 3 coins away from ten they made mistakes. Sometimes the children seemed very dependent on the manipulatives too.

Some MLs and LPs commented that there could be more variety within the programme. This may be in relation to activities provided but also in terms of the ability range that is catered for. There were comments that the programme could benefit from including activities involving the use of visual representations, such as graphs and charts, which pupils will need to become more familiar and confident with as they move through school.

### The Digital Tool

The unique feature of MC is the Digital Tool, which was specifically developed to support the MC programme. It has never been used before in other similar maths interventions. The process evaluation revealed some initial difficulties and glitches reported by LPs. For example, some found it difficult to navigate the Digital Tool to select the learning objectives and the matching activities. Learning partners also found that it took them too long (about 40 minutes) to plan each lesson, well in excess of the ten minutes suggested. But many agreed that once they were familiar with the system they were considerably faster. In a few cases, LPs reported that the activities suggested did not match the learning objectives. This may have affected the delivery. A common comment that came up repeatedly from the teaching staff was the need for more opportunity to try out the programme prior to implementation.

### Diagnostic assessment of pupils' learning and other socio-emotional needs

Feedback from the teaching staff and our own observations suggest that some of the pupils may have learning needs in addition to struggling with maths. One child had quite severe autism and would not engage with any activities, and a number had been diagnosed with (or were awaiting diagnoses of) dyslexia. The evaluation team noted pupils reading 12 as 21, 20 as 2, and 80 as 18. These observations suggest that children's additional needs may impact on their engagement and attainment within the programme. The InCAS assessment also involved problem sums and required the understanding of written instructions. A few pupils were observed to have difficulties reading and comprehending what they were expected to do as well as dealing with the mathematical challenges within the test.

To achieve maximum impact, it may be necessary for such learning needs to be identified and appropriate strategies developed to tackle them either prior to the implementation of the programme or alongside the programme. This is a complex area and one which may require specialist support in terms of developing the intervention further.

### **Control group activity**

The within-school randomisation meant that all schools were treatment schools. This minimised demoralisation and dropouts considerably. Also, schools were allowed to continue to have access to the Digital Tool and were encouraged to continue with the programme with the control pupils following the end of the trial. This ensures that no pupils that needed the extra help were left out, and reduced the temptation for schools to use the programme with the control group. Schools also kept the resource box and the teaching materials, which allowed them to continue with the programme if they wished to.

During our observation visits to schools we also talked to the control pupils asking them what maths interventions they were receiving and how they were conducted. We also asked teaching staff how other pupils struggling with maths were supported. In all instances, pupils and staff reported business as usual. In most schools, business as usual was small-group maths practice sessions where pupils were given maths questions set by the classroom teacher which were then practised with a teaching assistant. There was no evidence of diffusion in the schools we visited. Since the use of the Digital Tool was password protected, only the treatment pupils were assessed using the diagnostic lessons and appropriate learning objectives were identified for them. No similar information was available for the control pupils (see page 12 under Trial Design).

## Conclusion

### Key conclusions

1. Children who received Maths Counts made the equivalent of two additional months' progress in general maths, on average, compared to similar pupils that did not receive the intervention. This result has a low to moderate security rating.
2. Pupils who were eligible for free school meals made two months less progress if they took part in the intervention, compared to similar pupils who did not. This result may have lower security than the overall findings because of the smaller number of pupils.
3. Maths Counts appeared to be more effective with the youngest (Year 3) pupils and with the lowest attainers in this age group. This result may have lower security than the overall findings because of the smaller number of pupils.
4. Implementation appeared to be enhanced when Maths Counts had the support of school leaders who provided time and space for the intervention to take place.
5. The key challenge for implementation was finding sufficient time to plan and deliver the lessons. Staff turnover, staff absence due to illness, and pupil absences were other barriers which led to fewer sessions conducted than planned.

## Interpretation

### Factors that could impact outcomes

The overall results of the impact evaluation suggest that Maths Counts had a positive effect on the General Maths outcome for KS2 children (see Table 11). Indicative results suggest it was more effective for the weakest Year 3 pupils (see Table 19), but not for the older cohorts and those who were ever eligible for free school meals in the last six years. It should be noted that these are based on smaller sample sizes than the total cohort and will be less secure. Also, baseline data on the youngest cohort (Year 3) was different to the baseline data collected for the older cohorts (Years 4, 5, and 6) which also makes comparisons between younger and older cohorts difficult.

One possible reason for the difference between years could be that the programme was designed to address very basic maths problems and targets the very low performing children. The selection criteria for eligibility were specifically those who were not likely to achieve the Year 2 programme of study. Some schools may not have many of these children and selected the slightly higher performers. As the programme is meant to address very low-level or basic maths problems, it may be seen by the higher attainers as patronising. This could have had an adverse effect on the motivation of the better able pupils. This was also the professional view of the developer and the teaching staff (see Appendix F, feedback from schools). A slightly higher proportion of EverFSM6 children (54%) were from the older age cohort, which may explain the slightly suppressed results for the older cohort.

The larger effects for the Year 3 could be due to the fact that the KS1 scores were defined in broad descriptive categorical variables whereas those for the older children (Years 4, 5, and 6) were recorded in numerical point scores. However, because the post-scores are independent of this, the gain scores are unlikely to be an artefact of the change in KS1 recording.

The process evaluation suggests a number of other factors that may have impacted on the outcomes, and some lessons that can be learnt from this trial. One factor was pupil absences; this impacted on the optimal delivery of the programme and led to about 18% of the treatment pupils ( $n = 56$ ) having fewer than the recommended minimum number of sessions. The CACE analysis shows that compliance

to the minimum number of sessions is associated with greater impact. Strong leadership support is needed to ensure this.

Some children also displayed other learning and social-emotional and behavioural difficulties which could not be addressed by the programme. The recent EEF/Royal Society review suggests literacy as an important mediating factor in learning science (Nunes et al., 2017). Poor literacy skills and dyslexia can affect children's learning. Research evidence suggests that there is a close link between low income, mental health, and attainment at school (Bradley and Green, 2013; Gutman and Vorhaus, 2012; PHE, 2014). The problem with a number of these children may not be simply lack of understanding of mathematical concepts. So while the programme is successful in supporting those who felt lost in a whole-class environment, it may be less successful in helping those who have more complex needs. Feedback from teaching staff suggests that the programme is less suited to those with wider and more complex learning difficulties (see Appendix E). Perhaps future trials may also want to consider how these children can be supported in other ways to help them access the curriculum. Enhancing the general well-being of children may be a precursor to effective learning (The Public Health England Report, 2016; Weale, 2017).

A small number of children were observed not being able to read mathematical symbols This suggests that a further area for development may need to be around understanding of basic mathematic symbols.

Staff absences and staff turnover have also affected optimal delivery. This can be disruptive to some children who take time to develop a rapport with adults. Staff absences and turnover also meant that children missed lessons and did not have the continuity that may have been beneficial.

### **Perceived impact on pupils' wider outcomes**

Overall, staff and pupils were very positive about the programme. Pupils particularly liked the one-to-one individual attention and many of the activities. They found the pace of the lessons met their needs and this gave them the confidence to learn maths. The learning environment was supportive and unthreatening. Children felt that if they did not understand a concept they could always ask the LP whereas in a whole-class environment they could not and often felt lost. Teaching staff liked the structured protocol starting with the diagnostics, which helped to identify the individual needs of the child. The lesson activities and the resources are all readily available, which saved time having to think of interesting things to do with the children. All the staff we spoke to commented on how much more confident children had become. The initial anxiety about maths had been slowly eroded. There was evidence of this, not only during the sessions, but also in the classroom. We also observed and heard about changes in pupils' attitude towards learning maths. They were more willing to have a go, to make mistakes. Even if test score gains are limited, this perceived improvement in confidence is a positive first step towards learning maths and overcoming maths anxiety for the children involved. However, it should be noted that there was no empirical evidence that the programme had an impact on attitudes to maths as measured by a standardised test.

### **Empowerment of teaching assistants**

The programme also had an impact on teaching assistants. Maths Counts differs from its predecessors (for example, Numbers Count) in that it was conducted by teaching assistants rather than classroom teachers. The trial has shown that teaching assistants can be effectively deployed to deliver the programme. Some of the teaching assistants reported that they had learnt a lot about how to utilise the various common, but rarely used, resources, such as the Numicon and Dienes. Two teaching assistants have since conducted a workshop for other teaching assistants in their school on the numerous ways to use Numicon manipulatives. Many teacher assistants also reported that they felt empowered. For the first time they were not simply doing maths problems with pupils which were set by the classroom teacher; they were actually preparing, developing, and delivering the lessons themselves. The trial has

shown that, if properly trained, teaching assistants can be effectively deployed to support children's learning. This is consistent with the EEF guidance report on the use of teaching assistants (Sharples et al., 2015).

## Limitations

1. The main limitation of the evaluation is the small sample size. According to the developers, each LP could only support two learners. This is to protect the integrity of the programme. In addition, there is the issue of the capacity of schools to release more staff for the programme. This severely limits the scale of the study.
2. The use of KS1 results as the pre-test scores for two different cohorts of pupils whose KS1 scores are not comparable created complexity in the analysis. This led to separate and different analyses for the two cohorts, thus reducing the already small sample further. The use of KS1 for pre-test and the InCAS assessment for the post-test is likely to dampen the effect size. One issue is that the two tests will have lower correlation compared to using the same test for pre and post assessments. In this trial the correlation coefficient between the KS1 scores and the InCAS assessment is only 0.404. Coe and May (2011) also found that even with the same test, the correlation coefficients are lower for low performing pupils (Coe et al., 2011) thus reducing statistical power. In combination these factors would reduce effect size quite considerably.
3. In terms of generalisability, the schools in the trial are fairly similar to those in England, but they are slightly more likely to have higher proportions of pupils eligible for FSM and with reported SEN. They also tend to be lower performing schools with a lower than average proportion of pupils attaining level 4 and above at KS2 in reading, writing, and maths.

The trial schools are located in the South and South West of England, in big cities like London and Bristol and small towns with largely white population (Westbury and Trowbridge). These schools have proportionately fewer pupils who have English as an additional language compared to the national average. So in this respect the results may not be representative of schools in other parts of England where the demographics are slightly different.

4. Finding an appropriate assessment for the kind of children being supported is another factor to consider. Maths Counts only delivers lessons on number skills but we could only find normative assessments that assessed general maths and mental arithmetic. The developers preferred assessment was the Sandwell Early Numeracy Test but this was not considered appropriate for the trial as it was also used for establishing the baseline measure and had many aspects which were closely aligned with the intervention. The most appropriate assessment at the time was the CEM InCAS assessment which is adaptive but also includes data handling, shapes, and space. These were not the focus of MC.

## Future research and publications

The main objective of these trials is to introduce a programme of promise to schools with the aim of raising children's attainment rather than being solely for academic research purposes. However, with most trials there is the issue of intervention decay where the schools go back to business as usual after the trial ends and researchers leave the field. If possible we would like to follow-up these schools to find out, a year later, how many have actually continued with the programme as it is, how many have continued with the programme but in a modified form, and how many have abandoned it completely. We would also like to see how many of the schools decide to adopt the programme after the trial.

Almost all the schools in this trial have said they would like to continue with the programme but with less intensity, perhaps once a week rather than three times a week and on a small group basis (with two or

three pupils) rather than on a one-to-one basis. The main concern was cost in terms of the amount of time Learning Partners spent on the preparation and delivery. If they could do it on a small group basis it would be more cost-effective.

There are some accounts suggesting that this programme also works with small groups for younger children. Edge Hill has done its own evaluation and found that the small group intervention does not work as well with older children. These assumptions have not been tested properly in randomised trials. So future research might want to look into whether a modified version of Maths Counts and with different age groups is just as effective. If so, this would be more appealing to schools.

This trial did not test the differential effects of teaching assistants, which may vary as some were able to establish better rapport with pupils than others and some were more experienced or committed to the programme. Therefore, there is a potential for teaching assistants to have an effect on pupil progress. This was not measured nor analysed because the number of pupils taken by each teaching assistant is too small for any sensible analysis.

Future studies could look into the following kind of research questions:

- Is MC effective when conducted in pairs or in small groups and for which age group?
- Is MC effective when conducted once a week rather than three times a week?
- Is there a differential effect between teaching assistants?
- What is the impact on other wider outcomes, such as confidence in maths, reduction of maths anxiety, and improvement in staff-pupil relationship?
- Can the MLs and LPs train other teaching staff to deliver the programme? (This question could be addressed by randomising teaching assistants rather than pupils.)

Future research could also look into finding a suitable test for assessing number skills only for children whose maths skills are still at the elementary stage for their age. For a stronger evidence of effect, future study could use the same instruments for measuring the pre-intervention baseline and post-intervention outcomes.

### **Further publications**

Besides this EEF report, the evaluators envisage that at least one peer-reviewed journal article will be published as a result of this study.



## References

- Bradley, B. and Greene, A. (2013) 'Do health and education agencies in the United States share responsibility for academic achievement and health? A review of 25 years of evidence about the relationship of adolescents' academic achievement and health behaviors', *Journal of Adolescent Health*, 52 (5), pp. 523–32.
- Campbell, D. T. and Stanley, J. C. (1963) 'Experimental and quasi-experimental designs for research on teaching', in N. L. Gage (ed.), *Handbook of research on teaching*, Chicago, IL: Rand McNally (pp. 171–246).
- Coe, R., Haimson, J., Perez-Johnson, I. and May, H. (2011) 'Variability in pretest-posttest correlation coefficients by student achievement level', Washington: IES.
- DfE (2016) 'Phonics screening check and KS1 assessments in England, 2016', SFR 42/2016, 29 September 2016: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/577806/SFR42\\_Phonics\\_KS1\\_2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/577806/SFR42_Phonics_KS1_2016.pdf)
- Dong, N. and Lipsey, M. (2011) 'Biases in estimating treatment effects due to attrition in randomised controlled trials: A Simulation study', SREE Conference, 2011.
- Dowker, A. (2004) *What works for children with mathematical difficulties?* Nottingham: DfES publications.
- EEF (2017) 'Improving mathematics in Key Stages two and three', London: EEF.
- Edgehill University (2018) 'Numbers Count': <https://everychildcounts.edgehill.ac.uk/wp-content/uploads/2016/03/school-preparation-for-Numbers-Count.pdf>
- Foster, M. E. and Fang, G. Y. (2004) 'Alternatives to Handling Attrition: An Illustration Using Data from the Fast Track Evaluation', *Evaluation Review*, 28, pp. 434–464.
- Gorard, S. and Gorard, J. (2016) 'What to do instead of significant testing? Calculating the "number of counterfactual cases needed to disturb a finding"', *International Journal of Social Research Methodology*, 19 (4), pp. 481–490.
- Gorard, S. and Taylor, C. (2002) 'What is segregation? A comparison of measures in terms of strong and weak compositional invariance', *Sociology*, 36, 4, pp. 875–895.
- Gutman, L. and Vorhaus, J. (2012) 'The Impact of Pupil Behaviour and Wellbeing on Educational Outcomes', London: DfE.
- Little, R. J. A. and Rubin, D. B. (1987) *Statistical analysis with missing data*, New York: Wiley.
- Nicholl, J. (undated) 'Complier Average Causal Effect analysis', [https://www.sheffield.ac.uk/polopoly\\_fs/1.4187111/file/JNicholls.pdf](https://www.sheffield.ac.uk/polopoly_fs/1.4187111/file/JNicholls.pdf)
- Nunes, T., Bryant, P., Strand, S., Hillier, J., Barros, R. and Miller-Friedmann, M. (2017) 'Review of SES and science learning in formal educational settings', London: EEF.
- Public Health England (2014) 'The link between pupil health and wellbeing and attitude: A briefing for head teachers, governors and staff in education settings', London: Public Health England.
- Public Health England (2016) 'The mental health of children and young people in England', London: Public Health England.
- Puma, M. J., Olsen, R. B., Bell, S. H., and Price, C. (2009) 'What to Do When Data Are Missing in Group

Randomized Controlled Trials' (NCEE 2009-0049), Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Shadish, W. R., Cook, T. D. and Campbell, D. T. (2001) *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*, Boston: Houghton Mifflin.

Sharples, J., Webster, R. and Blatchford, P. (2015) 'Making best use of teaching assistants guidance report', London: EEF.

Torgerson, C., Wiggins, A., Torgerson, D., Ainsworth, H., Barmby, P., Hewitt, C., Jones, K., Hendry, V., Askew, M., Bland, M., Coe, R., Higgins, S., Hodgen, J., Hulme, C. and Tymms, P. (2011) 'Every Child Counts: the independent technical report', London: DfE.

Torgerson, C., Wiggins, A., Torgerson, D., Ainsworth, H. and Hewitt, C. (2013) 'Every Child Counts: testing policy effectiveness using a randomised controlled trial, designed, conducted and reported to CONSORT standards', *Research in Mathematics*, 15 (2), pp. 141–153.

Weale, S. (2017) 'Primary school teachers not trained to deal with mental health issues', *The Guardian*, 21 September 2017.

Ye, C., Beyene, J., Browne, G. and Thabane, L. (2018) 'Estimating treatment effects in randomised controlled trials with non-compliance: A simulation study', *BMJ*, 4 (6).

## Appendix A: The pilot

Phase 1 of the pilot was to develop the intervention.

Although the predecessors of Maths Counts have been trialled and developed over ten years, the digital tool, which is the new development of the programme, has not. So it went through a pilot phase of testing, first in its paper version and then with the digital version. An external commercial company (18a) was contracted to develop the Digital Tool. The paper version of the programme was tested with 19 pupils across the Mead Academy Trust. Several consultations with pupils and teachers were carried out to make sure that it was user-friendly and appealing to children. Children consulted also had a say in how they wanted the platform to look like. Phase 1 also saw the development of the Maths Counts website and the teaching resources.

Phase 2 was launched in the Spring of 2016. The aim of this phase was to rehearse the main trial including the randomisation process, data collection from schools, training of teaching staff and testing the Digital Tool. This phase also aimed to assess the suitability of the Progress Test in Maths and to collect some preliminary impact data. During this phase a lot of discussions went on between the evaluation and the project teams. For example, the evaluators discussed with the project team the conduct of the trial, the importance of minimizing attrition, getting schools to keep them informed of changes in staff and pupils and to maintain the integrity of the randomisation. Developers kept a record of the sessions conducted by each school and monitored the delivery of lessons. Evaluators were kept informed throughout the pilot phase about the progress of the Digital Tool and the recruitment process. When it was learnt that the overall sample for the main trial would not be large enough to detect the effect size suggested, discussions were made with the project team and the EEF on the need to increase the number of schools to recruit big schools with more than one form entry.

### The pilot

A total of 22 pupils from eight schools in the Trowbridge area including three from The Mead Academy Trust Schools were recruited for this phase. Two neighbouring schools agreed to be in the comparison group with the promise that they will receive the intervention after the pilot. A total of 10 Learning Partners were supported by three Maths Leads. The average number of lessons taught over the three months of pilot phase was 24.

### Impact evaluation

While the pilot was in progress the project team decided that the Progress Test in Maths would not be suitable for the trial. A number of options was suggested by evaluators and EEF. Eventually, the project team decided on the InCAS assessment. However, due to complications in purchasing the test it was not possible to set up the test in time for the children to take the test. As part of the intervention the Sandwell (Early Numeracy Test) test was used to check for progress. A decision was made to use this as an indication of pupils' progress. However, this meant that progress results were only available for the treatment schools. Therefore no comparison data was available from the control schools.

Results from the pilot suggested a strong impact on pupil progress using the Sandwell test over the three months of intervention. Years 3 and 4 pupils recorded slightly bigger progress than Years 5 and 6 pupils.

<b>Average Number age gain:</b>	<b>(Range from / to)</b>
The Mead: 4 learners Average +9 months	(from +4m to +12m)
River Mead: 5 learners Average: +13 months	(from +8 m to +16 m)
Castle Mead: 4 learners Average: +8.5 months	(from +5m to +11m)
The Grove: 3 learners Average: +17 months	(from +8m to +24m)

Studley Green: 4 learners Average: +18 months (from +12m to 28m)

Holbrook: 2 learners Average: +16.5 months (from +12m to +21m)

Year 3 Learners across Pilot 2 schools (10) Average +15 months

Year 4 Learners across Pilot 2 schools (7) Average +11 months

Year 5 Learners across Pilot 2 schools (5) Average +10 months

Year 3 Learners across TMAT (4) Average +9 months

Year 4 Learners across TMAT (5) Average +11.4 months

Year 5 Learners across TMAT (4) Average +10.5 months

**Average Number of Lessons taught:** (target 30)

The Mead: 21.5 lessons (range from 19 to 25)

River Mead: 17.6 lessons (range from 15 to 20)

Castle Mead: 18.5 lessons (range from 17 to 19)

The Grove: 30 lessons

Studley Green: 26 lessons (from 24 to 27)

Holbrook: 21.5 lessons (from 18 to 25)

**Overall across Pilot Phase 2 Schools:**

Average Number age gain: 13 months (range +4m to +28m)

Average number of lessons taught: 24.4 (range from 15 to 30)

**Overall across TMAT Pilot Phase 2:**

Average Number age gain: 10.4 months (range +4m to +16m)

Average number of lessons taught: 19.1 lessons

**Process evaluation**

Evaluators attended the staff training and observed three sessions of delivery, two of which using the paper version of the intervention and one using the digital version. Teaching staff were excited and positive about the intervention. Learning Partners appeared confident in delivering the intervention. Learning Partners (TAs) were observed to confidently work with individual pupils in dedicated mini-learning environments, using project resource boxes. Learning Partners were well supported by Maths Leads. Surgeries were held to support the implementation. The project team also shared experiences of the Learning Partners and pupils with the evaluation team as the cycle progresses.

One Maths Lead talked to us about how she felt that some of the training for LPs needed to start right back at the beginning – referring to basic principles from the earlier Numbers Counts programme. These include: connections model, questioning, use of working memory. She felt that no assumptions should be made about what potential LPs do/do not know prior to their training. Her comments were based on the experience of the LPs at her school and what she has heard from other Maths Leads. She explained that at her school extra half an hour was given on Fridays to LPs for planning of Maths Counts sessions and collaborative planning with other LPs. This did not happen at other schools. Both LPs in her school also had the opportunity to observe each other and the ML teaching. They felt that this was a valuable learning experience for them.

*Lesson observation with a Y4 pupils*

The lesson took place in a designated space just off the ML's classroom. It was quite a large space (the size of a small room) with different areas/spaces for different activities. There were resources on the wall. Because of the dedicated space they did not need the personal learning boards.

The LP employed a range of very good excellent questioning techniques throughout the session. E.g. 'What is happening here?' 'How do we know this?' 'Can we check this?' She was constantly ensuring that the pupil was proactive and thinking. Crucially time was given for the pupil to think, make mistakes and self-correct. Praise was also given effectively. The session was delivered as per protocol. The pupil and the LP ended the session with a discussion of the learning objectives secured and using the maths map to display what the pupil can do, what she needs to do and the next step.

We talked to the LP about her experience and she suggested some practical planning support would have been very useful at the beginning. She found the digital tool quite confusing initially but soon realised that some of this was due to technical glitches. She also fed back that some of the learning objectives were not relevantly linked with the activities which made planning tricky and time consuming. She also found some of the activities quite repetitive so improvised with some of her own. The project team said this was not encouraged unless LP was experienced and familiar with the aims and philosophy of MC.

The second LP commented that she originally thought lessons would be clearly outlined on plans but they were not so she also felt some support with planning would have been good. She also agreed that some of the objectives and activities do not match. But overall she was very positive about the impact the programme had on the pupils. She commented on the progress she had seen in her pupils and how their confidence had grown - they were now quicker at simple maths.

## Appendix B: TIDieR checklist

### Maths counts intervention description

1. **Brief name:** Maths Counts
  
2. **Why – rationale, theory or goal of the elements essential to the intervention:**  
The theory is that individualised provision of one-to-one teaching of number concepts using The Connection Model and a constructivist approach to children with low attainment in maths can improve their performance in general maths, mental arithmetic and maths attitudes, as measured using the independently assessed InCAS assessment.
  
3. **Who – recipients of the intervention:**  
The recipients of the intervention are primary school pupils in Years 3, 4, 5 and 6 working at or below the Year 2 Programme of Study.
  
4. **What (materials) – describe the physical and or informational materials used in the intervention:**  
  
The intervention involved the development and application of a Digital Tool. This digital platform enables Maths Leads to enter detailed diagnostic information for individual learners, Learning Partners to plan the lessons based on banks of relevant activities, secure lesson objectives and map ongoing progress. Each school received a box of resources and a privacy board that could be developed into a bespoke mini learning environment with resources from the Maths Counts website. The resource box contains items such as coins, Numicon, number cards, Dienes, stationery set (for creating a shop), place value arrow cards number lines. Maths Leads also received a CPD manual with workshop training the Learning Partners in the use of Numicon and The Connection Model.
  
5. **What – procedures, activities and/or processes used in the intervention:**  
  
The intervention began with 5-7 diagnostic lessons for each learner to establish their profile of learning strengths and needs and to provide a starting point for teaching. This was necessary to ensure that the Maths Counts lessons were bespoke and directly targeted at the individual needs of each learner. The information from the diagnostic lessons were uploaded onto the Digital Tool in the form of small-step learning objectives that were either secured or yet to be secured for each child. Learning Partners used this information to plan the lessons according to an identified lesson structure and selecting appropriate lesson activities to suit each learner. Each lesson begins with 10 minutes of key skill practice, followed by 20 minutes of key learning activities. Teaching is focused, and purposeful with weekly reviews and celebrations of progress alongside the learner through the Maths Map. Depending on the learning objectives, the activities could be counting in 10s or in threes or multiplication. Counting activities could involve throwing a soft football to and fro with the LP, counting straws or coins. Fun activities were sometimes built into the lesson, for example, playing shop using plastic coins to purchase items.
  
6. **Who – provided/implemented the intervention:**

The programme was developed by The Mead Academy Trust and all resources supplied by them, including the development of the Digital Tool. The training of Maths Leads and the Learning Partners was delivered by the developers. Maths Leads conducted diagnostic work with learners identified in their schools and delivered a total of four CPD workshop sessions (one every fortnight) over the 10 weeks of intervention. The one-to-one intervention was delivered by Learning Partners (mostly teaching assistants but occasionally a teacher).

#### **7. How – mode of delivery:**

The sessions were delivered on a one-to-one basis during curriculum time. Learners were taken out of class for the 30-minute session. Many schools elected to rotate the class lessons that learners missed to avoid them being removed from the same lessons each week.

#### **5. Where – location of the intervention:**

The sessions were conducted in work spaces outside the regular classroom. These could be spare classrooms, group work rooms or sometimes spaces in a corridor or library. The schools involved were located in the South and South West of England clustered in four hubs (Bristol, London, Wiltshire and Somerset).

#### **6. When and how much – duration and dosage of the intervention:**

The intervention was delivered during the third and fourth half terms (late Spring/early Summer) of the academic year 2016/2017. Lessons were undertaken three times a week over a 10-week period. The minimum number of sessions expected was 30. Each session lasted 30 minutes.

#### **7. Tailoring – adaptation of the intervention:**

The lesson plans and suggested activities were provided as part of the Digital Tool. Schools were also provided with all resources required for the activities. Schools could choose to make paper versions of the Maths Maps or use the Digital version. If digital maps were used children were also given the choice of themes and pictures they wanted as backgrounds on their Maths Maps. Parents could also view their child's Maths Map and undertake suggested home learning activities at home. An optional gallery of photos of learners undertaking maths activities could also be uploaded in school and viewed by parents.

#### **8. How well implemented (planned):**

The programme was closely monitored via the Digital Tool, which enabled the developers to log the number of times LPs had accessed it for planning a lesson, looking at activities, securing learning objectives and looking at the maths maps. The tool provided information on how many learning objectives have been secured and the number of lessons conducted for each learner. The developers could observe if the LP was active and their learner was achieving new objectives. Based on such information the developers were able to contact schools and offer support if they noticed that the tools was not being engaged with or if lesson plans were limited. Equipped with such information developers also visited schools perceived to be having problems to give them the additional support needed. Full training for new LPs was undertaken in one school and in others detailed advice was given via phone and email.

## Appendix C: Opt out consent



September 2016

Dear Parent/Carer

### Research Study – Mead Maths Counts

We are pleased to let you know that «School» has signed up to take part in a national research and development project called Maths Counts. The head teacher has given permission for the programme to be delivered to pupils from Years 3 to 6. This research is funded by the Educational Endowment Foundation (EEF).

Maths Counts is aimed to support children who are struggling with maths to learn mathematics through a series of manageable steps which are tailored to a child's individual needs. The project is developed by the Mead Community Primary School. This will involve learning partners or teaching assistants in the school delivering Maths Counts to pupils from Years 3 to 6. Your child has been selected to take part in this study. Pupils will be randomly selected to receive the intervention. This means that some pupils will have an opportunity to receive the intervention now and others will receive it later.

Previous studies have shown that the intervention can have a positive impact on children's performance and attitude to mathematics. Durham University are working with the Mead Community Primary School to study the impact of Maths Counts on children's maths attainment. To enable us to do this we will be asking pupils to complete a maths assessment at the end of the study in summer 2017. The school will have access to their own pupils' results to inform teaching.

To help us with this research the school will pass on some background information about pupils to the evaluation team at Durham University. The data collected will be linked to the child's Key Stage 1 data and to their future achievement through linking our results with the National Pupil Database (NPD). The information which the child's school submits for the assessment to be carried out (which includes details such as your child's name, date of birth, gender, ethnicity, free school meal status and whether they speak English as an additional language) along with the results of the assessment will also be shared by the assessment provider with the evaluation team at Durham University for the purposes of the Maths Counts programme evaluation.

All pupil and assessment data will be treated in the strictest confidence and never be made public. No individuals will be identified or identifiable. The data for your child's school will be analysed anonymously, together with data from other schools, and no individual pupils or schools will be named in any report. The data will be anonymised (no names will be attached) and shared by Durham University with the Education Endowment Foundation data archive. The assessment provider may also use anonymised information that the school has provided for the assessments to be carried out along with the assessment data for the purpose of internal research. The assessment provider may share such anonymised data with third parties for use in their own research, and the results of this research may be used in publicly available documents. The study has been approved by Durham University Ethics Committee.



We hope you will support this important study and are happy for your child to take part in this project and for your child's data to be used in the way outlined above. If you do not wish your child to take part in this project or if you would prefer we did not use your child's data in this research study please complete the form below and return it to your child's class teacher by <<DATE>>. If you have further questions about the project or the evaluation you can contact us directly. Contact details are below:

Yours faithfully,

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Dr Sarah Couzens

(Project Lead)

Email: [scouzens@themead.wilts.sch.uk](mailto:scouzens@themead.wilts.sch.uk)

Prof Stephen Gorard

(Lead Evaluator)

Durham University

Email: [s.a.c.gorard@durham.ac.uk](mailto:s.a.c.gorard@durham.ac.uk)

Tear here

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**NB: You do not need to return this form if you are happy for your child to take part in the study and for his/her data to be used in the way described above.**

Child's Name \_\_\_\_\_ Year Group \_\_\_\_\_



I **do not** want my child to take part in this study.

Name of parent/caregiver: \_\_\_\_\_

Relationship to child: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix D: Memorandum of Understanding



### THE MEAD TEACHING SCHOOL: MATHS COUNTS TRIAL PROGRAMME 2016-17

#### MEMORANDUM OF UNDERSTANDING

**SCHOOL NAME :** \_\_\_\_\_

The Mead Community Primary School together with Durham University are undertaking a research project entitled Maths Counts (the Project). Details of the project are in the Leadership Guide. The Mead Community Primary School (MCPS) will deliver the training of intervention. Durham University (the independent evaluator) will evaluate the impact of the intervention. This project is funded by the Education Endowment Foundation.

The aim of this project is to assess the impact of Maths Counts on the maths outcomes of pupils in Key Stage two not meeting the Year 2 Programme of Study. The intervention provides one-to-one or small group support and will need to be delivered by trained Teaching Assistants (Learning Partners), working with a nominated Maths Lead Teacher in each school. 35+ schools are being recruited and the project will start in September 2016. Pupils identified as eligible will be randomly assigned either to receive the intervention or to a business as usual control. To assess the impact of the intervention all the pupils identified as eligible (both those selected to receive the intervention and those who are not) will undertake a standardised assessment at the end of the programme.

This document sets out the roles and responsibilities of all parties concerned.

School commitment	Project Team commitment
<ul style="list-style-type: none"> <li>• To identify a member of the senior leadership team to take overall responsibility for programme in the school and correspondence with parents</li> <li>• To identify a school-based Maths Subject Lead to maintain an operational overview and carry out the diagnostic lessons to inform pupil learning programmes. For larger schools, this may include the identification of more than one Maths Lead</li> <li>• To identify appropriate Learning Partners to deliver the Maths Counts programme (preferably those with IT capability)</li> <li>• To identify target children to be supported by the Maths Counts intervention, i.e. children in Years 3 to 6 who are working at or below the Year 2 Programme of Study.</li> <li>• To send out opt out consents letters to parents/caregivers of pupils taking part in this project and inform the Project Lead of the names of any pupils that wish to opt out.</li> <li>• To securely provide Durham University with pupil data required for the evaluation. These data include pupils' UPNs, KS1 results and background data (e.g. sex, ethnicity, date of birth, free school meal eligibility, first language and SEN status), along with the results of the assessment to be shared by CEM with the evaluation team at Durham University for the purposes of the Maths Counts programme evaluation.</li> <li>• To register themselves for the Centre for Evaluation and Monitoring (CEM) InCAS assessment for the 2016/17 academic year and sign up to the CEM's terms and conditions for the use of the assessment.</li> <li>• To inform the Project Lead of any pupils in the project who leaves before the end of intervention assessment, and to provide the name and destination school of these pupils</li> <li>• To inform the Project Lead of any changes in staff involved in the project.</li> <li>• To ensure participating Learning Partners are supported in delivering the intervention to ensure fidelity to the Maths Counts programme. I.E. by providing a maximum of</li> </ul>	<ul style="list-style-type: none"> <li>• To provide training to Maths Leads and Learning Partners</li> <li>• To provide all required supporting resources for participating Learning Partners and Maths Leads.</li> <li>• To provide funding to support the implementation of Maths Counts in the school (£1,500 per school with an additional £500 for a further Maths Lead) from the core funding.</li> <li>• To be an accessible source of support throughout the Project Trial.</li> <li>• To provide training and support in relation to the Digital Maths Counts Tool.</li> <li>• To respond to initial queries about the use of the Digital Tool.</li> <li>• To provide pass worded access to the dedicated website for participating schools.</li> <li>• To provide the school with Sandwell (SENT) Assessment if requested.</li> <li>• To liaise with Durham University (the independent evaluators) in supporting the gathering of background data for eligible Learners.</li> <li>• To collect parental opt-out consents from schools for pupils taking part in the project.</li> <li>• To ensure schools are credited as official participants in the Project Trial in reports and subsequent documentation and share the findings of the trial with the participating schools.</li> <li>• To support the evaluation team in the process and impact evaluation.</li> </ul>

<p>two Learning Partners per Maths Lead and two Learners per Learning Partner.</p> <ul style="list-style-type: none"> <li>• To provide an appropriate physical space for the intervention to take place.</li> <li>• To support the Learning Partners in delivering the intervention</li> <li>• To ensure that a dedicated time is given to allow for the delivery of the intervention to the pupils</li> <li>• To ensure Learning Partners have ready access to a laptop with internet access for the duration of the programme</li> <li>• To use the core funding provided by the Education Endowment Foundation to support the implementation of the Maths Counts programme and not for any other purpose. The allocation per school is £1,500.</li> <li>• To support the Maths Leads in the delivery of four CPD Workshops for Learning Partners at specified points over the duration of the Maths Counts intervention.</li> <li>• To release Learning Partners and maths leads to attend central training events and in-house CPD workshops.</li> <li>• To make available laptops for the designated Learning Partners attending the training.</li> <li>• To support school visits by members of the Maths Counts project team and by Durham University, the independent evaluation team (where applicable).</li> <li>• To administer a maths assessment to all eligible learners; both those randomly selected for the programme and those who are not at the end of the intervention.</li> <li>• To inform the evaluation team of the dates and time when the post-test is to be conducted.</li> <li>• To provide such eligible learners with a laptop or computer and headphones for this assessment.</li> <li>• To complete Maths Counts Results summary sheet (including optional Sandwell testing) for the Maths Counts Team.</li> </ul>	
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**Durham University's commitment**

1.	Conduct the random allocation of eligible pupils to receive Maths Counts training or business-as-usual control.
2	Work with the project team (Mead Community Primary School) to ensure that opt-out consents are obtained from parents for participation and for subsequent data linking concerning their child.
3.	Work with the project team to schedule the testing and support school with delivering this.
4.	Conduct informal interviews with pupils and teachers and observation visits to schools.
5.	Collect data on the number of sessions accessed by pupils from schools to measure dosage and also regularity of implementation
6.	Collect other relevant data on pupils' prior attainment and background characteristics, such as age, date of birth, sex, ethnicity, first language, SEN and FSM from schools as part of pre-testing. These data are essential for sub-group analyses. Data will be matched with the National Pupil Database. No individual school or pupil will be identified in any report arising from the research
7.	Ensure that all pupil and test data will be treated in the strictest confidence and never be made public. This means no individual school or pupils will be identified in any report arising from the research.
8.	Ensure that all data collected are stored securely and anonymously processed.
9..	Ensure that all evaluation team members conducting school visits have DBS clearance.
10.	Analyse data from the project in order to evaluate the impact of the intervention.
11.	Produce an end-of-project evaluation report and share this with the Mead Community Primary School and the Education Endowment Foundation.
12.	Collate data collected as part of the project and transfer school and pupil level data to the Education Endowment Foundation's (EEF) long term data archive for future research purposes.
13.	To share anonymised data with the Centre for Evaluation and Monitoring at Durham University (the assessment provider) for future research purposes.
14.	Ensure that the research is conducted in accordance with the British Educational Research Association's ethical guidelines and approved by Durham University ethics committee (Ref number 2225).

**Memorandum of Understanding**

If you agree to the roles and responsibilities set out above in the Memorandum of Understanding, please sign two copies of the form below, retaining one and returning the second copy to Dr Sarah Couzens (Project Leader).

**SCHOOL**

1. I confirm that I have read and understood the Memorandum of Understanding for the Maths Counts Project and have had the opportunity to ask questions about the Project and receive answers.
2. I understand that by agreeing to take part in the Project the school agrees to provide the necessary support for the delivery of the intervention and to assist the evaluation team with the data collection and administration of the assessment.
3. I agree to share pupil data with the evaluator and for the anonymised pupil data and test data to be shared with the developer of the assessment for standardisation and research purposes
1. I agree to the responsibilities set out for the schools in the MOU and agree to deliver these.
2. I consent to the school taking part in the above study.

**Head teacher name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Head teacher signature:**

**Email address:**

**School name and address:**

**Telephone contact:**

**MEAD COMMUNITY PRIMARY SCHOOL**

I have read and understood our roles and responsibilities as the project developer as set out in the Memorandum of Understanding and agree to commit to the project.

**Name (Project Lead):**

**Date:**

**Project Lead signature:**

**Email address:**

**Telephone contact:**

**DURHAM UNIVERSITY**

I have read and understood our roles and responsibilities as the independent evaluator as set out in the Memorandum of Understanding and accept these roles and responsibilities.

**Name (Lead Evaluator):**

**Signature of Lead Evaluator:**

**Email address:**

**Telephone contact:**



## Appendix E: End of Trial Review and Feedback Report



### Maths Counts Trial

2016 -2017

### Summary of Review and Feedback comments from Trial Schools

July 2017

### The Mead Academy Trust

#### Attendance

Attendance at the scheduled Review and Feedback session from all four Hubs is outlined below. Those schools that weren't able to attend were asked to contribute detailed feedback comments via email. The majority of the absent schools offered such feedback.

Delegates	Training Hub			
		London (16.5.17)	Somerset (18.5.17)	Wiltshire (23.5.17)

<b>Maths Leads</b>	4	8	6	5
<b>Learning Partners</b>	3	16	12	10
<b>Total delegates</b>	7	24	18	15
<b>No. of Trial Schools represented</b>	5/6	8/11	6/10	7/8

### **Review and Feedback session content**

During the 2-hour session schools were asked for their views on the following key areas:

- Overall impressions of the Maths Counts programme
- What worked well/not so well with the programme in school
- Who does this programme suit best – a learner profile?
- The strengths, issues and improvements on the following specific aspects of the Maths Counts intervention:
  - The Diagnostic lessons
  - The four CPD sessions for Learning Partners
  - The Maths Map
  - The Digital Tool
  - Initial training for schools
  - Resources
- Planned future use of the programme

A further presentation of Sandwell data received from 22 schools was also included. Details of these findings are presented on pages 12 to 15 of this document.

### **Overall impressions of the Maths Counts programme**

*This programme is inspiring, fun, interactive and enjoyable!*

The majority of Trial schools reported positive comments about the Maths Counts programme. They welcomed a resource that was focused on the most vulnerable underachievers in mathematics at Key Stage 2 and felt that it offered them a personalised intervention that targeted gaps in a learner's mathematical knowledge. One school commented that Maths Counts had filled a gap in their current provision and it now formed part of the school's improvement plan.

Schools saw the diagnostic lessons as a valuable resource in identifying fundamental gaps in mathematical knowledge. The flexibility and child-centred nature of intervention as well as the quick and easy digital planning tool that maximised time spent on teaching was enjoyed by the majority of schools. Whilst it was deemed to be an intensive and time consuming programme, many felt that it was a manageable programme to deliver within their setting given the appropriate level of time commitment.

### **Impact on the learner**

Schools from all four Hubs highlighted the positive impact on the learners concerned as an advantage of the programme. Protected one-to-one time for the majority had resulted in both improved attainment and attitude towards number work generally. Schools reported greater enthusiasm and enjoyment of maths as a subject as well as an increase in confidence, self-esteem and resilience more broadly. Being able to actively 'see' the progress being made through the Maths Map was also felt to be particularly helpful for more vulnerable learners.

### **Resources /activities**

The provision of a box of manipulatives and general resources to support learning on the programme was welcomed by many. The all-in-one place, grab-and-go nature of the resource box and privacy board was thought to be hugely time saving. The Maths Count Digital Tool was also seen as helpful, making lesson planning straightforward and quick but providing a good selection of practical interactive and enjoyable games and activities to support learning objectives alongside a wealth of suggestions for home learning. The CPD workshop sessions were felt to be useful in supporting the delivery of lessons by most schools.

For a minority of schools however the Digital Tool was reported to be 'fiddly' with a lot of navigating required before a Learning Partner was confident in its use. For others, the number of resources and activities available via the Digital Tool and website was felt to be 'a bit overwhelming' and CPD workshop sessions too lengthy, inappropriate for some staff members and difficult to schedule into the busy school timetable.

### **Time and staffing challenge**

Any negative impressions of Maths Counts resulted from the challenge of finding time and releasing appropriate staff for the delivery of the programme. Several schools felt the time burden of the intervention would be better spent in addressing the needs of small groups rather than individual learners. Some described the human resource cost of one-to-one work as 'unjustifiable'; taking the TA away from 'other needy learners'. The logistics of timetabling three sessions a week meant that teachers were reluctant to release learners and learners did not want to miss favourite lessons. The impact of time spent on diagnostic lessons by Maths Leads was also felt to be costly and time consuming especially as most of them were also class teachers.

### **What worked well/not so well with the programme in school?**

Schools were asked to provide more detail to their general impression feedback by giving examples of what worked well or not so well in the teaching, delivery and management of the Maths Counts programme in their settings.

### **Teaching and delivering the programme**

**Diagnostic work:**

Two schools commented on the importance of the diagnostic lessons in identifying specific gaps in learners' number skills. They felt that the use of such lessons and the capacity to transfer diagnostic information onto the Digital Tool for each learner had worked well in supporting decisions about where to start work in lessons. However, two other schools experienced problems directly matching diagnostic lesson information to specific learning objectives on the Digital Tool and felt that the process for doing this was overly time consuming for a Maths Lead. These schools would have liked Learning Partners to have undertaken the diagnostic lessons instead.

**Lessons and Resources:**

For schools in each Hub, lesson planning was thought to be enhanced by the use of the Digital Tool. Most felt that the capacity to have a range of activities and construct a printable lesson plan all in one place worked well; two schools in Somerset described the game-like nature of the activities as 'fun and engaging for learners'. The individualised mini-learning environment was considered to be a very useful resource for supporting learning and the provision of a large box of relevant resources a real bonus – saving time in gathering such resources from around school. For one school, the importance of creating a dedicated space with resources to hand had worked particularly well.

For a limited number of other schools the time taken for Learning Partners to get familiar with the Tool and gather online resources from the Maths Counts website had proved onerous. A few schools also suggested that activities on the Tool were not always linked directly to the learning objective being worked on. There was also some disagreement among schools about the range of activities on offer with one school describing the delivery of activities as 'a bit repetitive with limited choice' but another suggesting that there was 'too much content for a 30 minute lesson'.

Several schools highlighted that using the Maths Map online had not worked well and that this needed further development to make it quicker and easier to use. Where a school had made use of a paper Maths Map and sticky notes, they had felt it had been beneficial and they had been especially encouraged by their learners desire to take it home to share progress.

**Management of the programme**

For many schools timetabling was the biggest challenge to ensuring the programme ran well. Whilst schools in London reported that they could see the benefits of one-to-one teaching from a social point of view, they indicated that the intensity of such provision had been 'extremely challenging' particularly in the light of learner and Learning Partner absence. They had found the tight time-scale of the Trial difficult and would have preferred an extended period in which to deliver lessons. Similarly, trying to fit the CPD workshop sessions in had proved difficult and opportunities for the Learning Partner to feedback to class teachers about the Maths Counts lessons had not been available.

To ensure that the programme was delivered with fidelity, several schools highlighted the importance of senior management involvement in 'driving' the work forward and welcomed the focus on this in the early briefing session for Head teachers and Maths Leads. One school reported that the capacity for Maths Leads to work alongside the SENCO would be a helpful approach in supporting their most vulnerable learners going forward.

Despite difficulties, schools from all Hubs indicated that, when time had been invested in managing and delivering the programme appropriately, they had reaped considerable rewards for both learners and Learning Partners. One school indicated that their learners were now 'seeing links between Maths Counts and maths in the classroom' and were now 'not afraid to have a go'; another noted that the learners who had undertaken the programme were 'more resilient' in their approach to trickier questions on the InCAS assessment tasks. Yet others had seen development in Learning Partner confidence in lesson delivery especially as a result of the CPD workshops and sharing good practice with each other. Several schools had also experienced direct feedback from parents who had seen more confidence and desire to do maths at home. One school described parents as being 'thrilled about the programme'. Support from the Maths Counts team was also highlighted by a few schools as being helpful in their programme delivery and management. For one of these schools the capacity to get quick responses to queries about the correct use of the Digital Tool was crucial to their success with the programme.

### **Who does the Maths Count Programme suit best? A Learner Profile**

In addition to providing feedback on general impressions and what worked well/not well, Trial Schools were also asked for their views on who the Maths Counts intervention is best suited for; the profile of learner who would benefit most from this programme.

Data taken from all four Hubs indicated that the following characteristics/needs were important considerations when selecting learners for the programme. Learners **best suited** for Maths Counts were:

- Lower Key Stage 2 children (Years 3 and 4) - the activities were felt to be more appropriate for this age group.
- Children with English as an additional language - the programme was found to be helpful in developing and supporting gaps in understanding mathematical vocabulary
- Children with social confidence needs, self-esteem issues and who enjoy working one-to-one with adults
- Children who have missed chunks of their learning- e.g. forces children, travellers
- Children with processing speed and memory difficulties
- Children who are capable of working at age related expectations but have significant gaps
- Children who are eager to learn and happy to miss other lessons
- Children with ADHD as it was felt that this helped their self-organisation
- Children on the autism spectrum as learning could be tailored to their learning needs and special interests.

One school found that girls were more motivated with Maths Counts than boys but there was no consensus around gender over the four Hubs. There was however agreement from all schools about the following considerations for learners who may not benefit from intervention.

Learners **least suited** for Maths Counts were:

- Children who did not attend school regularly
- Children with wider and more complex learning difficulties
- Children who felt stigmatised by intervention and/or did not want to miss favourite lessons.

### **Strengths, Issues and Improvements**

Six components of the Maths Count programme were identified as crucial to its success as an intervention. These were:

- The Diagnostic lessons
- The four CPD sessions for Learning Partners
- The Maths Map
- The Digital Tool
- Initial training for schools
- Resources - the resource box and website resources.

During the Review and Feedback sessions schools were asked to circulate around the room and make written comments on each of these six key components by identifying strengths, challenges and areas for improvement for each. Views from all schools have been collated in the tables below:

### The Diagnostic Lessons

*These diagnostic lessons were brilliant! The information they gave us meant we could hit the ground running. We could also share this with class teachers to support maths in class.*

Strengths	Issues	Improvements
<ul style="list-style-type: none"> <li>• Helped to establish baseline data</li> <li>• Covers many areas where the learner may have gaps/misconceptions and helps to clarify these</li> <li>• Provided insight into the learner's needs</li> <li>• Provided relevant information to pass onto Learning Partners as a start point</li> <li>• Detailed level of insight obtained as a result of working on a one-to-one basis in assessing</li> <li>• Removed pressure from the class teacher to provide such data.</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient time available for Maths Leads to do these</li> <li>• Tasks /questions were broad/open ended and subject to misinterpretations</li> <li>• Diagnostic lessons felt slightly laborious, arduous and time consuming</li> <li>• Diagnostics did not always relate directly to learning objectives on the Digital Tool</li> </ul> <p><i>I spent a lot of time (evenings) uploading information onto the Digital Tool.</i></p>	<ol style="list-style-type: none"> <li>1. Learning Partners trained to undertake diagnostic lessons</li> <li>2. Develop an online test for diagnostics that will automatically upload to the Digital Tool</li> <li>3. Create a more summative type of assessment</li> <li>4. Match diagnostic lessons more directly to the objectives on the digital tool</li> </ol>

### The CPD Workshop Sessions for Learning Partners

*Workshops gave Learning partners time to raise some interesting points and created some good conversations.*

Strengths	Issues	Improvements
<ul style="list-style-type: none"> <li>• The workshops were detailed and contained</li> </ul>	<ul style="list-style-type: none"> <li>• Time consuming - took up time that could have been</li> </ul>	<ol style="list-style-type: none"> <li>1. Change the order of the four CPD session</li> </ol>

<p>good ideas for how to use resources</p> <ul style="list-style-type: none"> <li>• Provided time to touch base and address any issues/ideas Learning Partners had with Maths Leads</li> <li>• Useful as a resource for further TA training in school</li> <li>• No preparation for the Maths Lead</li> <li>• Array training - very useful - Numicon, connections model and calculation progress were particularly helpful.</li> </ul>	<p>used for teaching Maths Counts</p> <ul style="list-style-type: none"> <li>• Limited space in school to meet up/ Time needed after school to complete</li> <li>• The order of the CPD sessions – useful CPD came later than needed</li> <li>• Long and overly prescriptive – but perhaps not the case in all schools!</li> </ul> <p><i>We would have liked the CPD to have started before the programme.</i></p>	<p>modules – particularly 3<sup>rd</sup> and 4<sup>th</sup> sessions</p> <ol style="list-style-type: none"> <li>2. Complete CPD earlier and allow greater flexibility over the content</li> <li>3. Reduce time spent on delivery</li> <li>4. Include more active learning activities and provide PowerPoint slides.</li> </ol>
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### The Maths Map

*The children found their Maths Map very important, far more than I would have anticipated. I would often meet them in the playground and corridors and they would talk to me about their Map and how they were progressing. It had a positive effect on their confidence.*

<b>Strengths</b>	<b>Issues</b>	<b>Improvements</b>
<ul style="list-style-type: none"> <li>• A visual talking point – children could see their progress on display. Great for self-esteem</li> <li>• Children enjoyed interacting by moving the objectives on the Map</li> <li>• Learners used their Maths Maps as part of an award presented in assembly to celebrate success</li> <li>• Using the Digital Maths Map was easier when under time pressure.</li> </ul>	<p>All the issues raised related to the Digital Tool version of the Maths Map:</p> <ul style="list-style-type: none"> <li>• Problems accessing the digital Maths Map version</li> <li>• Printing the Map off was problematic – too many pages and access to a colour printer needed</li> <li>• Digital Maths Map sometimes would not 'save' after building</li> <li>• Learning objectives would overlap or were difficult to move.</li> </ul>	<p>All improvements related to the Digital Tool version of the Maths Map:</p> <ol style="list-style-type: none"> <li>1. More background design choices</li> <li>2. Better printed output</li> <li>3. Iron out technical difficulties</li> <li>4. Once an objective is secure, it should automatically move to the Maths Map</li> <li>5. Reduce the number/size of the objective tiles on the Map</li> </ol>

**The Digital Tool**

*A fabulous one stop shop that empowered Learning Partners and reduced workload!*

Strengths	Issues	Improvements
<ul style="list-style-type: none"> <li>• User friendly, easy to navigate and saved time</li> <li>• The Digital Tool contained a good range of engaging activities and resources</li> </ul>	<ul style="list-style-type: none"> <li>• Too much choice in activities for some learning objectives but others didn't have any activities</li> <li>• Couldn't save edited planning</li> <li>• Frustrating at times!</li> <li>• Some learning objectives didn't match with games/activities suggested.</li> </ul> <p style="text-align: center;"><i>Not always as user-friendly as I'd like – rather too many steps to follow!</i></p>	<ol style="list-style-type: none"> <li>1. The capacity to print any resources with the lesson plan and a home learning activity</li> <li>2. Tool to be able to prompt as to what lesson to move on to next</li> <li>3. The Tool needs to respond to changes made to Maths Map</li> <li>4. Online opportunity to save a lesson before finish</li> <li>5. Hyperlinks to other resources</li> <li>6. A search engine to pinpoint a certain topic</li> <li>7. More varied problem solving activities</li> </ol>

**Initial Training**

*Training both Learning Partners and Maths Leads together enabled a joint planning approach*

Strengths	Issues	Improvements
<ul style="list-style-type: none"> <li>• Initial training was clearly structured and informative</li> <li>• Good to include Learning Partners in all training days</li> <li>• As Maths Leads, it was good to have time with Learning Partners to discuss how we would implement programme</li> </ul>	<ul style="list-style-type: none"> <li>• Long distance to travel for training – especially half days</li> <li>• Lack of modelling of how to teach certain concepts especially multiplication and division</li> <li>• Lack of clear directions about assessment using InCAS</li> </ul>	<ol style="list-style-type: none"> <li>1. Half day training only for Day One</li> <li>2. More video examples of actual teaching sessions and use of the Maths Map</li> <li>3. More opportunity to try out the Digital Tool and create lesson plans</li> </ol>



<ul style="list-style-type: none"> <li>• Funding to support cost of supply cover to attend training was helpful</li> <li>• The background to the creation of the programme was detail</li> </ul>	<ul style="list-style-type: none"> <li>• Learning Partner afternoon session on Numicon was not needed</li> <li>• More training time needed on using the Digital Tool</li> <li>• Some elements of training felt a bit repetitive</li> </ul>	<p>4. More training time be given to how best to use the resources</p>
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**Resources – the resource box and website resources**

*The box contained a wide variety of helpful resources that the children enjoyed using*

<b>Strengths</b>	<b>Issues</b>	<b>Improvements</b>
<ul style="list-style-type: none"> <li>• The resource box was attractive and provided a wide variety of resources for most activities</li> <li>• All in one place and reduced any preparation time</li> <li>• Good to have own set of resources - no borrowing from classes, hunting around</li> <li>• Mini learning environments useful in shared spaces</li> <li>• All resources were familiar and aided the transfer of learning to the classroom</li> <li>• Good online resources to print</li> </ul>	<ul style="list-style-type: none"> <li>• Some resources still needed to be sourced in order to carry out the lessons</li> <li>• Two boxes per school were needed as lessons could overlap</li> <li>• ‘Shop’ resources too single sex</li> <li>• Too much preparation time needed to print and laminate website resources</li> </ul>	<ol style="list-style-type: none"> <li>1. Time built in to prepare website resources</li> <li>2. More activities to engage a girl’s interest</li> <li>3. More variety of resources in the box - dominoes, scales, animals, cars, top trump cards</li> <li>4. Provide a comprehensive list of resources needed for all activities on the Digital Tool</li> </ol>

**Planned Future use of Maths Counts**

Schools were asked to respond to two questions related to Maths Counts and its future use.

- Would you recommend Maths Counts to another school? Why/why not?
- How would you like to see Maths Counts used in the future in your school?

**Recommend to other schools?**

All schools in the Wiltshire and Bristol Hub and the majority in the London and Somerset Hubs indicated that they would recommend the Maths Counts programme to another school. They highlighted the following reasons for this:

- The positive impact on confidence, resilience, self-esteem and attitude towards maths for struggling learners
- Accelerated progress for learners who are significantly under achieving
- The provision of good resources to support the delivery of the programme.

Three schools who attended the review and feedback sessions indicated that they would like to reserve judgement on recommending this programme until the final EEF Report was available. Only one school reported that they would not suggest this programme to another school as it was felt to be too time consuming and human resource expensive.

### **Future use?**

Schools from all four Hubs indicated that they were already using the Maths Counts programme with 'control' children who had not been given the opportunity to receive the intervention during the Trial period. Most also reported that they will continue to use the intervention with other learners and train up more Learning Partners to deliver the intervention.

A variety of other responses were offered by schools when asked how they may continue to make use of the Maths Counts programme in their setting. These are listed below:

- Use the intervention with groups of learners rather than one-to-one in order to meet a larger group of underachievers – group sizes from two to four learners were considered
- Extend the intervention to include learners in Year 2
- Target the intervention for learners in Year 3 and 4 only
- Make use of pupil premium funding to support further cohorts of intervention in school
- Introduce more flexibility into the length of lessons and time spent on the programme by each learner
- Ensure that resources used in Maths Counts are actively employed in the class maths lessons
- Transfer leadership and oversight of the programme to other relevant members of staff such as the SENCO.

Only one school reported that they would be making no future use of the programme as it represented too high a cost to implement.

## Appendix F: Digital tool activity

### Maths Counts Digital Tool Activity 27.3.17 (for one Hub of Trial Schools)

<u>School Name</u>	<u>Maths Lead</u>	<u>Learning Partners</u>		<u>Digital Tool activity (27.3.17)</u>			
				<u>Learner 1</u>	<u>Learner 2</u>	<u>Learner 3</u>	<u>Learner 4</u>
				Lessons planned  (LP Sessions on DT)  Learning objs secured	Lessons planned  (LP Sessions on DT)  Learning objs secured	Lessons planned  (LP Sessions on DT)  Learning objs secured	Lessons planned  (LP Sessions on DT)  Learning objs secured
BB school	Susan	Dorothy	Samuel	<b>Helen</b> 33 (69) 15	Precious 28 (110) 20	Catherine 28 (113) 19	<b>Jade</b> 32 (72) 19
BSP school	Peter	Judith	Nicholas	<b>Timothy</b> 33 (37) 26	Angel 22 (59) 19	<b>Keith</b> (Complex needs) 9 (12) 2	<b>Jo</b> 50 (36) 27
WSM school	Stephen	Denzel	Alistair	<b>Stace</b> 20 (1) 0	<b>Cassandra</b> 19 (1) 0	<b>Jocelyn</b> 25 (4) 0	<b>May (exclusions)</b> 15 (2) 0
CD school	Derek	Lydia	Georgette	<b>Jack</b> 51 (70) 35	<b>Ronan</b> 53 (88) 54	<b>Riccardo</b> 32 (157) 61	<b>Evie</b> 43 (147) 60

Hh school	Vincent	Samantha	Lulu	<b>Sujata</b> 34 (310) 39	<b>Daisy</b> 34 (81) 37	<b>Connor</b> 33 (257) 44	<b>Heather</b> 31 (86) 34
CM school	Robina	Calista	Alice	<b>Bonnie</b> 60 (75) 45	<b>Oscar</b> 33 (37) 34	Thomas 26 (52) 17	Jazmin 26 (88) 21
MB Academy	Salma/ Didi (new SENCO)	Angelina	Nigel	<b>Eliza</b> 32 (56) 28	Paul 29 (30) 16	Samuel 23 (28) 20	Abbey 22 (46) 22
HCE school	Arthur	Sandy	Cheng	<b>Jeanette</b> 35 (179) 92	<b>Olivia</b> 32 (62) 43	<b>Alexandra</b> 32 (95) 39	<b>Arun</b> 36 (181) 87
BF school	Jack	Sushma	Megan	<b>Millu</b> 35 (41) 20	<b>Jasmine</b> 39 (50) 26	<b>Lucy</b> 45 (84) 29	<b>Henry</b> 41 (56) 20
RG school	Martha /Patricia	Kelly	Eszter	<b>June</b> 32 (73) 19	Beatrice 26 (89) 9	<b>Charlie</b> 21 (9) 3	<b>Ralph</b> 23 (20) 7
WP	Mariann e	Ashia	Belinda	<b>Letitia</b> 31 (99) 47	<b>Leon</b> 33 (76) 51	Dimitra 23 (31) 27	Immanuel 26 (16) 24

Learners highlighted in green are those that appear to have met or superseded the target of 30 lessons. Red learners are those that the delivery team have been following up actively.

(All the names have been pseudonymised)

Note: LP sessions on the Digital Tool (the bracketed figure) indicates the number of times a Learning



Partner has looked at information on the Tool.

The number of objectives secured vary widely for a variety of reasons, such as:

- Learning Partners being reluctant to secure objectives because of a lack of confidence in doing this
- Learning Partners finding that objectives are already in place when they start teaching – so objectives are quickly secured.
- Too many objectives secured at diagnostics, so fewer objectives secured overall.

There is no set number of objectives that 'ought' to be secured for a Learner. As learners progress at different rates discrepancies in number of objectives secured are to be expected.

## Appendix G: Security rating template

Rating	Criteria for rating			Initial score	Adjust	Final score
	<b>Design</b>	<b>Power</b>	<b>Attrition<sup>2</sup></b>			
5	Well conducted experimental design with appropriate analysis	MDES < 0.2	0-10%			
4	Fair and clear quasi-experimental design for comparison (e.g. RDD) with appropriate analysis, or experimental design with minor concerns about validity	MDES < 0.3	11-20%	4 	Adjustment for Balance [ - 2 ]	
3	Well-matched comparison (using propensity score matching, or similar) or experimental design with moderate concerns about validity	MDES < 0.4	21-30%		Adjustment for threats to internal validity [ 0 ]	
2	Weakly matched comparison or experimental design with major flaws	MDES < 0.5	31-40%			2 
1	Comparison group with poor or no matching (E.g. volunteer versus others)	MDES < 0.6	41-50%			
0	No comparator	MDES > 0.6	over 50%			

- **Initial padlock score:** lowest of the three ratings for design, power and attrition = The trial was well designed and attrition was low, but the trial at randomisation was powered to detect a MDES of 0.21: 4 padlocks
- **Reason for adjustment for balance** (if made): the imbalance on the pre-test scores is 0.13. While the evaluators have used gain scores to try and address this issue, the imbalance is still enough of a concern for the report to drop 2 padlocks.
- **Reason for adjustment for threats to validity** (if made): n/a
- **Final padlock score:** initial score adjusted for balance and internal validity = 2 padlocks

<sup>2</sup> Attrition should be measured at the pupil level (even for clustered trials) and from the point of randomisation to the point of analysis.

## Appendix H: Cost rating

Cost ratings are based on the approximate cost per pupil per year of implementing the intervention over three years. More information about the EEF's approach to cost evaluation can be found [here](#). Cost ratings are awarded as follows:

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

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