Education Endowment Foundation

Texting Parents

Evaluation report and executive summary

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Post-reporting appendix added June 2017

Independent evaluators:

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The Education Endowment Foundation (EEF) is an independent grant-making charity dedicated to breaking the link between family income and educational achievement, ensuring that children from all backgrounds can fulfil their potential and make the most of their talents.

The EEF aims to raise the attainment of children facing disadvantage by:

- identifying promising educational innovations that address the needs of disadvantaged children in primary and secondary schools in England;
- evaluating these innovations to extend and secure the evidence on what works and can be made to work at scale; and
- encouraging schools, government, charities, and others to apply evidence and adopt innovations found to be effective.

The EEF was established in 2011 by the Sutton Trust as lead charity in partnership with Impetus Trust (now part of Impetus - Private Equity Foundation) and received a founding £125m grant from the Department for Education.

Together, the EEF and Sutton Trust are the government-designated What Works Centre for improving education outcomes for school-aged children.

This project was co-funded by the EEF and Nominet Trust as part of a funding round focused on digital technology.

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About the evaluator

The project was independently evaluated by a team from Queens University Belfast which included Dr Sarah Miller, Dr Jenny Davison, Dr Jamie Yohanis, Dr Seaneen Sloan, Aideen Gildea and Professor Allen Thurston. The evaluation team was responsible for the design of the evaluation and all data collection for both the impact and the process evaluation.

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Executive summary

The project

The Parent Engagement Project (PEP) was a school-level intervention designed to improve pupil outcomes by engaging parents in their children's learning. The intervention involved text messages being sent to parents using school communications systems, such as Schoolcomms. Texts informed parents about dates of upcoming tests, whether homework was submitted on time, and what their children were learning at school. The programme was developed collaboratively by research teams from the University of Bristol and Harvard University and was delivered between September 2014 and July 2015. The trial involved 15,697 students in Years 7, 9 and 11 from 36 English secondary schools, with schools sending an average of 30 texts to each parent over the period of the trial.

This study was an efficacy trial in which the developers of the intervention managed its delivery to ensure optimal implementation. It was a cluster randomised controlled trial with randomisation at the Key Stage level, designed to determine the impact of the intervention on the academic outcomes of students in English, maths, and science, and the impact on absenteeism. A process evaluation used focus groups, telephone surveys, interviews, and an online survey to provide data on implementation and to capture the perceptions and experiences of participating parents, pupils, and teachers. The project was co-funded by the Education Endowment Foundation (EEF) and Nominet Trust as part of a funding round focused on digital technology.

Key conclusions
1. Children who had the intervention experienced about one month of additional progress in maths compared to other children. This positive result is unlikely to have occurred by chance.
2. Children who had the intervention had reduced absenteeism compared to other children. This positive result is unlikely to have occurred by chance.
3. Children who had the intervention appeared to experience about one month of additional progress in English compared to other children. However, analysis suggests that this finding might have been affected by bias introduced by missing data, so we cannot reliably draw this conclusion. There is no evidence to suggest that the intervention had an impact on science attainment.
4. Schools embraced the programme and liked its immediacy and low cost. Many respondents felt that the presence of a dedicated coordinator would be valuable to monitor the accuracy and frequency of texts. Schools should consider whether they would be able to provide this additional resource.
5. The vast majority of parents were accepting of the programme, including the content, frequency, and timing of texts.

How secure are the findings?

Security rating awarded as part of the EEF peer review process

Overall, the findings have moderate security. The trial was a two-armed multi-site cluster randomised controlled trial. The trial was well-designed and large. However, pupils from 19% of the schools were not included in the analysis because the schools dropped out of the trial. There were some important differences between the pupils who received the intervention and those in the comparison group; the latter had a higher proportion of students eligible for free school meals.

Boycotts of the SATs tests by schools in 2009/2010 meant that pre-intervention attainment data was missing for a relatively high proportion of pupils who could not therefore be included in the analysis. Tests were conducted to assess the impact of this missing data on the results. These tests supported the findings that the programme had a small positive impact on attainment in mathematics and

absenteeism, but suggested that the result for English is less certain and might be the result of bias introduced by missing data.

What are the findings?

There were small positive impacts on maths and English, and a reduction in absenteeism. As discussed above, the evaluation team conducted tests to check that missing information did not bias the results. These tests supported the impact on maths and absenteeism but found a risk of bias to the English outcome. The positive effects of the programme in relation to a reduction in absenteeism was surprising given that no texts related to attendance were sent, and is perhaps related to the increased monitoring by parents of children's school-related activities overall, creating an environment in which pupils felt less able or willing to truant. It appears the intervention was more effective in reducing absenteeism in the KS4 cohort compared to KS3. This result is of particular note given that absenteeism increases as pupils progress through school.

Of the parent outcomes that were measured, the only positive effect that was unlikely to have occurred by chance was in relation to the likelihood of parents asking their child about revising for upcoming tests, where intervention parents were more likely to do so than control parents.

Although the effects of the intervention were low, the programme is inexpensive and relatively easy for schools to implement. Parents reported general satisfaction with the frequency, content, and timing of the texts, and in the majority of cases talked to their children about the information they were receiving via text from the school. Similarly, the teacher survey and interviews showed that schools were enthusiastic about PEP and liked its immediacy and low cost. Teachers acknowledged that there would need to be a person (or persons) responsible for the coordination of texts within the school—to monitor text content, accuracy, and frequency. Some schools struggled with the more complex and time-consuming texts, such as conversational prompts, and sent these less frequently.

How much does it cost?

The intervention cost a total of £7,550 per school (£7.55 per pupil) for the first year of implementation, including training and cover for the staff involved. The annual cost for subsequent years would be £3.25 per pupil per school to cover the cost of 65 texts. Schools that do not already have access to suitable communication software would need additional resources for this. The price of the software varies, but for Schoolcomms is £1,500 a year, bringing the average cost per student over three years to around £5.68 a year.

Outcome	No. of pupils	Effect size (95% confidence interval)	Estimated months' progress	Security rating	Cost rating
English	5,376	0.033 (0.004, 0.064)	+1[1]	🔒🔒🔒	**£**
Maths	5,613	0.067 (0.041, 0.092)	+1	🔒🔒🔒	**£**
Science	4,726	-0.013 (-0.048, 0.022)	0	🔒🔒🔒	**£**
Absenteeism	7,436	-0.054 (-0.079, -0.029)	Absenteeism reduction of one half day	🔒🔒🔒	**£**

[1] *Since this report was published, the conversion from effect size into months of additional progress has been slightly revised. If this result was reported using the new conversion, it would be reported as 0 months of additional progress rather than +1. See here for more details.*

Introduction

This report presents the findings from an efficacy trial and process evaluation of the Parent Engagement Programme (PEP). The study was conducted by the Centre for Effective Education, Queen's University Belfast between February 2014 and February 2016.

Intervention

PEP is a universal, school based intervention that is designed to help secondary schools engage parents in their child's learning, with the ultimate aim of improving pupil attainment. It is intended to be a low-cost and low-effort process, involving text messages being sent directly by schools—via their existing school information management system ('SIMS', Schoolcomms or similar system)—to parents' mobile phones at specific time-points and intervals during the school year. Parents were not made aware of the specific type of text content to expect, but rather that they would receive text messages about their child's progress in school. The programme was developed collaboratively by a research team from the University of Bristol and Harvard University.

For the purpose of this evaluation, the programme was delivered from September 2014 to July 2015 and focused on the subjects of English, mathematics and science. The type of text messages that parents were sent included some or all of the following information (more detail is provided in Table 1):

- advance notice of any upcoming tests;
- notice of missing homework; and
- brief updates on what their child learned in their lessons, with conversational prompts (these subject texts were sent on a three-weekly rotation—science one week, maths the next, and English the following week, then the fourth week it was back to science).

While the intervention is suitable for all pupils in a secondary school setting, the recipients of the intervention in this study were Year 7, 9 (Key Stage 3), and 11 (Key Stage 4) pupils. It was intended that parents would receive approximately 65 texts over the academic year. For example, per subject, ten texts would be sent regarding upcoming tests and conversation prompts were to be sent once per week during non-testing weeks (totalling five texts over the academic year). It was also planned that parents would receive five texts per subject for feedback on their child's grades or test results, and five texts concerning their child's attendance at school, but these texts were not sent as part of the project. There were no targets or standards set for the frequency of missing homework text messages as this is dependent on whether homework is submitted or not.

Table 1: Description of the text messages that were sent as part of the PEP intervention

Text type	Description	Requirement from school	Text sent by
Upcoming assessment	4 and 1 day warnings of upcoming tests and important deadlines	Share assessment calendar with project delivery team, at least 1 week in advance	Project delivery team
Missing homework	Notification of missing homework	Log behaviour report on SIMS	Automatic
Conversation prompt	Summary of the day's lesson so parents can discuss	Teachers must write prompts as timetabled	Project delivery team

Training and support

The intervention is designed to be implemented by teachers and administrators within the school. For the purpose of this trial, however, schools were supported in the implementation of the programme by the project delivery team.

Teachers were required to attend 1.5 days training—one full day in September 2014 and a further half-day training event the following January. At these events schools were introduced to key members of the project delivery and evaluation teams as well as provided with information packs for their teachers and administrators. Training was digitally recorded and made available to all schools.

The training events were hosted by the project delivery team and attendees were provided with an overview of the study, its design, and the associated timelines. Schools were introduced to an updated version of Schoolcomms specifically developed for schools taking part in the study. Download and set-up instructions were provided by way of written information and a practical demonstration. Attendees were also provided with detailed written and verbal instructions on how to implement the five components of the programme: texting (1) advance notification of upcoming assessments (ideally approximately ten test texts per subject per year), (2) the results of tests (n=5), (3) missing homework alerts (as appropriate), (4) conversational prompts regarding recent learning (n=5), and (5) attendance summaries (n=5).

With respect to modifying the intervention, schools in the current study were required to adhere to the protocol described above and were only allowed to modify text content related to the conversational prompts. It was expected that there would be some variability between schools in relation to the frequency of texts sent, and this was indeed the case (described in more detail later in the report).

In each school a member of staff was appointed to act as the PEP project liaison officer. Their role was to co-ordinate the delivery of PEP within the school and ensure that the appropriate content for the texts was collated from individual subject teachers. This content was subsequently given to the project delivery team who took responsibility for sending the information to parents via a text from the Schoolcomms system.

Within schools, use of texting systems is often restricted to administrators and is unfamiliar to teachers. For this reason—and to ensure consistency of implementation—the project delivery team employed a number of research assistants (RAs), each of whom had dedicated responsibility for overseeing and supporting the implementation of PEP in a certain number of the evaluation schools (usually eight). Each RA would liaise directly with the PEP project liaison officer who would in turn liaise with the teachers and staff involved in the project within the school.

The specific role of the RA included:

- obtaining test dates from heads of department;
- obtaining conversation prompts from heads of department;
- encouraging the use of the missing homework texting tool; and
- providing any ongoing support needed by the schools.

To facilitate the smooth running of the project, RAs ensured that they introduced themselves to the heads of department and built personal relationships with school staff. They were encouraged by the delivery project lead to take the time to understand the individual circumstances of each school and when test dates were likely to be available. RAs were supported by the project lead who held daily and weekly Skype meetings to allow each RA the opportunity to raise issues and to get advice on how to deal with any problems arising.

In the future, if the programme is rolled out more widely, it is envisaged that schools would assume responsibility for sending the texts as most schools already possess the necessary technological knowledge and resources. In this study, because it was an efficacy trial, the delivery team managed the sending of the text messages to ensure the programme was delivered under optimal conditions. Despite this, the consistency of implementation did vary considerably between schools and this is described in more detail in the fidelity section of the process evaluation.

Background evidence

Parental engagement plays a significant role in children's learning (Goodall and Vorhaus, 2010) and can be thought of as 'parent engagement in their children's lives to influence the child's overall actions' (Kim, 2009, p. 89). While the most powerful form of parental engagement takes place between parents and their children entirely away from school (Sylva, Melhuish, Sammons *et al.*, 2008), the school has much to gain by facilitating and promoting such engagement. 'School parental engagement' is considered to involve a parent's participation in their child's learning as well as parental involvement with schools (Harris and Goodall, 2007). Thus it brings together two key contexts, the home and school settings, within the educational pyramid of pupil-school-home.

Parental engagement with children's learning has recently emerged as one of the best levers available for raising achievement (Gorard, See and Davies, 2012)—by as much as 0.44 of a standard deviation (Fan and Chen, 2001; Jeynes, 2007). The benefits of both home-based and school-based parental involvement, in terms of improving academic achievement (for children of all ages), have been reported in several meta-analyses and reviews of the literature (Henderson and Mapp, 2002; Cox, 2005; Pomerantz, Moorman and Litwack, 2007; Fan and Chen, 2001; Jeynes, 2007). It has been identified, albeit by correlational studies, as a key factor associated with improved behaviour, increased attendance at school, better emotional adjustment, and greater well-being (Epstein, 2001; Henderson and Mapp, 2002; Jeynes, 2007; El Nokal *et al*., 2010, Hornby and Lafaele, 2011).

While there is evidence to suggest that school-based parental engagement can result in raising achievement, the evidence relating to the long-term impact of such programmes on academic outcomes is limited and typically studies have not employed rigorous methodological designs. Consequently—and despite the established correlation between parental engagement and positive outcomes for students—it is still necessary to understand and identify what parents want and need in order to help them to better engage and participate in their children's learning experiences. This remains a challenge for schools, particularly in relation to reaching and involving parents who are unwilling or unable to engage with their child's learning (Goodall and Vorhaus 2011; See and Gorard, 2014). Traditional engagement strategies used by schools, such as talking with parents on the phone, parent meetings, and school visits, are often ineffective and do not truly support parent involvement (Wyn *et al.*, 2000). Indeed, Fryer (2016) examined evidence from experimental studies in which the treatment involved providing parents with information about their child's education, and concluded that parent information interventions tended to have no impact on standardised test scores for school-aged children. Moreover, it appears that the engagement young people value the most is the interest of their parents—parents asking about school days and offering guidance, as opposed to attending parents evenings and responding to school correspondence (Harris and Goodall, 2008)—and, as the literature suggests, it is this type of engagement that can have a greater effect on achievement: a meta-analysis of 51 studies (Jeynes, 2012) found that effect sizes for school-based parental involvement programmes were typically not as large as those found for voluntary acts of parental involvement (ES = 0.30 compared to ES = 0.51).

Recent advances in information communications technology (ICT) have opened up new ways and opportunities for schools to communicate with parents. ICT provides a convenient means for schools to send, and parents to access, up-to-date information about their child's learning (Goodall and Vorhaus, 2011) and the curriculum (Lewin, Mavers and Somekh, 2003). Research shows that providing additional information to parents can have a significant impact on children's attainment. For example, Bergman (2014) found that notifying parents of missing homework reduced any further replication by 25%. In the

U.S., Kraft and Rogers (2015) found that informing parents via weekly one-sentence messages that contained feedback about student exam performance reduced the proportion of students failing to earn summer school course credit by 40%. Moreover, York and Loeb's (2014) evaluation of a pre-school text messaging programme which aimed to help parents (n = 440) support their children's literacy development concludes that—given its widespread use, cost effectiveness, and ease of adaptability—regular text message prompts and guidance (three texts per week, over an eight-month period) to encourage parents to practice literacy with their children led to improvements in children's attainment—by as much as 0.34 of a standard deviation. There is no consensus within the literature as to whether this type of approach is moderated by different characteristics of students or schools, so with this in mind the current study sought to explore whether the efficacy of the intervention might be affected by student or school characteristics.

According to the Department for Education (Goodall and Vorhaus, 2011), a top government priority is the development of effective school-based programmes for supporting parental engagement. This report determines the effectiveness of various intervention components in supporting parental engagement and improving outcomes for children by profiling what success looks like. In particular, based on a review confined to studies undertaken between 2000 and 2010, the report presents a model of good practice for promoting parental engagement within an educational setting. The model suggests four key elements, namely:

- *planning*—that parental engagement strategies must be designed as a whole-school approach, informed by a comprehensive needs assessment;
- *leadership*—the need for a senior teacher who has a strong sense that children and families matter, is focused on people and outcomes, is willing to develop relationships and networks, functions as an effective role model, and engages support from stakeholders;
- *collaboration*—engagement with all parents that is proactive rather than reactive, empowering, sensitive, and cognisant of the contributions parents can offer; and
- *sustained improvement*—ongoing support, monitoring, development, and evaluation.

Rationale for the current study

With the above in mind, the current intervention, PEP, seeks to promote the engagement of parents in their child's learning by building on communication processes and technologies that are already familiar to schools. Here, through the creative use of text messages from the school, parents are kept informed about various aspects of their child's attendance, learning, and progress.

The project delivery team has already undertaken developmental work to better understand the type and frequency of text messages that are likely to be most effective in improving attainment outcomes. In a feasibility study it was found that pre-informing parents about upcoming tests emerged as relatively straightforward and more effective compared to texting conversation prompts. The latter, it was concluded, should be limited to non-assessment weeks and rotated between departments to avoid over burdening parents. It was also concluded that missing homework reports could be automated and attendance reports sent at the school's discretion. The findings from this study (Chande, *et al.*, forthcoming) have subsequently informed the version of PEP that is being trialled in the current evaluation. As such, this is an efficacy trial that aims to provide an initial test of the programme's efficacy under optimal conditions (that is, delivered by schools with support from the project delivery team). It represents an opportunity to conduct a rigorous experimental evaluation that will enable us to better understand the causal mechanism between parental engagement (as defined by PEP) and pupil attainment. Furthermore, as the data from this trial will be linked to the National Pupil Database (NPD), and potentially to other relevant statutory datasets in the future, there is the potential to follow up participants to better understand the long term effects, if any.

The project and evaluation was funded as part of the EEF's Digital Technology in Education funding round (2013) in partnership with Nominet Trust. The aim of this funding stream was to identify and evaluate promising interventions that used digital technology to improve educational outcomes, specifically for pupils from disadvantaged backgrounds.

Evaluation objectives

The purpose of the current evaluation was to determine the impact of PEP on the academic outcomes of secondary school students and explore issues related to implementation and delivery. The evaluation consisted of two components:

An *impact evaluation* that aimed to—

- assess the impact of the intervention on the English, maths, and science outcomes (primary outcomes) in addition to school attendance of pupils, and the engagement behaviour of parents (secondary outcomes); and
- determine the impact of the intervention for different groups of students, specifically, whether the impact of the programme varied according to Key Stage group, gender, ethnicity, socioeconomic/FSM status, school size, or baseline attainment.

A *process evaluation* that aimed to explore whether the intervention was delivered with fidelity, and to identify the successes and challenges associated with implementation.

Project team

PEP is a collaborative research project and the intervention was developed by Professor Simon Burgess, Raj Chande (University of Bristol) and Assistant Professor Todd Rogers (Harvard University). Raj Chande led the delivery and implementation of PEP in the evaluation schools with the support of James Watson, John Ault, Erica Brandt and Ben Cole (University of Bristol), and Kim Bohling (Harvard University). The project delivery team at the University of Bristol provided technical support and assistance directly to schools.

Dr Sarah Miller (Queens University Belfast) led the independent evaluation team, which included Dr Jenny Davison, Dr Jamie Yohanis, Dr Seaneen Sloan, Aideen Gildea and Professor Allen Thurston. The evaluation team was responsible for the design of the evaluation and all data collection for both the impact and the process evaluation.

Ethical review

Ethical approval was granted by the Research and Ethics Committee of the School of Education, Queens University Belfast in April 2014. Informed consent was obtained at the school level from headteachers and teachers. Written information and opt-out consent forms were sent home to parents of eligible pupils. Opt-in consent was obtained for pupils taking part in the focus groups.

Trial registration

This trial is registered with the ISRCTN registry (ref: ISRCTN1696856).

Methods

Trial design

The evaluation was designed as a multi-site cluster randomised controlled trial (cRCT) to determine the impact of the intervention on the academic outcomes of secondary school students. The study involved two Key Stage groups, KS3 and KS4, and three year groups—Years 7 and 9 from KS3, and Year 11 from KS4—in a convenience sample of 36 geographically dispersed English secondary schools.

Within-school random assignment was used to allocate Key Stage group (KS3 and KS4) to either intervention or control. Consequently all participating schools were involved in the delivery of the programme. Pupils and parents in the intervention Key Stage received the Parental Engagement Programme for one academic year (September 2014–July 2015). Those in the control Key Stage did not receive the intervention and represented 'business as usual'.

Key Stage group was chosen as the unit of randomisation for two main reasons. Firstly, it maximised the efficiency of the trial, requiring fewer schools than if 'school' were the unit of randomisation. Secondly it minimised the risk of contamination between treatment and control arms compared to a simple randomised trial using 'pupil' as the unit of randomisation.

Protocol violations

There were two changes to the protocol, both of which were related to outcomes, specifically science attainment and parent behaviour and attitudes.

Firstly, an amendment to the protocol (dated 23 February 2015) indicated that science attainment in the Year 7 cohort of participants would not be measured due to the lack of an available and suitable test. There was, however, a protocol violation of this updated protocol because, as it transpired, the evaluation team *did* measure this outcome for Year 7 using an adapted version of the 2009 Standard Assessment Test for Science (see the following section on outcome measures for more detail).

Secondly, it was originally intended that the evaluation team would collect secondary outcome data relating to parental behaviour and attitudes at post-test via a self-complete questionnaire. This data was collected, but not by the evaluation team. Instead, the project delivery team had the opportunity and resources to complete a much more robust and in-depth study on parental behaviour and attitudes than was possible within the remit of the current evaluation, so they took forward this aspect of the study. This data was provided by the project delivery team, analysed by the evaluation team, and is reported below.

Participant selection

Between January and April 2014 the project delivery team recruited secondary schools from across England drawing on established relationships with networks of schools across the country. While this method of recruitment worked well in terms of achieving the required sample size, the lack of random sampling is a threat to the external validity of the trial and means that the generalizability of the results may be somewhat compromised.

Schools were eligible for inclusion in the evaluation if they were willing to be randomly assigned to condition at the level of the Key Stage group (KS3 or KS4), engage with the intervention and implement it with students and parents, provide access to socio-economic and demographic data of students, and provide access to assessment data for participating students. Within participating schools, all pupils in Years 7, 9 and 11 were eligible for inclusion.

School-level consent was sought from headteachers prior to randomisation. A Memorandum of Understanding (MoU) that detailed schools' responsibilities and rights regarding the project was signed by all participating headteachers (Appendix 2). Schools informed the parents of all Year 7, 9 and 11 pupils about the evaluation using the information and consent forms provided by the evaluation team (Appendix 3). Parents had the opportunity to withdraw their child from the evaluation by returning the opt-out consent form to the relevant class teacher, and 285 chose to do so.

In September 2014, an information and training event was held for two representatives from each of the participating schools. This was organised by the University of Bristol project delivery team and was also attended by members of the evaluation team. The event provided a valuable opportunity to explain both the programme and the nature of the independent evaluation to teachers.

Outcome measures

Primary outcomes—student achievement in English, maths and science

The intervention was targeted at English, maths and science classes, thus the co-primary outcomes were student attainment in these three subjects at immediate post-test, at the end of the school year (May 2015). All participating students were tested on all outcomes. Post-test data collection was organised and overseen by the evaluation team—the outcome measures are described below and in Table 2. To control for prior attainment, KS2 data on English and maths outcomes for all participating pupils was accessed by the evaluation team via the NPD.

Table 2: Primary outcomes and post-test measures for each Key Stage and year group

Key Stage	Year Group	Primary outcomes and measures		
		English	**Maths**	**Science**
Key Stage 3	Year 7	Access Reading Test (Hodder)	Access Maths Test (Hodder)	2009 SAT Paper2 Levels 3–6 Q1–13
	Year 9	Access Reading Test (Hodder)	Access Maths Test (Hodder)	2009 SAT Paper2 Levels 5–7 Q1–11
Key Stage 4	Year 11	GCSE English	GCSE Maths	GCSE Science

English and Maths

Key Stage 3

For KS3 (Years 7 and 9), attainment in maths was measured using the Hodder Access Maths Test (McCarty, 2008) and attainment in English was measured using the Hodder Access Reading Test (McCarty and Crumpler, 2014). It was intended that these tests would take the place of the school's normal end of year assessments that would be reported to parents. Pencil and paper versions of the tests were administered by the schools so it was not possible to blind teachers administering the tests to student allocation. However, the tests were scored independently by Hodder, who returned the test results—within three weeks of receiving them—directly to the evaluation team which in turn shared the data with schools.

The Hodder Access Reading and Access Maths tests are appropriate for pupils aged up to 16 and are reliable, valid, and widely used measures of literacy and numeracy outcomes. These tests were selected because they are more efficient time-wise than other available, comparable tests.

Access Reading consists of 60 items that assess four reading skills: literal comprehension, vocabulary, comprehension requiring inference, prediction and opinions, and comprehension requiring analysis. The test provides a global measure of reading attainment as an age-standardised score and it is this score that was used in the analysis.

Access Maths (Test 2, suitable for Years 7 to 9) consists of 45 items that assess seven numeracy skills: using and applying mathematics, counting and understanding number, knowing and using number facts, calculating, understanding shape, measuring, and handling data. The test provides a global measure of maths attainment as an age-standardised score and it is this score that was used in the analysis.

Pencil and paper rather than computer based versions of the tests were selected due to this being schools' preferred mode of administration. Computer based tests can add a layer of complexity when testing large numbers of students, with schools frequently reporting difficulties in resolving timetabling issues associated with computer testing large numbers of students.

Key Stage 4

For KS4 (Year 11), English and maths was measured at post-test using GCSE English and maths standardised scores (from which the GCSE grade is normally derived). This data was accessed by the evaluation team via the NPD for all participating KS4 pupils. The reliability and validity of GCSEs are well established and are standardised measures that are high in contextual validity as they constitute the main indicators of school and student academic performance. In light of this, it is highly likely that teachers in all treatment arms of the trial will be focused on ensuring that students succeed on them.

Science

Key Stage 3

Science has not been tested using Standardised Assessment Tests (SATs) since the KS3 SATs were dropped in 2010 and as such no recent or standardised science test exists that is suitable for this age group. At the time of this evaluation GL Assessment were in the process of devising a science test aimed specifically at KS3 and it was intended that this study might make use of this. Unfortunately the test was not available in time so this was not possible.

In the absence of a suitable alternative it was decided to use past SAT science papers from the year 2009 for both Year 7 (2009, Paper 2, Levels 3–6, Q1–13) and Year 9 (2009, Paper 2, Levels 5–7, Q1–11)[2] acknowledging that this was going to have potential limitations with respect to the test content being relevant to the current syllabus being taught in class. The tests were shortened by omitting the final two questions to make it possible to administer within a 45-minute period.

To ensure that pupils were not already familiar with the content of the tests, the evaluation team asked all schools whether they had used past SAT science papers as revision tools with their science classes. This, however, was not the case. The tests were administered by teachers under exam conditions and were returned to the evaluation team to be scored using the accompanying mark scheme. The evaluation team subsequently returned the scores directly to schools.

Key Stage 4

[2] See sats-papers.co.uk

For Year 11, post-intervention science attainment was measured using GCSE Science standardised scores (highest point score achieved, as provided by the NPD) accessed by the evaluation team via the NPD.

Secondary outcomes—school attendance and parental behaviour and attitudes

Attendance data (number of sessions absent) for each student was accessed at post-test via the NPD for the year of the evaluation, 2014/2015. Attendance for the previous academic year (for the pupils in the trial) was used as a baseline for this outcome.

It was originally intended to collect data on parent-related outcomes via a short self-complete questionnaire at post-test. This was to include background demographic information and data relating to aspects of the home learning environment, information regarding parental involvement in their child's education and school, and aspirations for their child's education and future employment. To minimise the research burden on parents, no baseline data collection was planned. As reported above, this data was collected by the project delivery team instead of the evaluation team as the latter had the opportunity and resources to complete a much more robust and in-depth study on parental behaviour and attitudes than was possible within the remit of the current evaluation. Parent interviews were conducted by telephone and the following data was collected in this alternative study on parental behaviour and attitudes:

- Parent demographic data was collected, including relationship to child, ethnicity, education level, and primary language spoken at home.
- Parent engagement was measured using a series of ten questions devised by the project delivery team (Q2–11 in Appendix 1) relating to ensuring a child's attendance at school, checking that homework is submitted, ensuring revision for upcoming tests is completed, and talking to their child about what they are learning at school. Parents were also asked about their beliefs relating to their own influence on their child's education and beliefs about whether the school values parents' participation in their child's education. These questions were combined into a single variable (parent engagement) which had satisfactory internal consistency (Cronbach's alpha = 0.75) and a single factor structure.

  In addition, parents were asked about whether they asked their child what they learned at school, whether they talked to their child about their attendance, whether they asked their child to revise for an upcoming test, and whether they asked their child about the results of any tests.
- For intervention parents only, questions were asked concerning the frequency of conversations with their child about text messages received from school, the perceived usefulness of texts, and the preferred content, frequency, timing, and acceptability of texts.

This parent outcome data has been linked to the trial data by the evaluation team and is reported below.

Other student variables

Pupil background information was collected directly from schools including UPN, gender, date of birth, FSM status (free school meal entitlement), English as an Additional Language (EAL) status, and ethnicity.

Sample size

A previous evaluation of a homework alert messaging system detected an effect size in the order of d = 0.20 in favour of the intervention group (Bergman, 2012). Thus it was estimated that for the proposed trial to detect a minimum effect size of d = 0.20 with approximately 80% power, a total sample size of 68 Key Stage groups (34 schools) and up to 120 students per KS group (approximately 8,160 students in total) would be required. These estimates were calculated using Optimal Design (Version 3.01) and are based on a two-level cluster design (where pupil is level 1 and school is level 2) and the following assumptions:

- Significance level = 0.05
- Power = 80%
- Effect size = 0.20
- Estimated intraclass correlation coefficient (ICC) = 0.15
- Estimated variance shared between KS2 and post-test scores (R^2) = 0.5

Randomisation

Once the headteacher of each participating school signed the MoU, the project delivery team sent the school's details to the evaluation team for allocation (36 schools in total). Allocation was undertaken by the evaluation team (specifically the Principal Investigator) using the programme Minim.[3] This uses minimisation to create groups that are balanced across pre-specified characteristics likely to be related to the outcome under investigation, in this case attainment (Altman and Bland, 2005). For this trial minimisation was used to ensure that the intervention and control groups were balanced in terms of the proportion of KS3 and KS4 allocated to each condition. This process was also used to ensure that schools allocated to deliver PEP to KS3 or KS4 were balanced in relation to school characteristics, thereby minimizing the risk of schools delivering the intervention to KS4 being somehow systematically different (in terms of attainment, size, or deprivation) to the schools delivering the intervention to KS3.

Within each school, either the KS4 cohort (19 schools) or the KS3 cohort (17 schools) was allocated to the intervention. The unallocated KS cohort within each school formed the control group.

The evaluation team informed the project delivery team of the outcome of allocation and they in turn informed the school.

Analysis

Analysis was conducted in Stata version 14 (Stata Corporation, College Station, Texas, USA) on an intention-to-treat basis. The initial characteristics of the intervention and control groups were compared at baseline in relation to their core characteristics: gender, FSM eligibility, EAL status, SEN status, ethnicity, and mean scores on the main outcomes (English, maths, science and absenteeism).

The main effects of the intervention were estimated using multilevel modelling to take account of the clustered nature of the data and a series of models were estimated for each outcome (where pupil is level 1 and school is level 2). First, a simple analysis was conducted: the relevant outcome measure at post-test forming the dependent variable and the independent variables including a dummy variable representing whether the child was a member of the intervention or control group (coded '1' and '0' respectively) and pupils' baseline scores for the outcome variable in question. Then, a series of pupil-level and school-level characteristics were added as covariates to control for any baseline differences in the variables. Standard errors were then bootstrapped as a test of robustness. Bootstrapping is a resampling method that provides an alternative means of estimating the variability within the observed data. It is a useful technique to establish the stability of results, for example when differences between groups and associated standard errors are small. If the standard error estimates still give rise to small p values even after bootstrapping, then this suggests that the statistically significant result is stable.

The main focus for the analysis was the estimated coefficient associated with the dummy variable that represented the difference in mean scores on the respective outcome variable between the intervention and control groups, once baseline scores and other covariates were controlled for. This coefficient was then used to estimate the effect size of the programme in relation to the respective outcome variable as the standardised mean difference between the two groups post-intervention (Hedges' g).

Multiple imputation was used to account for missing data and this is described in further detail in the results section.

As different measures were used to measure outcomes for KS3 and KS4, the scores for each measure were standardised with a mean of zero and a standard deviation of one prior to combining for the purpose of analysis. The mean and standard deviation of this pooled outcome remained zero and one

[3] http://www-users.york.ac.uk/~mb55/guide/minim.htm

respectively. The baseline score for each outcome was also standardised. The analysis was based on a complete case analysis and missing data was not imputed. Effect sizes were calculated using Hedges' g. The full models containing all the parameter estimates for each model are reported in Appendix 4.

In addition to the analysis of the main effects, sub-group analyses were conducted to examine any differential impact of the intervention for different groups of pupils. Specifically, does the impact of the programme vary according to:

- Key Stage group;
- gender;
- baseline attainment or level of absence;
- school size; or
- EAL status (added as an additional subgroup analysis in the protocol amendment dated 15 Dec 2015).

To estimate the effect of the intervention for children eligible for FSM the main analysis was repeated on a subsample of the data relevant to that group.

Implementation and process evaluation

A relatively light touch process evaluation ran alongside the cRCT to provide data on programme implementation and to capture the perceptions and experiences of key stakeholders' engagement with the programme. The evaluation team collected all the process-related data and its purpose was threefold:

- to explore the perceived successes, outcomes, and challenges associated with the intervention and its implementation;
- to determine whether the intervention was implemented with fidelity (with a focus on the content and frequency of text messages); and
- to determine whether and how the intervention might be rolled out more widely to more schools.

All participating schools were asked by the evaluation team to complete a short online survey in term two (June 2015), to capture data relating to the ease of implementation and fidelity to the programme schedule. The online survey was completed by 123 school personnel from 29 schools. The sample comprised 43 teachers, 38 subject heads, one headteacher, 17 deputy headteachers, six senior management team, 13 administrative staff, and five roles were not specified.

Interviews (both telephone and face-to-face) were conducted with 12 participants from four schools. Originally it was intended that three schools would participate in the process evaluation, however due to uncertainty around the participation of one school a fourth school was recruited as a reserve. As it transpired, all four schools were wiling and able to take part and so they were all retained in this element of the study.

Schools were chosen to represent those that experienced difficulties with implementation as well as those who did not, based on both survey responses and school ratings provided by the University of Bristol delivery team. Schools were also selected to represent a mix of socioeconomic and ethnic backgrounds. Of those interviewed, four respondents were project liaison officers for PEP within their school (of which three were teachers and one administrative support staff), seven were teachers, and one was a headteacher.

Four focus groups were conducted with intervention pupils (n = 29), two focus groups from each year group within Key Stage 3 (Years 7 and 9). Schools were unable to accommodate focus groups for the Key Stage 4 cohort (Year 11) as at the time these pupils were sitting their GCSEs.

- Focus Group 1: Year 7 (n = 8, 4 boys and 4 girls)
- Focus Group 2: Year 9 (n = 8, 4 boys and 4 girls)
- Focus Group 3: Year 7 (n = 7, 2 boys and 5 girls)
- Focus Group 4: Year 9 (n = 6, 2 boys and 4 girls)

The University of Bristol project delivery team kindly provided fidelity data relating to the frequency and type of texts sent by each school for the duration of the trial. This is reported below (and in Appendix 5).

Timeline

Table 3: Timeline of activities related to the evaluation and intervention delivery

Date	Activity
January–February 2014	Evaluation design
April 2014	Ethical approval
April–September 2014	School recruitment
May–June 2014	Allocation of Key Stage groups to intervention and control
September 2014	Training and information day for all participating schools
September 2014–July 2015	Delivery of intervention
January 2015	Additional training (1/2 day) for participating schools
April–May 2015	Post-intervention test data collection in schools for KS3 maths, English and science
June 2015	Online school survey
July 2015	Parent telephone survey
July 2015	Teacher interviews and pupil focus groups
October 2015	Application to NPD for KS2 baseline and KS4 outcome data
December 2015 and January 2016	Data received from NPD

Costs

The project delivery team kindly provided the information on which the cost calculations are based. Costs are calculated from the perspective of schools and the costs to the school as well as the cost per pupil are reported. These figures include the cost of teacher training in addition to costs associated with implementing the programme (both project delivery team support and text message costs). Cumulative costs are reported over a period of three years. More detail is provided in the analysis section below.

Impact evaluation

Participants

Key Stage group was the unit of randomisation, thus within each school either KS3 (Years 7 and 9) or KS4 (Year 11) was allocated to receive the intervention. The remaining Key Stage cohort formed the control group. In total, 72 Key Stage groups within 36 schools were allocated to the intervention and control arms of the trial.

The intervention group consisted of 19 KS4 groups and 17 KS3 groups (pupil n = 7,570). The control group consisted of 17 KS4 groups and 19 KS3 groups (pupil n = 8,127). The total number of pupils involved in the trial was 15,697. Participant flow through the study is described in more detail in Figure 1 below.

Attrition

Seven schools withdrew from the trial post allocation, leaving 29 remaining. Five of these seven schools were allocated to deliver PEP to their KS3 group and two were allocated to deliver PEP to their KS4 group, resulting in some differential attrition (leaving 17/19 schools delivering to KS4 and 12/17 schools delivering to KS3). Differential attrition can be (but is not inevitably) a source of bias, with a high risk of bias being most likely when the reason for drop-out is correlated with the outcome(s) being measured. The reasons for withdrawal given by the seven schools in question, however, appeared unrelated to attainment and included:

- changing the school communication system from Schoolcomms and so being unable to commit to a full year of Schoolcomms usage (to send texts);
- being unable to release senior staff (or commit the necessary time) to attend the training event at the start of the academic year; and
- an unwillingness to divert resources away from school priorities.

The schools that withdrew were unwilling to take part in any further aspect of the trial and so no pupil characteristics are available for these schools, only school characteristics. It can be seen from Table 6 that there were noteworthy differences between the schools that remained in the study and those that withdrew. The withdrawn schools tended to have a poorer OFSTED rating, be smaller in size, have a higher proportion of pupils eligible for the Pupil Premium and to have lower attainment at GCSE.

Table 4 describes the minimum detectable effect sizes (MDES) at the protocol, randomisation, and analysis stages of the study. Despite attrition—and notwithstanding the potential source of bias this introduces—the MDES ranged between 0.07 for absenteeism and 0.19 for science.

Table 4: Minimum detectable effect size at different stages of the study

Stage	N (pupils) (intervention, control)	N (clusters)	r	ICC	Minimisation prognostic factors	Power	Alpha	MDES
Protocol	8,160 (4,080; 4,080)	68	0.70	0.15	School attainment, deprivation and size (34 schools)	80%	0.05	0.20
Randomisation	19,298 (9,631; 9,667)	72	0.70	0.15	School attainment, deprivation and size (36 schools)	80%	0.05	0.18
Analysis (i.e. available pre- and post-test)	English: 11,413 (5,376, 6,037) Maths: 11,590 (5,613, 5,977) Science: 10,308 (4,726, 5,582) Absenteeism: 15,355 (7,436, 7,919)	58	0.66 0.78 0.60 0.66	0.08 0.06 0.09 0.01	School attainment, deprivation and size (29 schools)	80%	0.05	0.17 0.13 0.19 0.07

Missing data from the National Pupil Database

Prior attainment data (KS2 data on English and maths outcomes) for all participating pupils in the trial was accessed from the National Pupil Database. Unfortunately, approximately 20% of this data was missing, particularly for those pupils in KS4 group (Year 11), which explains the higher than expected number of 'not analysed' cases reported in Figure 1. The reason for such a high proportion of missing KS2 data (for the KS4 pupils) is because of the school boycotts that occurred in 2009/2010 that resulted in many schools not submitting their test results. The NPD have confirmed this reason for missing KS2 data and also acknowledges other instances where pupil data might be missing, for example, if a child did not attend school on the day of an assessment or if a child performs below the test level.

In this sample, KS2 baseline data was more likely to be missing for pupils with the following characteristics:

- KS4: 44% of KS4 pupils compared to 6% of KS3 pupils
- SEN: 23% of those with SEN compared to 18% of those without SEN
- EAL: 34% of those with EAL compared to 15% of those without EAL
- FSM: 20% of those with FSM compared to 18% of those without FSM
- Allocation: 21% of those in the intervention compared to 17% in the control group

To formally test the extent to which missing data varied as a function of the individual characteristics described above and also school characteristics, a multilevel logistic regression was conducted with 'missingness' as the dependent variable and individual characteristics (KS group, SEN, EAL, FSM, allocation) and school characteristics (school size, GCSE attainment, and proportion of children eligible for the pupil premium).

The result of this model indicated that KS group, SEN and EAL were statistically significant in their association with missingness. The remaining pupil-level variables (FSM and group allocation) and the school-level variables (school size, GCSE attainment, and proportion of children eligible for the pupil premium) were unrelated to missingness. Table 5 provides an explanation for the missing prior attainment data in the current study.

Table 5: Description of missing reading and maths data at KS2 (baseline)

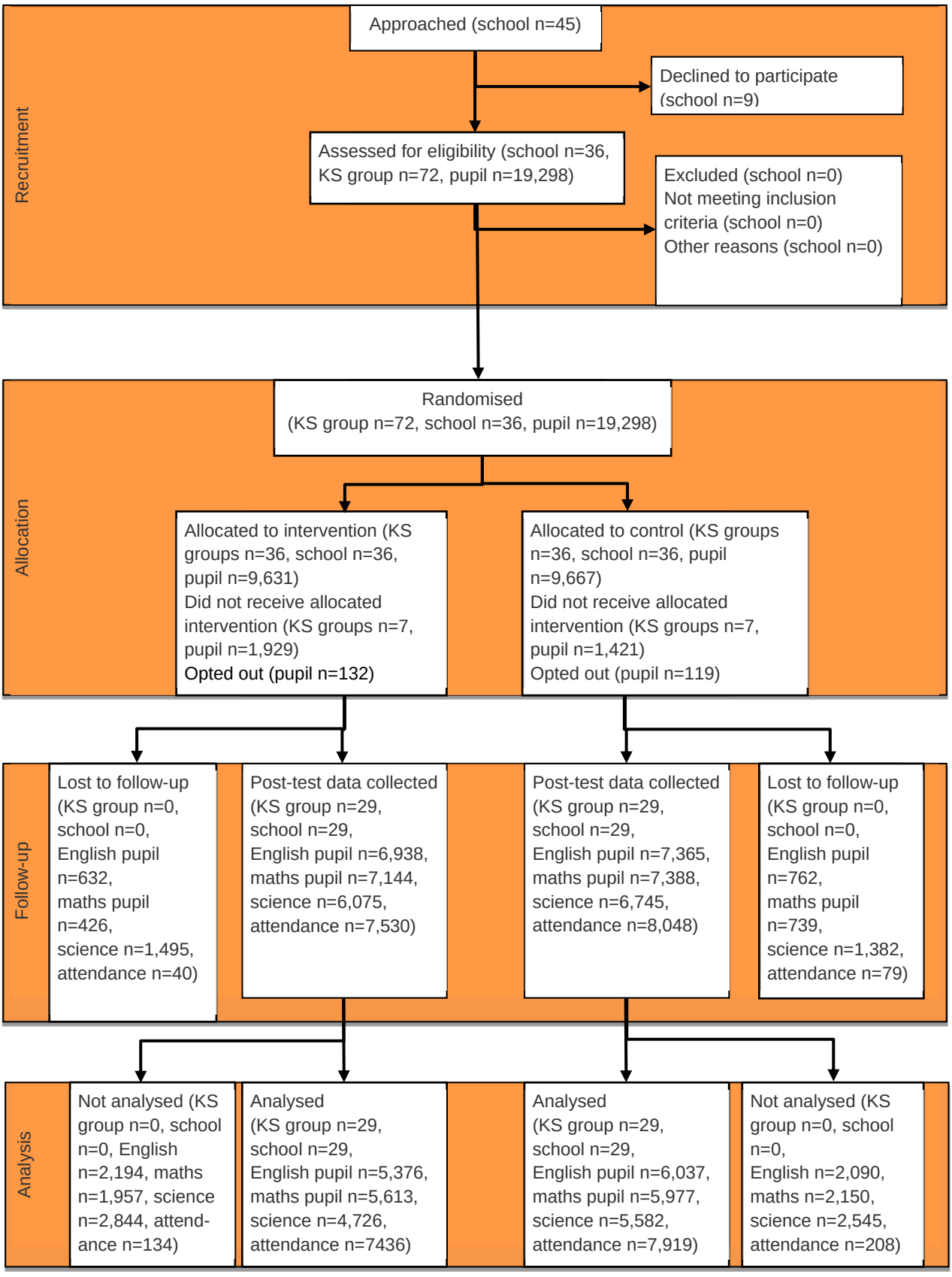
Variable	Description	n	Percentage
Reading KS2 baseline score	Absent	32	1.03
	Below the test level	702	22.67
	Missing	2,355	76.04
	Malpractice	1	0.03
	Unable to access test	7	0.23
	Total	**3,097**	**100**
Maths KS2 baseline score	Absent	41	1.31
	Below the test level	283	9.03
	Missing	2,803	89.41
	Malpractice	2	0.06
	Unable to access test	6	0.19
	Total	**3,135**	**100**

'Unable to access the test' is recorded if a child is unable to sit the test because of a disability. 'Malpractice' is recorded if results have been annulled due to the incorrect administration of the test itself—such as children being given too long or too short a time to do it, or responses to questions being changed—or because of pupils cheating, and so on. Most frequently it is because of administration issues.

Measurement attrition

Post-test data was successfully collected for over 90% of the sample in English and maths. Post-test science data was collected for 88% of KS4 pupils but only 79% of KS3 pupils. While the number of cases analysed is still sufficient to maintain the power of the study, it may be the case that this measurement attrition has introduced some bias into the data. This was taken into account in the analysis of the data (see Results section for more details).

Figure 1: Participant flow chart



Pupil characteristics

In total, 15,697 pupils from 29 schools participated in the trial. Table 6 describes the characteristics of the 29 participating schools and compares them to the seven schools that withdrew post-allocation.

The KS3 sample (n = 10,401) was twice the size of the KS4 sample (n = 5,296) and this was because two year groups within KS3 (Year 7, n = 5,244 and Year 9, n = 5,157) participated in the evaluation compared to one year group in KS4 (Year 11, n = 5,296). We would expect this 2:1 ratio to be reflected in both the intervention and control groups however because five of the seven schools that withdrew from the trial post-randomisation were allocated to deliver the programme to their KS3 cohort, this resulted in an imbalance in the proportion of KS3 and KS4 pupils in the intervention and control groups. As can be seen from Table 7, the intervention group consisted of 57% KS3 and 43% KS4 pupils and the control group consisted of 77% KS3 and 23% KS4 pupils.

Table 6: Characteristics of participating and withdrawn schools

School-level characteristics	National average[1]	Trial schools (n=29)	Withdrawn schools (n=7)
	n (%)	**n (%)**	**n (%)**
School type			
Academy converter	1,362 (40%)	13 (45%)	3 (43%)
Academy sponsor-led	511 (16%)	2 (7%)	2 (29%)
Community school	657 (19%)	9 (31%)	1 (14%)
Foundation school	299 (9%)	4 (14%)	1 (14%)
Voluntary aided school	301 (9%)	1 (3%)	0 (0%)
Ofsted rating			
Outstanding	681 (21%)	3 (10%)	1 (14%)
Good	1,672 (53%)	18 (62%)	2 (29%)
Requires improvement	656 (21%)	6 (21%)	2 (29%)
Inadequate	173 (5%)	2 (7%)	2 (29%)
Allocated to deliver PEP to KS3	n/a	12 (41%)	5 (71%)
	Mean	**Mean (SD)**	**Mean (SD)**
School size Total number of pupils	942	1,029 (337)	879 (145)
Pupil Premium Proportion of eligible pupils	28	26 (15)	30 (16)
School attainment proportion of pupils achieving A*–C GCSE English and maths (in 2013)	60	59 (12)	54 (13)
English as an additional language Percentage of pupils with EAL	15	20 (27)	6 (5)
Special Educational Needs Percentage of pupils with statement of SEN or EHC plan	2	2 (1)	3 (2)

Gender Proportion of boys	51	55 (17)	50 (2)

[1] *Based on all state-funded secondary schools in England.*

Compared to national figures (Table 6), sponsor-led academies and voluntary aided schools were under-represented in the trial sample, while community and foundation schools were over-represented. Also, fewer schools were rated as 'outstanding' compared to the national average. Trial schools were slightly larger in terms of pupil numbers, with a greater proportion of EAL pupils and a greater proportion of boys. Trial schools were comparable to national figures in terms of proportion of pupils eligible for Pupil Premium, attaining grades A* to C in English and maths, and proportion of SEN pupils or Education, Health and Care (EHC) plans.

Since each school in the trial had both an intervention and a control group the school-level characteristics of the intervention and control groups were also balanced. At baseline, the intervention and control groups were relatively balanced with respect to the proportions of FSM, EAL, or SEN pupils within each group, however there were marginally more pupils with FSM (ES = 0.12), EAL (ES = 0.04) and SEN (ES = 0.05) in the control group.

Similarly, the groups were relatively equivalent in relation to gender and baseline reading score (ES = 0.04, in favour of control), mathematics scores (ES = 0.005 in favour of intervention) and absenteeism (ES = 0.05 in favour of control).

Table 7: Baseline comparison between intervention and control groups

Variable	Intervention group		Control group	
School-level	**n (missing)**	**Percentage**	**n (missing)**	**Percentage**
Number of KS3 pupils	4,312 (0)	57%	6,089 (0)	77%
Number of KS4 pupils	3,258 (0)	43%	2,038 (0)	23%
Pupil-level	**n/N (missing)**	**Percentage**	**n/N (missing)**	**Percentage**
Male	4,164/7570 (1)	55%	4,490/8127 (0)	55%
Eligible for FSM	1,048/7570 (4)	14%	1,469/8,127 (20)	18%
English as and additional language (EAL)	1,293/7570 (3)	17%	1,529/8,127 (21)	19%
Special Educational Needs (SEN)	1,348/7570 (9)	18%	1,600/8,127 (19)	20%
White British	5,530/7570 (0)	73%	5,427/8,127 (0)	67%
	n (missing)	**Mean (standard deviation)**	**n (missing)**	**Mean (standard deviation)**
Reading KS2 baseline score	5,944 (1626)	30.6 (9.3)	6,708 (1,419)	30.2 (9.2)
Maths KS2 baseline score	5,972 (1598)	69.4 (20.1)	6,641 (1,486)	69.3 (20.2)

Absenteeism (sessions) 2013/14 baseline	7,453 (117)	17.4 (20.4)	7961 (166)	16.3 (20.0)

Outcomes and analysis

Main analysis

Table 8 reports the unadjusted post-test differences between the intervention and control groups on each outcome measure. The effect sizes are calculated based on the statistical model and so take into account any pre-test differences in English or Maths, as well as taking into account any clustering at the level of the school.

In this simplest model—with only pre-test score and group allocation as covariates—the intervention appeared to have an extremely small, positive yet statistically significant impact on three of the four outcomes measured: English, maths and absenteeism. Thus, pupils who received the intervention had (at post-test) very slightly higher attainment in English (ES = 0.033, p = 0.024) and maths (ES = 0.067, p < 0.001) and slightly reduced absenteeism (ES = -0.054, p < 0.001). There was no evidence of any effect of the programme on science attainment.

Table 8: Primary analysis using group allocation and pre-test scores (only) as covariates

	Unadjusted post-test means				Effect Size		
	Intervention		Control				
Outcome	Analysed n	Mean (SD)	Analysed n	Mean (SD)	Hedges g [95% CI]	sig.	ICC
English	5,376	0.091 (0.942)	6,037	0.058 (0.958)	0.033 [0.004, 0.064]	p = 0.024	0.082
Maths	5,613	0.091 (0.950)	5,977	0.017 (0.965)	0.067 [0.041, 0.092]	p < 0.001	0.061
Science	4,726	0.028 (1.009)	5,582	0.057 (0.951)	-0.013 [-0.048, 0.022]	p = 0.467	0.088
Absenteeism	7,436	0.002 (0.984)	7,919	0.007 (1.022)	-0.054 [-0.079, -0.029]	p < 0.001	0.009

Given these very small effect sizes, the narrow confidence intervals, and the large proportion of missing data described earlier in the report, additional analyses were conducted to check the robustness of this result. To determine whether the statistical significance of the effect sizes remained under other conditions, additional level 1 and level 2 covariates were included in the model, specifically:

- level 1 covariates: KS group, ethnicity, and FSM to account for group differences at pre-test (reported in Table 7); and
- level 2 covariates: school size, GCSE attainment, and proportion of pupils eligible for the Pupil Premium.

It was not possible to include a dummy variable representing 'missing' in the model because this was perfectly collinear with the pre-reading and pre-maths variables, however the standard errors were bootstrapped as an additional test of robustness.

It can be seen from Table 9 that with the inclusion of these additional covariates the effects for maths and absenteeism remained statistically significant (p < 0.05), albeit extremely small. The positive effect

on English observed in the previous analysis has now disappeared and science remains unaffected by the intervention. The analysis reported below is based on bootstrapped standard errors.

Table 9: Primary analysis using additional level 1 and level 2 covariates

	Unadjusted post-test means				Effect Size		
	Intervention		Control				
Outcome	Analysed n	Mean (SD)	Analysed n	Mean (SD)	Hedges g [95% CI]	sig.	ICC
English	5,376	0.091 (0.942)	6,037	0.059 (0.957)	-0.007 [-0.035, 0.020]	p = 0.603	0.082
Maths	5,612	0.092 (0.949)	5,975	0.017 (0.965)	0.029 [0.002, 0.055]	p = 0.033	0.061
Science	4,725	0.028 (1.010)	5,581	0.057 (0.951)	0.017 [-0.023, 0.058]	p = 0.396	0.088
Absenteeism	7,434	0.002 (0.985)	7,916	0.007 (1.022)	-0.049 [-0.077, -0.022]	p < 0.001	0.009

Multiple imputation

Multiple imputation was conducted in order to account for the high proportion of missing data. A higher proportion of missing data was evident in the intervention group than the control group (Chi square = 40.08, df = 1, $p < 0.001$). This was because the intervention group had a higher proportion of KS4 pupils and it was for these pupils that the baseline data was missing, if it was missing at all. 'Missingness' (missing reading and maths KS2 data) was also negatively associated with all four outcomes at post test such that children whose reading and maths data were missing at baseline (KS2) had poorer English (ES = -0.23, $p < 0.001$), maths (ES = -0.17, $p < 0.001$), science (ES = -0.17, $p < 0.001$), and attendance (ES = 13, $p < 0.001$) at post-test.

The imputation model accounted for the clustered nature of the data (by imputing data separately for each cluster) and included all relevant variables and auxiliary variables involved in the analysis and sampling design. Data was presumed to be missing at random (MAR) rather than MCAR (missing completely at random) or MNAR (missing not at random). This assumption renders the missing mechanism ignorable, simplifying the imputation step while ensuring correct inference. Variables were centred prior to imputation. The imputation was performed using chained equations: this fills in missing values in multiple variables iteratively by using a sequence of univariate imputation methods with fully conditional specification of prediction equations. This method accommodates arbitrary missing-value patterns. Twenty imputations were conducted in order to lessen the simulation (Monte Carlo) error.

The two complete case analyses (CCAs) reported above—the simple model (Table 8) and the additional covariates model (Table 9)—were then performed again, this time using the imputed dataset. Table 10 below reports the model coefficients for the group allocation variable (β) and associated standard error and p value for these four models:

1. simple model (just two covariates) using a complete case analysis (CCA);
2. simple model using the multiply imputed dataset;
3. additional covariates model using a complete case analysis; and
4. additional covariates model using the multiply imputed dataset.

As all variables were standardized (mean of zero, standard deviation of one) within these models, the beta coefficients (β) can be interpreted as an effect size.

Table 10: Main analysis using both complete case analysis and multiple imputation

Outcome	1. Simple model CCA			2. Simple model MI			3. Additional covariates CCA			4. Additional covariates MI		
	β	*SE*	*95% CI*	*β*	*SE*	*95% CI*	*β*	*SE*	*95% CI*	*β*	*SE*	*95% CI*
English	.034	.015	.004, .064	.008	.013	-.018, .034	-.007	.014	-.035, .020	-.026	.014	-.053, .001
Maths	.067	.013	.041, .092	.067	.012	.042, .091	.029	.014	.002, .055	.039	.013	.013, .064
Science	-.013	.018	-.048, .022	-.034	.015	-.062, -.005	.017	.021	-.023, .058	-.026	.015	-.056, .004
Absenteeism	-.054	.013	-.079, -.029	-.053	.013	-.078, -.028	-.049	.014	-.077, -.022	-.050	.013	-.075, -.024

Across all four analyses the results for maths and absenteeism remain largely consistent. For maths there is some variation in the magnitude of the effect size and the confidence intervals. Both simple models estimate a positive effect of the programme of 0.067. For the models utilizing additional covariates, the complete case analysis estimates a smaller effect of 0.029 compared to the estimation based on the multiply-imputed dataset of 0.039. All four effect size estimates are statistically significant.

With regard to absenteeism, this outcome had the least amount of missing data associated with it and consequently the estimates of the effect of the intervention on this outcome (across all four models) is relatively consistent, in the region of 0.05 and statistically significant in each instance.

For English, the direction, magnitude, and statistical significance of the effect of the intervention varies with each model. In the main, however (for three of the four models) it is not statistically significant. Similarly, for science, while the magnitude, direction, and statistical significance of the effect of the intervention does vary across each of the four models, a pattern of a small negative effect does emerge, although in most cases (again for three of the four models) this is not statistically significant.

On treatment analysis

The number of texts sent by schools was included as an additional covariate in the model, however there was no evidence that the number texts sent by schools was related to the outcomes being tested.

Secondary analysis

FSM analysis

To estimate the effect of the intervention for children eligible for free school meals, the main analysis—including the additional pupil- and school-level covariates discussed above and using a complete case analysis—was repeated on the subsample of data relating to those eligible for FSM (n = 2,551). The results of this analysis are reported in Table 11 which shows that there was no difference between the intervention and control groups on any of the outcomes in this FSM subsample. As before, the standard errors were bootstrapped.

Table 11: Main analysis using only the subsample of pupils eligible for FSM

	Unadjusted post-test means				Effect size		
	Intervention		Control				
Outcome	Analysed n	Mean (SD)	Analysed n	Mean (SD)	Hedges g [95% CI]	sig.	ICC
English	668	-.276 (1.037)	1079	-.160 (.970)	-.021 [-.106, .065]	.634	.043
Maths	678	-.233 (.990)	1008	-.262 (.956)	-.004 [-.081, .073]	.917	.065
Science	638	-.368 (1.024)	991	-.113 (.999)	-.077 [-.173, .018]	.113	.075
Absenteeism	1035	.411 (1.425)	1439	.318 (1.363)	-.064 [-.149, .021]	.139	.052

Subgroup analysis

The potential differential impact of the intervention was explored for the following subgroups:

- Key Stage group;
- gender;
- baseline score;
- school size; and
- EAL status (added as an additional subgroup analysis in the protocol amendment dated 15 December 2015).

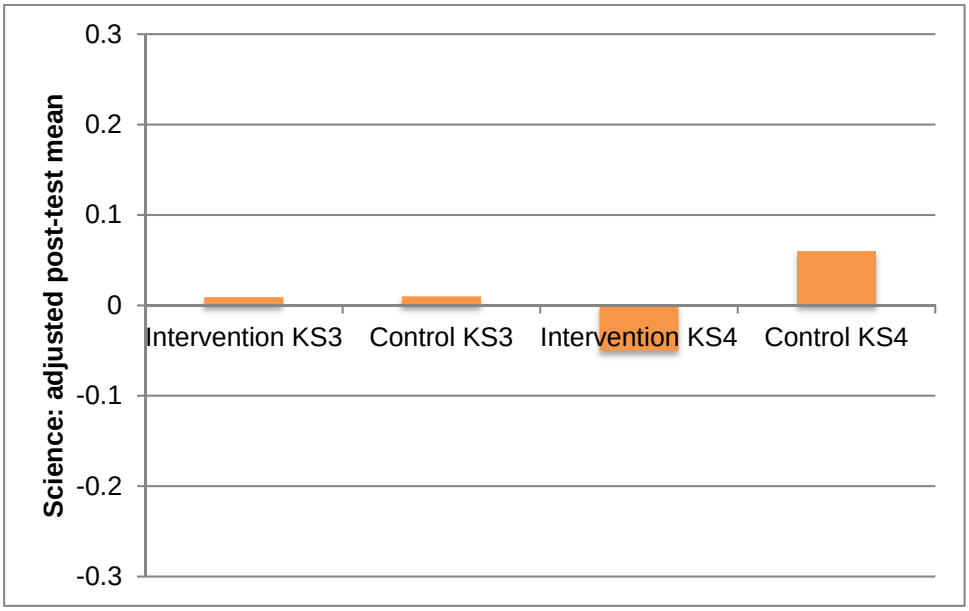
For each outcome an interaction term was created between the group allocation variable and the variable representing the subgroup in question. This interaction term was then added to the main multilevel model (described earlier) and the associated coefficient was subsequently used in the calculation of the effect sizes reported below. Standard errors were bootstrapped.

Key Stage group

The intervention appeared to have a differential impact on pupils in KS4 compared to KS3 and this for both science and absenteeism at post-test. There was no evidence of a statistically significant interaction (between intervention and Key Stage group) for English or maths.

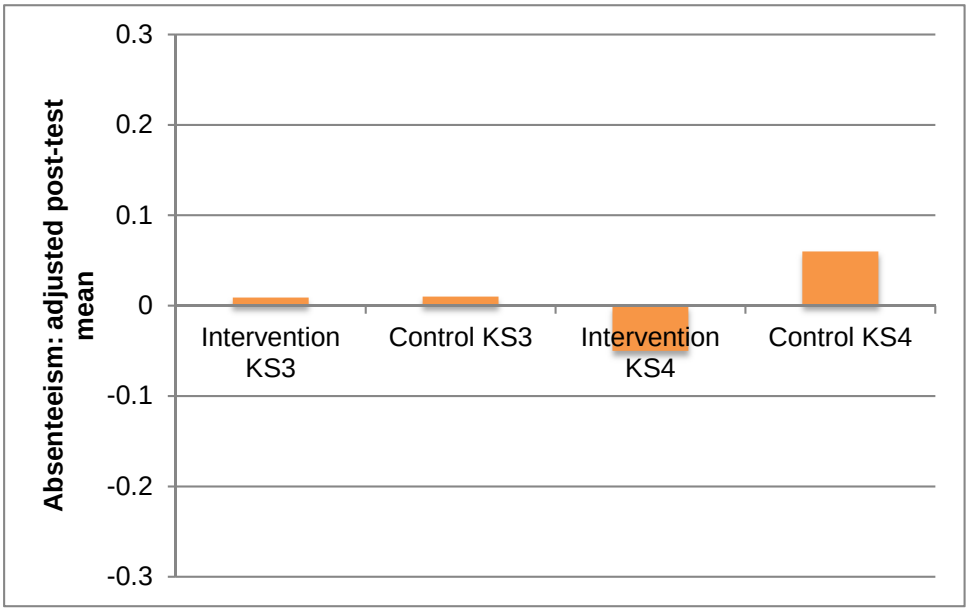
KS3 pupils in the intervention groups outperformed their control group peers in science (ES = 0.07, p = 0.01) compared to KS4 pupils where the group differences were in the opposite direction—control children performed slightly better than intervention children—and less pronounced (ES = -0.03).

Figure 2: Adjusted post-test scores by Key Stage group for science



Conversely, for absenteeism it appears that the intervention was most effective for KS4 pupils, reducing their absenteeism (compared to KS4 controls) by an effect size of ES = -0.11 ($p < 0.001$). By comparison, there was very little difference between the KS3 intervention and control groups (ES = 0.01) on this outcome.

Figure 3: Adjusted post-test scores by Key Stage group for absenteeism



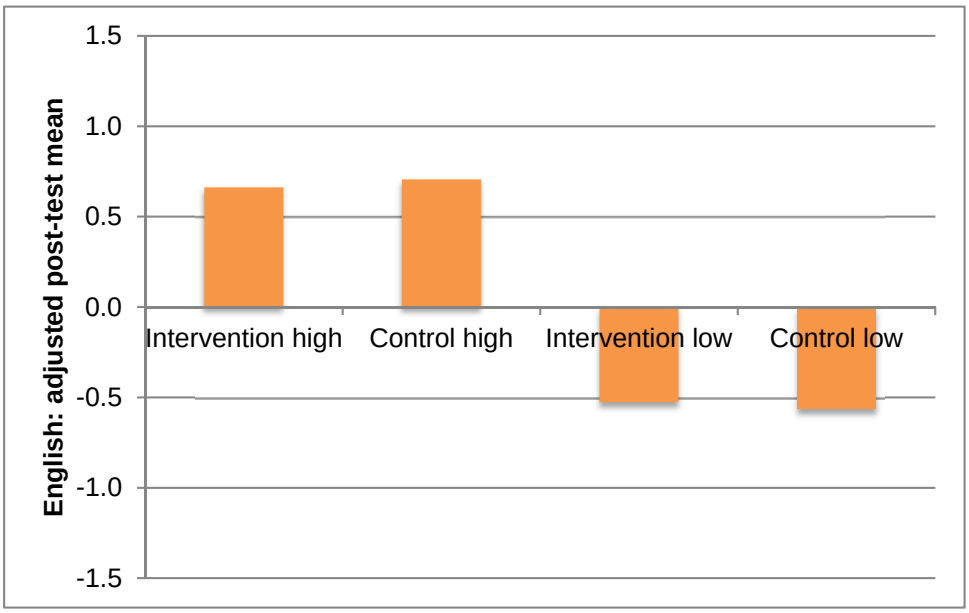
Gender

There were no significant interactions between gender and group allocation on any of the four outcomes.

Baseline scores

Intervention pupils who had lower attainment in reading at KS2—defined as one standard deviation below the mean—performed somewhat better at post test compared to controls who also had low reading scores at baseline (ES = 0.04, p = 0.001). For those pupils with high KS2 reading, the effect was in the opposite direction and control pupils outperformed the intervention pupils at post-test (ES = -0.04).

Figure 4: Adjusted post-test scores by baseline attainment for English

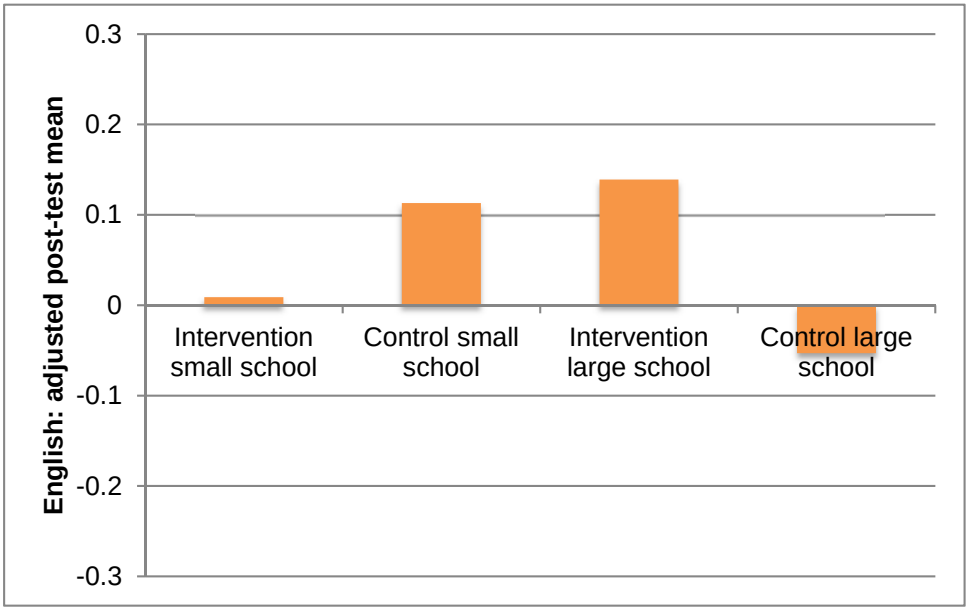


There were no statistically significant interactions between baseline scores and group allocation for maths, science, or absenteeism at post-test.

School Size

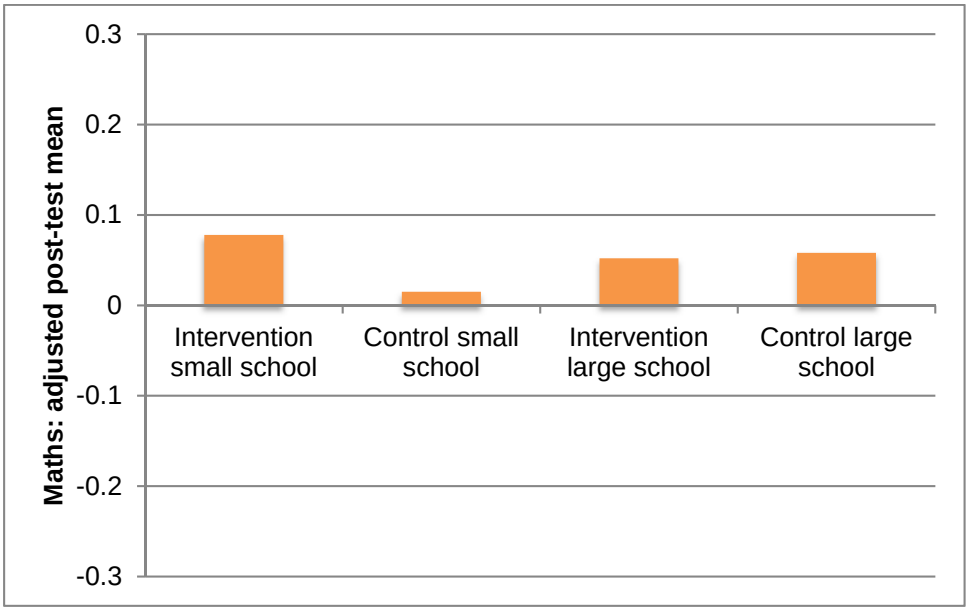
For pupils in larger schools, the intervention group performed slightly better in English than the control group (ES = 0.02, p = 0.03). Conversely, for children in smaller schools, the control group out-performed the intervention group (ES = -0.04).

Figure 5: Adjusted post-test scores by school size for English



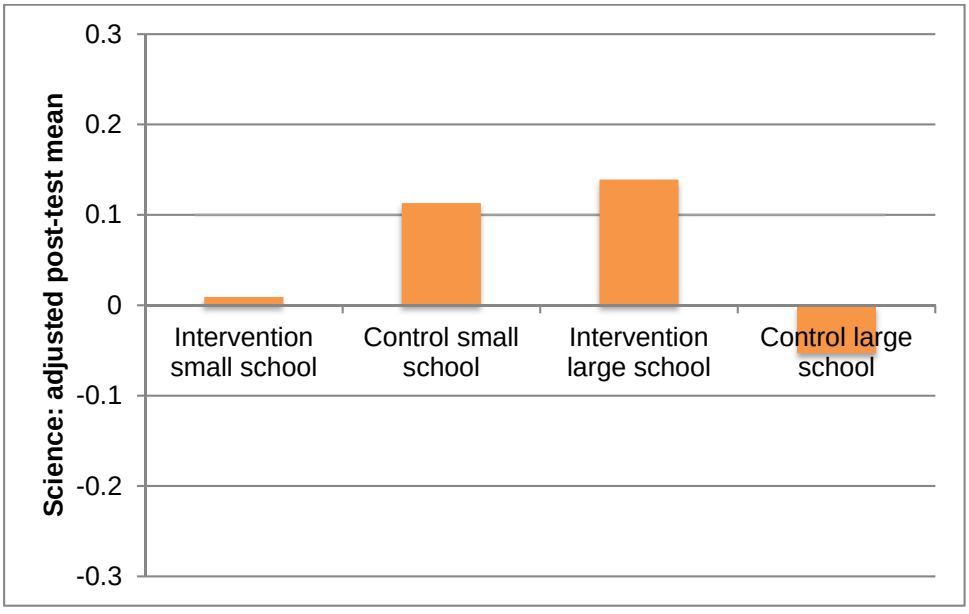
Maths attainment improved the most for intervention pupils in small schools compared to controls who were also in small schools (ES = 0.06, p = 0.003). For pupils in larger schools, there was only a very marginal difference in post-test maths scores (ES = 0.01) in favour of the control group.

Figure 6: Adjusted post-test scores by school size for maths



Conversely, for science, intervention pupils in *larger* schools performed much better than controls in larger schools (ES = 0.19, $p < 0.001$). For pupils in smaller schools, the intervention pupils actually performed worse in science compared to controls (ES = -0.10). There were no statistically significant interactions between EAL and group allocation for English or absenteeism.

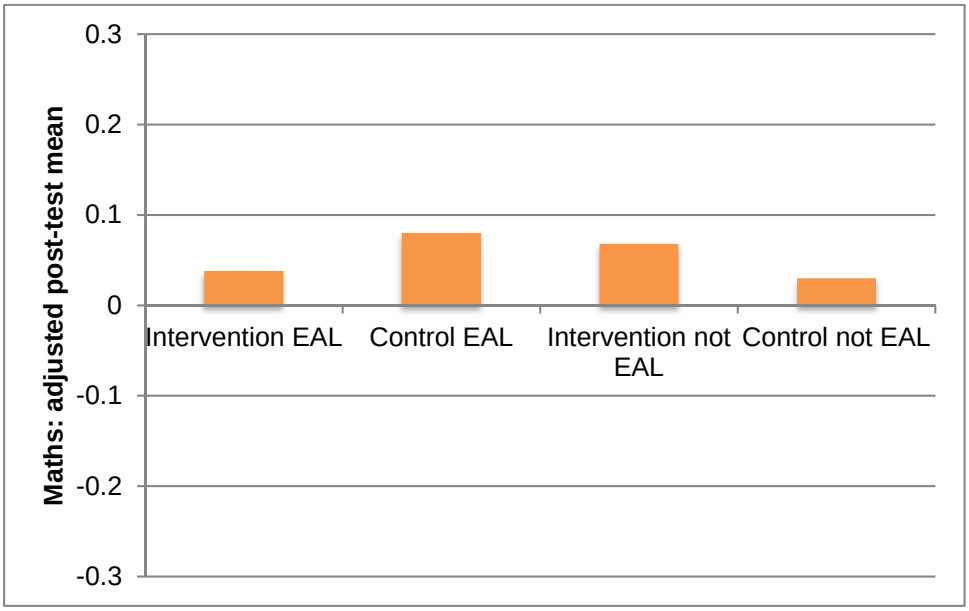
Figure 7: Adjusted post-test scores by school size for science



English as an Additional Language (EAL)

In the group of pupils who were not EAL, the intervention group did better in maths at post-test compared to the (non EAL) control group (ES = 0.04, $p = 0.03$). For children with EAL status the opposite effect was observed such that the control group performed better than the intervention group in maths at post-test (ES = -0.04). There were no statistically significant interactions between EAL and group allocation for any of the other outcome variables.

Figure 8: Adjusted post-test scores by EAL status for maths



Parent outcomes

The project delivery team collected data on parent outcomes via a phone survey from 2,891 intervention and control families (18% of the overall sample). Approximately 10–20% of participating families were sampled from each of the 29 schools in the trial.

The majority of respondents (92%) identified themselves as the child's parent and 80% identified their child's ethnicity as White British. Twenty-six per cent (26%) of the sample were educated to degree level or above and the majority of respondents (92%) identified English as the primary language spoken at home.

The pupil characteristics of the surveyed sample are compared to those of the main sample in Table 12. It can be seen that the survey sampled was largely representative of the main sample.

Table 12: Comparison of pupil characteristics between main sample and surveyed subsample

Variable	Main sample		Parent survey subsample	
School-level	**n**	**Percentage**	**n**	**Percentage**
Number of KS3 pupils	10,401	66%	1,968	68%
Number of KS4 pupils	5,296	34%	912	32%
Pupil-level	**n/N (missing)**	**Percentage**	**n/N (missing)**	**Percentage**
Male	8,654	55%	1,606	56%
Eligible for FSM	2,517	16%	449	16%
English as and additional language (EAL)	2,822	18%	299	11%
Special Educational Needs (SEN)	2,948	19%	533	19%

White British	10,957	70%	2,285	79%
	n	**Mean (standard deviation)**	**n**	**Mean (standard deviation)**
Reading KS2 baseline score	12,652	30.4 (9.2)	2,400	30.9 (9.2)
Maths KS2 baseline score	12,613	69.3 (20.1)	2,386	70.8 (20.0)
Absenteeism (sessions) 2013_14 baseline	15,414	16.8 (20.2)	2,811	15.5 (17.7)

Parent engagement

Parents were asked ten questions about their engagement in their child's learning which were combined into a single measure called 'parent engagement' (see section on Outcome Measures for more detail). In addition, parents were also asked four questions (to which they could respond 'yes' or 'no') about what kind of school-related information they discussed with their child:

- Have you asked your child what they learned at school?
- Have you talked with your child about their attendance?
- Have you asked your child to revise for an upcoming test?
- Have you asked your child about their grades?

Table 13 below reports the models for each of these five parent outcomes. The same covariates that were used for the main analysis were also used in these analyses.

There was no evidence that the programme improved outcomes for intervention families in relation to parent engagement or that it increased the frequency with which parents talked to their children about what they learned at school, their attendance, or their grades. It is important to note, however, that the vast majority of parents, both intervention and control, were scoring very highly on these outcomes (with the exception perhaps of talking about attendance) and it may be the case that there was little room for improvement to be made.

However, the odds of parents in the intervention group talking to their child about revising for an upcoming test were almost three times greater than the odds of control parents talking to their child about revising—an odds ratio (OR) of 2.811 (95% CI [2.070, 3.817], $p < 0.001$). This statistically significant result indicates that intervention parents were more likely than controls to talk to their child about revising for an upcoming test. (An OR of 1 indicates no effect of the intervention, an OR greater than 1 indicates that the effect is in favour of the intervention group, and an OR less than one indicates the effect is in favour of the control group.)

Table 13: Analysis of parent outcome data

	Unadjusted means				Effect Size	
	Intervention		Control			
Outcome	Analysed n	Mean (SD)	Analysed n	Mean (SD)	Hedges g [95% CI]	sig.
Parent engagement	1,362	-.052 (.947)	1,507	.047 (1.043)	-.040 [-.116, .035]	.298
	Intervention		Control			
Outcome	Analysed n	% yes	Analysed n	% yes	Odds ratio[1] [95% CI]	sig.
Has parent asked child what they learned at school?	1,355	94%	1,501	93%	1.084 [.796, 1.475]	.610
Has parent talked with child about attendance?	1,357	65%	1,504	67%	.956 [.807, 1.133]	.602
Has parent asked child to revise for an upcoming test?	1,356	95%	1,494	88%	2.811 [2.070, 3.817]	<.001
Has parent asked child about their grades	1, 350	92%	1, 501	92%	1.024 [.773, 1.355]	.869

[1] Mixed effects logistic regression was used to analyse dichotomous outcomes.

Cost

The cost of the programme as delivered in this one-year trial is estimated at £7.55 per pupil. This figure includes the cost of teacher training as well as costs associated with implementing the programme (both project delivery team support and text message costs).

Teacher training

Schools required one and a half days of supply cover to enable a representative to attend the training sessions (one full day in September and one half day in January). Not all schools will have required cover, however and at an estimated cost of £200 per day this will have cost each school approximately £300 per teacher.

Project delivery team support

The project delivery team employed a number of research assistants (RAs) to support the implementation of the programme within schools. Each RA cost approximately £20,000 for the duration of implementation and supported eight schools. This equates to a total cost of approximately £72,500 across 29 schools—£2,500 per school. One school did allocate paid teacher time to support the intervention and this cost the school in the region of £2,000.

Text messages

Once teachers are trained to deliver the programme the ongoing costs to the schools are the text messages in addition to an annual Schoolcomms license fee of £1,500 per annum. Parents should be sent an average of 65 texts per year, and at £0.05 per text this is the equivalent of £3.25 per child.

Thus, for a typical secondary school with 1,000 pupils, the cost to the school is:

- £3.25 x 1,000 (for 65 texts to 1,000 pupils);
- £2,500 for project support;
- £300 to cover one teacher to attend 1.5 days training; and
- £1,500 annual Schoolcomms license fee.

This comes to a total of £7,550 per school (£7.55 per pupil) for the first year of implementation, with ongoing yearly costs relating to the cost of the text messages (£3.25 per pupil) and the annual Schoolcomms license fee (£1.50 per pupil). Table 13 summarises cumulative and average costs per year.

Table 13: Cost per year over three years

Number of years using the programme	Cumulative cost per pupil	Average cost per pupil per year
1 year	£7.55	£7.55
2 years	£12.30	£6.15
3 years	£17.05	£5.68

Process evaluation

This section presents the key findings from the process evaluation. It involves the findings from an online survey with school personnel (n = 123), interviews with headteachers and teachers (n = 12), four focus groups with pupils (n = 29), and a telephone survey of 1,365 intervention parents.

Interview and focus-group discussion recordings were transcribed verbatim. Data was thematically content analysed. Transcribed data was read and re-read enabling the analyst to become immersed in the experiences and views of the informants, and to enable themes to be extracted inductively. Data was organised by emerging and recurring themes: those which arose spontaneously and were consistent between informants (unless otherwise stated) have been presented.

Implementation

Training and Support

School personnel were asked about training and support as part of the survey. Overall—following the initial training event in September 2014—the majority of respondents (71.6%) were positive about the training received, and thus confident (70.7%) about implementing the programme.

On reflection in May–June 2015, this was echoed in the interviews where school personnel expressed satisfaction with the continuous support received throughout the delivery of the programme. The comments below are representative of the teachers' views after the initial training.

> *'I think they were really supportive. If we were ever, we'd phone [Research Assistant from the project delivery team] up and he'd talk us through it on the phone. He was really good so I don't think there was anything extra that we really needed.'*

> *'The [Research Assistants] were really good at always being available on the phone and they came in a couple of times. Yeah, so I felt like there was a lot of support.'*

Only one of the schools reported a problem with the continuous support received during the programme implementation:

> *'But it became a little bit, kind of, hit and miss as to when we'd get them (emails). Whereas they started off quite regularly, they started becoming not very regular and then not at all, so it was very difficult to know when our week [for conversation prompts] was. So I think the communication was probably the thing, rather than just the training. The thing is, he [project delivery team RA] left his post, kind of, mid-year. I think it was just before Easter or somewhere around there, and it kind of fell off a little bit then, really. I don't think we've really done very much since then.'*

Barriers to delivery

A number of barriers to delivering the PEP programme are reported, and these fell broadly into two categories: (1) acceptance of the programme, and (2) organisational constraints.

The initial challenge for schools in implementing the programme was gaining teacher willingness to participate. Despite 72.3% of those who completed the survey acknowledging that implementing the programme has been beneficial for their school, each school interviewed mentioned problems with getting teachers on board at the beginning.

> *'I think one of the problems was that there's quite a lot of people involved in the projects because it's all the maths and English and science departments that were involved and it was kind of*

getting them on-board which was the tricky part of the project. So we weren't wholly prepared for that.'

All teachers interviewed referred to various organisational constraints being a challenge to successful implementation. For example, the main barrier to delivery of the programme, mentioned in all the interviews, was reminding to upload content data for the various text messages.

'Well, as a classroom teacher, for me, not a great deal of challenge because all I had to do was write a text message. The greater challenge was making sure I did it, you know, and reminding myself that I've got to do this text message, or I've got to input the date.'

There was also criticism surrounding text messaging causing confusion to parents. This was due to two reasons: schools uploading incorrect information, and the restrictiveness of text message character length. A typical comment regarding the former was:

'The type of information that can be sent, because it needs to be very, very short... because of that, sometimes the understanding of the parent as to what the message means and the importance of stuff gets a bit confusing.'

'The only issue begin was our end is when staff entered incorrect information or was conflicted information. Because that then generates a text straight out, that sometimes caused a little bit of a problem. One example being because of staff weren't completely aware how the system went on its initial stages, we had a group of parents were contacted to say that they went on a behavioural report, which obviously was never going to be the case, but because it was the first dropdown on the defaults, that's what they were sent.'

It was acknowledged that because the programme was in the development phase it was slow to commence:

'If it operated as it should have operated, I had anticipated they [parents] would be getting one [text] a week. I think there were some problems to overcome in the first half-term so I don't think they got it off as fast as they wanted. So I think there was probably the first four weeks where there wasn't probably very much.'

Furthermore, pressures of school life, at times, impacted on the programme. One teacher said:

'…English, maths and science are core subjects, you're always being asked to do extras, this was just another one on the pile, so it's not a lot to do, and I know it sounds like a lot, but fitting it in somewhere and finding something like a good conversational topic was tricky actually and then trying to make sure that the prompt and statement all lined up on the dates for all the classes and things like that was, in the evenings as well.'

Another problem was that school's found it difficult working with a third party (the project delivery team RA), which meant that schools did not have sole control.

'I think … it was just working [with] a third party, I found that quite challenging. So people were kind of saying to me, 'Don't do this', and then, you know, having to deal with another person all the time and... And sometimes there were email conversations going on between [project delivery team RA] and [school liaison officer] and one of the curriculum leaders that I wouldn't know about. And it wasn't, you know, anything bad, it was just that then you don't have that full control of what's going on, it was hard to have an overview. And obviously I think they had a full overview but it would have been nice if I'd had a full overview.'

A number of school-level organisational issues emerged surrounding the implementation of the programme. At the beginning, schools typically experienced problems securing the commitment of teachers to the programme and its schedule leading to problems with the timely uploading of text

content. Clearly, the lack of control that school's experienced when participating in the programme may have had a significant impact on their engagement.

Fidelity

In every school the project delivery team monitored the number and type of texts sent to parents for each subject—English, maths and science. As previously described, the type of text message included advance notice of upcoming assessments, conversational prompts, and notice of missing homework. It was intended that parents would be sent around 65 texts in total over the course of the trial; on average however, the total was 30. There was, however, considerable variability within this, from a minimum of 15 to a maximum of 77. The average number of messages sent per subject was relatively consistent at around 16 or 17: for English the average was 16.3, for maths, 17.5, and for science, 16.0.

It transpired that texts reporting absenteeism did not take place—these were not sent as part of the intervention by either the project team or by schools. From its previous feasibility study, the project delivery team found that parents were irritated if they received texts from the school relating to their child's legitimate absence(s). For this reason the intention was that parents would only be alerted to illegitimate absences. The difficulty was, however, that attendance data was cleaned—legitimated absences were updated on records—after a delay of two weeks, making the data more complicated to extract in a timely manner, and in some cases cleaning issues occurred such that the wrong parents were texted. Furthermore, since the rule revision in September 2013 prohibiting schools from authorising absences, attendance figures have significantly reduced. With this in mind, the project delivery team decided not to overburden schools by requesting this data and instead focused on collating test-date information.

It would appear that schools sent text messages regarding upcoming assessments (M = 22.19) much more frequently compared to missing homework (M = 11.39) and conversational prompts (M = 5.08). This was also the case for KS group: a higher number of texts detailing upcoming assessments was sent within the KS4 cohort (M = 12.35) than the KS3 cohort (M = 9.32). This was reflected in the process evaluation interviews during which school personnel described some of the difficulties they encountered with conversational prompts, for example, drafting information that was both clear and suitable for parents while also adhering to the constraints of the text character limit. This important point is reflected in the comments below:

> *'It was a bit short actually, it was really hard to get some of that down to the correct size, and parents more often than not were confused.'*

> *'I don't think the conversational prompts are easy to implement in any subject. I think assessment dates, as I've said, probably easier to get them out for some subjects than for others, and it will be much closer to the assessment that we can send that information out for some subjects like English.'*

Table 14: Mean number of text type sent per subject

Subject	Type of text	Mean (SD)
English	Upcoming assessments	6.96 (2.42)
	Missing homework	3.79 (3.58)
	Conversation prompt	2.08 (1.56)
Maths	Upcoming assessments	7.64 (2.87)
	Missing homework	4.38 (4.88)
	Conversation prompt	1.64 (1.52)
Science	Upcoming assessments	7.59 (3.91)
	Missing homework	3.22 (4.42)
	Conversation prompt	1.36 (1.40)

Schools also expressed the view that a few of the texts, particularly those concerning class tests—where pupils were not required to revise—were not suitable and should not have been sent to parents.

> *'But sometimes with the tests, some of the tests didn't really need a text message. So like, for example, we did the assessment at the end for the project so we had to do the assessment at the end and we had to send a text message out about that assessment but the children couldn't do anything for the assessment, they couldn't revise for it.'*

There was some criticism concerning the frequency of texts sent to parents, especially to those having more than one pupil in receipt of the intervention, which led to some parents making complaints to the school.

> *'Yeah, well that was the thing as well, is that sometimes they received like four in a week and then sometimes they didn't receive any and I received a couple of complaints about that, and particularly if you have a child in Year 7 and Year 9, and particularly we've got some children... you know, parents that have got twins, so, you know, if you've got twins in Year 7 and a child in Year 9 you're... their phone, they said it was almost like beeping constantly because if you just send four text messages, well then that becomes twelve text messages, and then other times there'd be no text messages, so...'*

Despite this, in the school and teacher survey, the majority of respondents (75.6%) agreed that the texting frequency was sufficient to impact on parents' behaviour and attitudes.

Outcomes

While 70% of school personnel believe that the programme engages and motivates the parents, there was a range of opinions on whether the programme would benefit students in terms of their parental engagement. A minority noted they found it difficult to see the outcomes for students, as 'it's difficult to know what the conversations parents have been having with the students at home.'

On the whole, schools did feel that the programme has resulted in increased communication between school and parents: 'we have communication with our parents much more than we normally do', and one school did comment that attendance numbers at parents evening have risen:

> *'If we look at attendance and you know, parents' evening and the like, and other events that would be you know, statistics show that the attendance has gone up in Year 11 parents. And*

there's statistics for everything that we do so we can compare year on year so that's quite encouraging, that we can identify as some of the parents who we have previously found very difficult to make contact with or get involved in any way with the school, some have, so I don't know, I have to suggest that might be down to the programme.'

Positive consequences of the programme, which were widely mentioned, include the programme's ability to develop and promote a three-way relationship between school/teacher, parents, and pupils. This was achieved by breaking down barriers between school/teacher and parents while stimulating communication between parents and pupils in the home environment, reflected in the comments below:

'On the whole, I'd say that it has had a positive influence because, certainly, my Year 9 students have come back and said, oh yeah, I had a conversation about Romeo when he tells Juliet he loves her for the first time. You know, I talked to my mum and dad about that. And I think that's really pleasing to know that what you're doing is reaching beyond the classroom and their parents are being made aware of it, but actually, not just aware of it, being involved in it.'

'It's empowering parents to talk about learning, not just talk about behaviour, which sometimes takes up too much of a focus.'

'I think my staff would say that they very definitely appreciate having parents on their side as well, having a way of communicating with parents, adult-to-adult, so that there is a team around the child, a team around the student, trying to get the best out of them.'

Other positive consequences, for the school, included text messaging being cost effective and time effective:

'Well, I just think that we are much more heavily text orientated than we use to be. We're sending many, many less letters out than we used to and so our postage cost has gone down significantly. But staff are talking to parents much more regularly by text.'

'It's made life a little easier around the fact that low level stuff you're not on the phone constantly all night trying to get hold of parents. I can usually say, yes I've contacted that parent by just clicking a button. And that is, when you've got a hundred other things to do, its really quick, it's really easy. It allows us to tick a box to say, yeah, we've done that bit. And I've really appreciated it, definitely.'

Pupils' experience of the programme

All pupils participating in the focus groups were aware of the programme and the type of information parents received via text messages from their school. Opinions were consistent regarding their experiences of PEP. While pupils acknowledged the programme was, at times, 'helpful' and 'effective', it was often referred to as 'annoying'. There were three main reasons for pupils branding the programme as annoying. First, pupils felt that it limited their independence as parents now were aware of upcoming assessments and so on, resulting in parents 'reminding' and 'nagging' them to prepare. Second, it caused 'frustration' at home (on the pupil's part) when incorrect information was sent: parents would remind children of the content received in a text which at times wasn't correct. Lastly, lack of clarity in the text messages caused confusion at home: pupils stated that they weren't detailed enough—for example, a text might have informed parents of an upcoming assessment without giving any information about the type of assessment it was (a class test or an exam).

Aside from this, pupils were in agreement that the programme did benefit their parents' relationship with the school:

> *'They have more of a connection with the school, like because obviously they don't come to the school with us so it's ways of finding out what we're doing because otherwise like if you don't really talk to your parents they wouldn't find out.'*

It also enabled communication between parent and child as it gave depth to their conversations surrounding school:

> *'I think it just means that they partially understand what I've been doing so I don't have to explain it all from like…it makes it easier to talk about what you've been doing at school.'*

Acceptability of the programme to parents

Overall, parents interviewed (n = 1,365) were happy with the programme in relation to the content, frequency, and timing of texts. They found the texts easy to understand (> 90%) and reported that they typically shared the information received with the child's other parent or carer (62%), with another relative (9%), or with a family friend (8%). Interestingly, just over a quarter of parents interviewed (27%) said that they did not share the information with anyone.

Types of texts received

Parents were asked how frequently they talked to their child about the different types of messages they received. Ninety-six per cent of parents reported receiving texts about upcoming tests, and the majority indicated that in response to this type of text they talked to their child about their test—either always (69%) or most of the time (18%). A smaller proportion of parents (70%) reported that they received texts about what their child was learning in school and that they talked to their child about it —either always (46%) or most of the time (14%).

The majority of parents reported that they did *not* receive texts about their child's grades (73%), however 18% said that they did and consequently they always talked to their child about their grade in that test. Similarly, 74% of parents interviewed reported that they did not receive any texts about missing homework (which may be because this type of text wasn't sent or the child rarely had missing homework). Nineteen per cent of the sample said they did receive texts about missing homework and as a result they always talked to their child about this.

These results reflect the variability in texts reported in the fidelity section above, with texts about upcoming tests and what was taught in school that day being the most frequent type of message received by parents. Consistently, however, of those parents who did receive alerts (regardless of the content), the majority responded by talking to their child about it either always or most of the time. Only a very small minority of parents (less than 2%) rarely or never talked to their child about the texts they received.

Child's response

When parents were asked how their child responded when they brought up information contained in the text messages, about half (48%) indicated that their child's response was neutral, 39% said that their child's response was somewhat or very positive, and a minority of parents (12%) reported that their child's response was either somewhat or very negative.

Usefulness, frequency and timing of texts

When asked which two types of texts they found most useful, the overwhelming majority of parents reported that they found the texts about upcoming tests the most useful (85%) followed by texts about what was taught in school that day (42%).

Most parents felt that the number of texts they received during the course of the year was about right (84%) with a minority reporting that there were too many (10%) or too few (6%). Equally, parents

preferred to receive the information by text (97%) rather than email (45%), smartphone app (22%), Facebook message (14%), a note sent home with the student (9%), or by post (7%).

During the trial texts were sent at approximately 4pm and parents were asked whether this or another time of day would be more convenient, however over 94% of parents were happy with the timing of texts at 4pm. With regard to upcoming tests, parents were informed four days in advance of the test and also the day before the test. Fifty-one per cent (51%) of parents responded to say that they would prefer to get a single text four days in advance, however 41% said that actually they preferred to get both. The majority of parents indicated that four days' notice (68%) was sufficient although a significant minority would have preferred seven days' notice (20%).

Formative findings

Overall, in this first year of implementation, schools enthusiastically embraced the PEP programme. There were positive comments about the use of text messaging for engaging parents, praised for its 'immediate, non-intrusive way of getting in touch with a significant number of parents' and 'informal way of contacting parents', while being cost-effective to schools: 'We now find texting much cheaper than a stamp.' Our survey revealed that 93.5% of school personnel agreed that text messaging is a suitable way to communicate information to parents. Similarly, parents who were interviewed reported being happy with the content, frequency, and timing of texts and indicated that they subsequently discussed the information contained within the texts with their child.

On the whole, schools report a positive implementation experience with 75.6% of those surveyed recommending the programme to other schools. While schools would be willing to support the roll out of the programme in subsequent years (72.4%), the following recommendations from the perspective of schools have been suggested.

Training

One school suggested that the initial training sessions be made available online (through a webinar) so that all of those involved in implementing the programme could benefit from the training sessions at a time convenient to them and at no cost (such as travel costs). While the project delivery team did make video recordings of the training available to all schools, it seems that not all schools were aware of this.

Targeted delivery

While schools acknowledge that it may be difficult to implement such a programme for every pupil in attendance due to teacher burden (additional workload) and parent burden (the receipt of too many texts), three of the schools did suggest that PEP would be most useful for certain groups, for example Pupil Premium students or hard to reach parents.

> *'If you were to target Pupil Premium students and hard to reach parents, I think it would be very successful and important part of the whole range of things that we use to sort of support them through…'*

Organisation and Management

A number of suggestions for improvements to the programme have been identified by schools:

1. Schools feel parents should be better informed at implementation, and made aware of the texting strategy, specifically the content that they can expect to receive during the academic year. This would help to overcome any confusion that was experienced by parents.
2. Schools also suggest that, at their end, they have an administrative procedure in place to monitor all text content, to overcome any incorrect information being sent to parents and to oversee the scheduling of the text messages. This would help to ensure that parents receive

the information at the correct time, for example, assessment prompts could be sent a week ahead and not three days before.

3. Schools also identify the need for a 'lead' within each subject that the programme is running for. This would help to ensure reminders are sent, and that consistency of the programme is maintained.
4. Lastly, schools feel that the assessment prompts would be better received if they were followed up with grades.

Recommendations surrounding organisation and management of the programme are reflected in the comments below:

> *'We could almost do with sending a letter out at the beginning of the year to say, look, you will be notified at certain times over this type of thing and this type of thing. And just perhaps making the message a tiny, little bit clearer; there will be an assessment on this. Your student need to revise this, or doesn't need to do this, or just that tiny, little bit more. And I think that would be, you know.'*

> *'If there was a teacher in each department who was, like, the lead for it, I think that would be quite helpful. Because it is very, very quick and easy, it's just reminding ourselves.'*

> *'I think probably what would have been better, you know, if it were carrying on, to pick up some of the grades because then to be able to, after the tests, text home and say, well, this is the grade that your child got in the test.'*

> *'The scheduling of texts to make sure that they happen at the best possible time for parents to be able to effect a change and maybe even having a couple of texts building up to things like tests so you tell them the date of it early and then you remind them.'*

Control group activity

As the trial was designed with randomisation at Key Stage level, the risk of contamination between groups was low, and there was no evidence that any pupils in the control groups were exposed to PEP. Furthermore, the process evaluation did not identify any spill-over effect to the control group pupils.

Schools (n = 4) were questioned (through interviews, n = 12) about communication with parents in their control groups. This indicated that those parents were not aware of the intervention, and communication from the school was 'standard practice'—Schoolcomms, email, telephone calls, letters, and pupil homework diaries/planners.

> *'It was standard practice, email mainly, but they would have received way less information.'*

> *'So for things like test timings and things, they would have had that as part of our original calendar and through their student planners and the like, but wouldn't have had a notification necessarily that it was coming in the way that the treatment group would have done.'*

Conclusion

Key conclusions
1. Children who had the intervention experienced about one month of additional progress in maths compared to other children. This positive result is unlikely to have occurred by chance.
2. Children who had the intervention had reduced absenteeism compared to other children. This positive result is unlikely to have occurred by chance.
3. Children who had the intervention appeared to experience about one month of additional progress in English compared to other children. However, analysis suggests that this finding might have been affected by bias introduced by missing data, so we cannot reliably draw this conclusion. There is no evidence to suggest that the intervention had an impact on science attainment.
4. Schools embraced the programme and liked its immediacy and low cost. Many respondents felt that the presence of a dedicated coordinator would be valuable to monitor the accuracy and frequency of texts. Schools should consider whether they would be able to provide this additional resource.
5. The vast majority of parents were accepting of the programme, including the content, frequency, and timing of texts.

Limitations

There were a number of limitations to the current study. The first of these was the assessment of science attainment at KS3. Unfortunately it was not possible to use an existing reliable and valid measure of this outcome as none were available and the evaluation team did not have sufficient time or resources to develop and pilot their own assessment measure prior to post-testing. As such, it was necessary to rely on an old (2009) SAT science test that perhaps had limited content validity and/or constructive alignment. This could have led to the imprecise measurement of science attainment, and indeed, while a small positive effect was observed for English and maths, no such effect was observed for science and poor measurement might be the reason. Despite this, however—and the potential to observe a basement or floor effect—there was considerable variability in the KS3 science scores, and these were approximately normally distributed suggesting that the measure was, in fact, capable of detecting variability in scores and any potential group differences. It should also be remembered that this was the measurement tool for two thirds of the sample and that GCSE scores were also used to measure science attainment (for KS4 pupils). For these reasons we do not believe that the measurement of science attainment at post-test was overly compromised.

A second potential limitation was the withdrawal of seven schools post allocation. This differential attrition resulted in an imbalance with respect to the proportion of KS3 and KS4 groups (and therefore also missingness) in the intervention and control groups which may have introduced a source of bias between the groups and acted as a confounding variable on the outcomes being measured. For this reason a number of additional covariates were included in the main (multilevel) regression models to control for group differences at baseline in terms of FSM, ethnicity, and Key Stage group as well as school-level differences including school size, attainment, and proportion of pupils eligible for the Pupil Premium.

Finally, an unexpected issue arose around the proportion of KS2 (baseline) English and maths data missing from the NPD dataset for the KS4 cohort. The reason for the missing data is the school boycotts that took place in 2009/2010, however the potential implication of this for the reliability and credibility of the results (related to English, maths and science) meant that it was necessary to use multiple

imputation to try and account for this missing data and obtain a more reliable estimate of the effect of the PEP programme on the measured outcomes.

Notwithstanding the limitations described above, this was a large trial that had sufficient power to detect small effects. It does need to be acknowledged, however, that due to the proportion of missing KS2 data, the differential attrition of seven schools at the start of the study, and the non-random sampling of schools, the external validity of this study is somewhat compromised and we should be cautious in terms of generalizing these results more widely.

Interpretation

This trial aimed to measure the impact of the PEP programme on English, maths and science attainment and absenteeism. Using a simple two covariate (multilevel regression) model and a complete case analysis, we found extremely small yet positive effects of the intervention on three of the four outcomes, namely English (ES = 0.034, p = 0.026), maths (ES = 0.067, p < 0.001) and absenteeism (ES = -0.054, p = 0.001). It should be noted that such small effects were only detectable because of the large sample size. When the same (simple) analysis was conducted using multiple imputation, the effects for maths and absenteeism remained consistent in magnitude and statistical significance, however the effect on English disappeared and a small negative effect on science emerged (ES = -0.034, p = 0.022).

When additional covariates were added to the model (in a complete case analysis) the effect of the programme on Maths (ES = 0.029, p = 0.033) and absenteeism (ES = -0.049, p < 0.001) remained intact, albeit the effect size for maths reduced in magnitude from 0.067 to 0.029. The effect of the programme on English, however, disappeared as it did with the MI analysis of the simple model reported above. When this additional covariate analysis was conducted again, this time using multiple imputation, the results were consistent with the complete case analysis. That is, there was a (slightly larger) effect of the programme on maths (ES = 0.039, p = 0.003) and the same magnitude of effect as before on absenteeism (ES = -0.050, p < 0.001). There was no effect of the programme on either English of science in this scenario.

The results of this evaluation are commensurate with other studies which have found that providing parents with regular, concise updates regarding their child's progress, missing homework, and exam performance can improve academic attainment (Bergman, 2014; Kraft and Rogers, 2015; York and Loeb, 2014). However, the current trial provides evidence of only a very small positive effect and was unable to confirm the larger effect sizes—in the region of one fifth to one third of a standard deviation—reported by these other studies which tended to have smaller sample sizes (< 500), were more intensely delivered, and not independently evaluated. Another possible issue to consider is that the smaller effect sizes detected in this trial might be the result of insufficient differentiation between the intervention and control groups. Given that the Schoolcomms system is used routinely by schools anyway (albeit not in exactly the same way for the control children), there is a risk that the difference between the control and intervention activities was insufficient to elicit larger changes in the measured outcomes.

In the process evaluation, teachers suggested that the intervention would be more feasible to implement if it were targeted (rather than universal) and there is certainly some support for this from the trial data. While the intervention worked for the average child in terms of consistent but small improvements in maths and absenteeism, PEP seemed to work better for certain groups of pupils across the different outcomes. (It should be noted that any group differences reported in the FSM subgroup analyses were not statistically significant.)

While there was some, inconsistent evidence that PEP improved attainment in English for the average child, there did seem to be a positive effect at post-test for pupils who had lower attainment in reading at baseline (ES = 0.04 for poor readers at baseline compared to ES = -0.05 for good readers at baseline).

In maths, the children who made the most progress (compared to the control) were those who received the programme and did *not* have EAL (ES = 0.04). For children *with* EAL status, the effect was in the opposite direction and those in the control group performed better at post-test than those in the intervention (ES = -0.04). Interestingly, maths attainment was also better for those intervention children who attended small schools (ES = 0.06) compared to intervention (and control) pupils in larger schools (ES = -0.01).

The results for science were mixed: for the sample as a whole there was no consistent evidence that the programme improved science attainment for the average child. However, KS3 pupils seemed to benefit more from the programme (ES = 0.06 vs controls) compared to KS4 pupils who also received the programme (ES = 0.01 vs controls). Improved attainment in science was also observed for intervention children in larger schools (ES = 0.19, compared to control pupils in larger schools); intervention children in smaller schools performed *worse* in science than comparable controls (ES = -0.10).

There were some effects of the programme in relation to a reduction in absenteeism. Given that no absence-related texts were in fact sent, this is a particularly curious finding which is perhaps related to the increased monitoring of children's school-related activities overall, creating an environment in which pupils felt less able or willing to truant. In particular, the intervention was more effective in reducing absenteeism in the KS4 cohort (ES = -0.11) compared to KS3 (ES = -0.01), and this result is of particular note given that absenteeism increases as pupils progress through school, is more likely if parents do not value education, and is closely linked to lower academic attainment (Taylor, 2012).

Of the parent outcomes that were measured, the only detectable (positive) effect was in relation to the likelihood of parents asking their child about revising for upcoming tests, where intervention parents were more likely to do so than control parents (OR = 2.81, 95% CI [2.070, 3.817]).

While the effects of the intervention were very small, the programme is inexpensive and relatively easy for schools to implement. Parents reported general satisfaction with the frequency, content, and timing of the texts and in the majority of cases talked to their children about the information they were receiving via text from the school. Similarly, the teacher survey and interviews showed that schools were enthusiastic about PEP and liked its immediacy and low cost. While teachers acknowledged that there would need to be a person (or persons) responsible for its coordination within the school—to monitor text content, accuracy, and frequency—they could see the value of the programme, especially if it was targeted at specific groups of pupils and parents perceived as 'hard to reach'.

There was considerable variability between schools in terms of the number and type of texts sent—some schools struggled with the more complex and time-consuming texts (conversational prompts) and these were sent least frequently by all schools. Even so, this trial detected small and consistent improvements in maths and absenteeism, and while it is not possible to determine what type or combination of texts might be most effective, the level at which PEP was implemented in the current study does suggest that this programme can make a small, positive difference to some academic outcomes.

Given the government's increasing focus on supporting parental engagement, this programme might well have a promising future. The effects detected by this trial are so small, however, that in combination with some of the external validity issues raised elsewhere (relating to missing data, sampling, and differential attrition) it is not yet possible to conclude with any certainty that this programme is effective in improving academic outcomes for pupils.

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Appendix 1: Phone interview questions

Q00. Hello. My name is [CALLER NAME]. University of Bristol and [SCHOOL NAME] are working together to learn how parents can be helped to support their child's learning. May I please speak with [PARENT NAME] and could you please confirm you are the parent or carer of [STUDENT FULL NAME]?

00 No, is not [PARENT NAME].

Thank you for your time. Have a good [day/evening/night]. Goodbye. ***[Terminate survey]***

01 Yes, is the parent carer → **Go to Q1**

90 Don't Know

91 Refused

92 Terminated

Q1. Okay, thank you. I am calling you today to ask how you support [CHILD NAME'S] schooling. The survey will take approximately 5 minutes. The school won't be given access to your individual answers and you won't be identifiable in any research published by University of Bristol. You do not have to participate, you can choose to not answer any questions I ask and you may stop at any time. Are you happy to take the survey?

00 No

Thank you for your time. Have a good [day/evening/nigh]. Goodbye **[Terminate Survey]**

01 Yes → Go to Q2

91 Refused

92 Terminated

[parent_beliefs]

Now I will read a series of statements. Please respond to the question based on how strongly you agree with each of the following statements. Please use the following options: strongly disagree, somewhat disagree, somewhat agree, strongly agree. *[ORDER of Q2-Q5 (inclusive) IS RANDOMIZED]*

[Role_construction1]

Q2. It is my responsibility to make sure [STUDENT FIRST NAME] attends school every day.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Role_construction2]

Q3. It is my responsibility to make sure [STUDENT FIRST NAME] submits all of [HIS/HER] homework.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Role_construction3]

Q4. It is my job to make sure [STUDENT FIRST NAME] revises for upcoming tests.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Role_construction4]

Q5. It is important that I talk with [STUDENT FIRST NAME] about what [HE/SHE] is learning at school.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[ORDER Q6-Q11 inclusive randomized]

[Invitation_1]

Q6. I believe that [STUDENT FIRST NAME]'s school and teachers want me to help [HIM/HER] with [HIS/HER] homework each night.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Invitation_2]

Q7. I believe that [STUDENT FIRST NAME]'s school and teachers want me to talk with [HIM/HER] about what [HE/SHE] is learning in school.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Invitation_3]

Q8. [STUDENT FIRST NAME]'s school and teachers believe I am a valuable partner in [HIS/HER] education.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Efficacy1]

Q9. I have a lot of influence over how well [STUDENT NAME] performs in school.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Efficacy2]

Q10. I have the ability to make sure [STUDENT FIRST NAME] is submitting all of [HIS/HER] homework.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused
92 Terminated at this question

[Efficacy3]

Q11. I am confident that I can make sure [STUDENT FIRST NAME] is spending enough time studying.

1 Strongly Disagree

2 Somewhat Disagree

3 Somewhat Agree

4 Strongly Agree

90 Don't Know

91 Refused

92 Terminated at this question

[behaviours]

Now, we would like to learn about what kind of school-related information you discuss with [STUDENT FIRST NAME]. Please tell us if you have discussed any of the following with [STUDENT FIRST NAME] in the past month. [RANDOMIZE Q12-15 inclusive]

[behavior_1]

Q12. Have you asked [STUDENT NAME] what [HE/SHE] learned at school?

0 No

1 Yes

90 Don't Know

91 Refused

92 Terminated at this question

[behavior_2]

Q13. Have you talked with [STUDENT NAME] about [HIS/HER] attendance?

0 No

1 Yes

90 Don't Know

91 Refused

92 Terminated at this question

[behavior_3]

Q14. Have you asked [STUDENT NAME] to revise for an upcoming test or exam?

0	No
1	Yes
90	Don’t Know
91	Refused
92	Terminated at this question

[behavior_4]

Q15. Have you asked [STUDENT NAME] about [HIS/HER] grades?

0 No

1 Yes

90 Don't Know

91 Refused

92 Terminated at this question

[experience]

Q16. This school year, have you received any text messages with information about [STUDENT FIRST NAME]'s upcoming tests, what they have been learning about in school or any homework they have missed?

0 No

1 Yes

2 Yes and provided comments about the messages (Capture response in Q16a)

90 Don't Know

91 Refused

92 Terminated at this question

Q17. Imagine that next school year, [STUDENT FIRST NAME'S] school texted you information on upcoming tests, what is being taught that week and any homework [STUDENT FIRST NAME] might have missed. There would be an average of 2 texts per week. Would you be willing to pay for a text message service like that?

0 No

1 Yes

90 Don't Know

91 Refused

92 Terminated at this question

TREATMENT ONLY, IF CONTROL, GO TO Q38

[usefulness]

We are interested in making these text messages more useful for families and would like to hear more about how useful you found them. For each type of message listed, we would like to know how often you talked with [STUDENT NAME] about the content – never, rarely, sometimes, most of the time, always. You can also say if you did not receive a message like this. [RANDOMIZE order of Q18-21 inclusive]

Q18. How often did you talk with [STUDENT NAME] about messages containing information about upcoming tests? Never, Rarely, Sometimes, Most of the Time, Always? Or did you not receive message like this?

0 Never

1 Rarely

2 Sometimes

3 Most of the time

4 Always

5 I did not receive this type of message

90 Don't Know

91 Refused

92 Terminated at this question

Q19. How often did you talk with [STUDENT NAME] about messages containing the grade received on an exam? Never, Rarely, Sometimes, Most of the Time, Always? Or did you not receive message like this?

0 Never

1 Rarely

2 Sometimes

3 Most of the time

4 Always

5 I did not receive this type of message

90 Don't Know

91 Refused

92 Terminated at this question

Q20. How often did you talk with [STUDENT NAME] about messages alerting you to homework that [STUDENT NAME] had not submitted? [Repeat options if requested]

0 Never

1 Rarely

2 Sometimes

3 Most of the time

4 Always

5 I did not receive this type of message

90 Don't Know

91 Refused

92 Terminated at this question

Q21. How often did you talk with [STUDENT NAME] about messages containing what the [STUDENT NAME] learned in school that day? [Repeat options if requested]

0 Never

1 Rarely

2 Sometimes

3 Most of the time

4 Always

5 I did not receive this type of message [Go to QXX]

90 Don't Know

91 Refused

92 Terminated at this question

Q22. Which <u>two types of text</u> that you received did you find most useful? Again, the types were upcoming tests, grades, missing homework, and what was taught that day? [Check all that apply]

1 Upcoming tests

2 Grades

3 Missing homework

4 What was taught that day

90 Don't Know

91 Refused

92 Terminated at this question

Q23. Which one of the messages that you received did you find least useful? *[Repeat list if requested]*

1 Upcoming tests

2 Test grades

3 Missing homework

4 What student learned

90 Don't Know

91 Refused

92 Terminated at this question

Q24. This year we tried to inform you about upcoming tests 4 days in advance and we'd like to know if you would have liked more or less notice. Ideally, how many *day*s in advance would you want to know about an upcoming test for [STUDENT NAME]? Please give your answer in days. *[Parent offers response]*

1 1 day

2 2 days

3 3 days

4 4 days

5 5 days

6 6 days

7 7 days

8 More than 7 days

9 Other [Enter response in]

10 Wouldn't want to know at all

90 Don't Know

91 Refused

92 Terminated at this question

Q25. We tried to alert you about upcoming tests 4 days in advance and the day before the test. Which of the alerts were useful to you: 4 days in advance, 1 day in advance, both, or neither?

1 4 days

2 1 day

3 Both

4 Neither

90 Don't Know

91 Refused

92 Terminated at this question

Q26. Now, thinking of all of the text messages together, how would you describe [STUDENT NAME]'s response when you brought up the information in the text messages? Was [his/her] reaction 'Very negative, Somewhat negative, Neutral, Somewhat positive or Very positive?

1 Very negative

2 Somewhat negative

3 Neutral

4 Somewhat positive

5 Very positive

90 Don't Know

91 Refused

92 Terminated at this question

Q27. [PreferredMode] Given the choice, please tell us if you would have liked to have received these messages in the following ways. By text? E-mail? Post? Facebook? School Gatewway (which is the school's smartphone app)? A note sent home with your child? (Allow respondent to reply for each option, and SELECT ALL THAT APPLY)

1 Text message (which is the way they were currently delivered)

2 Email

3 Regular postal service mail

4 Facebook message

5 Smartphone app

6 Note sent home with student

7 Other *[Please record]*

90 Unsure

91 Refused

92 Terminated at this question

Q28. What do you think about the frequency of messages sent? Were there too many, about the right amount or not enough messages?

0 Too many

1 About right

2 Not enough

90 Don't Know

91 Refused

92 Terminated at this question

Q29. If there were 3 pieces of information to share with you, would you prefer to receive 3 separate texts at the same time or 1 long text?

1 3 separate texts

2 1 long text

3 Other [Record in Q32a]

90 Don't Know

91 Refused

92 Terminated at this question

I'm now going to ask what time you would have liked to receive each type of message. You would have received all messages at 4pm this year, but we'd really like to know if we could have sent them at a more convenient time. Please think about how you responded to the message and tell us whether it might have been better if we had sent them at different times. [RANDOMIZE Q30-32 inclusive]

Q30. If you could choose, what time would you want to receive texts about upcoming tests? Please give your answer to the nearest hour. [Caller, please choose the appropriate option]

1 Morning

2 Between 12pm and 2pm inclusive

3 3pm

4 4pm

5 5pm

6 6pm

7 7pm or later

90 Don't know

91 Refused

92 Terminated at this question

Q31. If you could choose, what time would you want to receive missing homework messages? [Caller, please choose the appropriate option]

1 Morning

2 Between 12pm and 2pm inclusive

3 3pm

4	4pm
5	5pm
6	6pm
7	7pm or later
90	Don’t know
91	Refused
92	Terminated at this question

Q32. What time would you want to receive conversation prompts on recent learning? [Caller, please choose the appropriate option]

1	Morning
2	Between 12pm and 2pm inclusive
3	3pm
4	4pm
5	5pm
6	6pm
7	7pm or later
90	Don’t know
91	Refused
92	Terminated at this question

Q33. Please tell us who you think should receive the messages? This can be more than one person and can include yourself, another parent or carer of your child, a relative, a family friend. [PLEASE CHECK ALL THAT APPLY]

1 Myself

2 Another parent or carer of my child

3 Another relative

4 Family friend

90 Don't know

91 Refused

92 Terminated at this question

Q34. If you have discussed the text messages with someone other than your child, please let us know who? The options are another parent or carer of your child, a relative, a family friend. [PLEASE CHECK ALL THAT APPLY]

1 Another parent or carer of my child

2 Another relative

3 Family friend

4 I did not discuss the messages with anyone else

90 Don't know

91 Refused

92 Terminated at this question

Thanks. There are just a few more questions to go, thanks so much. [RANDOMIZE Q36-38 inclusive]

Q35. Were the messages about upcoming tests easy to understand?

0 No

1 Yes
2 Sometimes
3 I didn't receive this kind of text

90 Don't Know

91 Refused

92 Terminated at this question

Q36. Were the messages about missing homework easy to understand?

0	No
1	Yes
2	Sometimes
3	I didn’t receive this kind of text
90	Don’t Know
91	Refused
92	Terminated at this question

Q37. Were the messages about recent learning easy to understand?

0	No
1	Yes
2	Sometimes
3	I didn’t receive this kind of text
90	Don’t Know
91	Refused
92	Terminated at this question

Q38. Have you used School Gateway, the smartphone app that [SCHOOL NAME] uses, to find out more about [STUDENT NAME]'s learning? Please indicate all that apply from the following list: Upcoming school events, lunch, uniforms, negative behavior, good behavior, grades or anything else? (SELECT ALL THAT APPLY)

0 No [Go straight to Q40]

1 Upcoming school events

2 Low lunch credit/free lunch information

3 Uniform information

4 Negative behaviour

5 Good behaviour

6 Grades

7 Other [PLEASE STATE]

90 Don't know

91 Refused

92 Terminated at this question

Q39. How often do you check the SchoolGateway app? Never, less than once a month, once a month, once a week, a few times a week, every day, or whenever you received a message?

0 Never
1 Less than once a month
2 Once a month
3 Once a week
4 A few times a week
5 Whenever I receive a message

90 Don't know

91 Refused

92 Terminated at this question

[relationship]

Q40. Thank you. What is your relationship to [STUDENT FIRST NAME]? *[CALLER READS OPTIONS]*

1 Parent

2 Grandparent

3 Aunt or uncle

4 Step parent

5 Sibling

6 Cousin

7 Foster parent

8 Other

91 Refused

92 Terminated

[language]

Q41. What is the primary language spoken in your household? *(Answer is volunteered)*

1 English

2 Punjabi

3 Urdu

4 Bengali

5 Polish

6 Somali

7 Gujarati

8 Arabic

9 Other [Please state]

90 Don't Know

91 Refused

92 Terminated at this question

Q42. What do you consider to be your child's ethnicity?

1 White British
2 Irish
3 Traveller of Irish Heritage
4 White other
5 Gypsy/Romany
6 Mixed White/Black Caribbean
7 Mixed White/Black African
8 Mixed White and Asian
9 Any other mixed
10 Indian
11 Pakistani
12 Bangladeshi
13 Any Other Asian
14 Black Caribbean
15 Black African
16 Any Other Black Background
17 Chinese
18 Any Other Ethnic Group

90 Don’t know

91 Refused

92 Terminated at this question

[carer_education]

Q43. Last question: what is the highest level of education you have completed?[i] *(Answer is volunteered)*

1 Primary school abroad
2 Secondary school abroad
3 Secondary school in the UK
4 Secondary school with some GCSEs/O Levels (or equivalent)
5 Post-16 technical training/apprenticeship (or equivalent)
6 A Levels (or equivalent)
7 Undergraduate university degree
8 Post-graduate university degree

90 Don't know

91 Refused

92 Terminated at this question

Thank you so much for your time! Enjoy your [day/evening/night]!

Appendix 2: Memorandum of Understanding

Parent Engagement Project

Memorandum of Understanding

This memorandum of understanding is between the school taking part in the research (named below) and the research teams located in Bristol University, Harvard University and the Centre for Effective Education in Queen's University Belfast.

Name of School: _____

Its purpose is to clarify the roles and responsibilities of each organisation to facilitate the smooth running of the research project.

To receive the Parent Engagement Project and take part in this study please read and sign this Memorandum of Understanding.

Background

The Centre for Effective Education at Queen's University Belfast has been asked to carry out an independent evaluation of the implementation of the Parent Engagement Project in 34 schools. This research aims to find out what principals, teachers and pupils think of the programme, what were some of challenges and successes that were experienced and whether taking part in the programme has helped to improve children's achievement in English, maths and science.

The research team will ensure that parents are informed of the research and that opt-out consent is obtained for their child's participation in the study. This study has been approved by the School of Education Research Ethics Committee in Queen's University Belfast.

Agreeing to take part in the research will mean the following:

1. *Random allocation of classes to get the programme*

   Each participating school will put forward all the classes in Year 7, Year 9 (Key Stage 3) and Year 11 (Key Stage 4) to be included in the research. The CEE research team will randomly allocate either KS3 (Years 7 and 9) OR KS4 (Year 11) to get the programme. The Parent Engagement Project will be delivered between September 2014 and July 2015.

   The Key Stage Year Group that is *not* selected to get the programme will act as a comparison group (also called the control group). The parents in this group will not receive text messages about their child's learning; instead they will receive 'business as usual'.

2. *Facilitate 'informed consent' procedure*

   Your school will be given a letter that must be distributed at the beginning of the 2014/15 school year to parents of pupils in Years 7, 9 and 11, whether or not they have been allocated to receive the programme. The letter will inform parents of the nature of the research and give them 2 weeks to opt-out of the study. You will inform the research team of the pupils that have been withdrawn from the study.

3. *Facilitating the PEP programme*

The text messages will either be sent automatically by Schoolcomms or manually by a Research Assistant (RA) who will have temporary and restricted access to your Schoolcomms account. Your school will not need to send any text messages, but for some texts you will need to either provide your RA with some information, or ensure certain information has been properly recorded on SIMS:

	Text Type	**Description**	**Requirement from school**	**Text sent by**
a.	Upcoming Assessment	4 and 1 day warnings of upcoming tests & important deadlines	Share assessment calendar with your RA, at least 1 in advance	RA
b.	Grades	Grades for tests/important assignments	Notify RA when grades on SIMS can be sent to parents	Automatic
c.	Missing Homework	Notification of missing homework	Log behaviour report on SIMS as usual	Automatic
d.	Conversation Prompt	Summary of the day's lesson so parents can discuss	Teachers must write prompts as timetabled	RA
e.	Attendance Report	Summary of a student's attendance record for the term	Share termly attendance data with research team	RA

4. *Welcome event*

   You will send 2 representatives to attend a welcome event in September 2014 (exact date TBC). The 1-day event will explain the rationale for PEP and take you through the technical specifics of how the text messages will be sent in practice. We would recommend sending a Data Manager and a Departmental Head of English, Maths or Science.

5. *Liaising with your Research Assistant*

   Your school will provide a primary contact that your assigned Research Assistant can call to discuss any issues/problems regarding the project. Your school will also participate in a half-termly conference call with your Research Assistant to discuss any issues regarding the research project. This conference call will ideally include a member of your SLT and the Departmental Heads of English, Maths and Science.

6. *Costs*

   The costs of the text messages will be covered by the University of Bristol, as will other costs incurred as a result of participating in the project (such as the printing of letters to be sent home, etc).

7. *Teacher online survey*

   In Term Two (between January and April), teachers and administration staff involved in the Parent Engagement Project will each be asked to complete a short online survey to collect

information relating to the overall implementation of the programme and any challenges that were encountered.

8. *Principal, teacher and pupil interviews*

   Your school might be one of three schools selected by the evaluation team to take part in a small number of interviews with principals and teachers and a focus group with young people to further explore overall perceptions of the programme and its effectiveness. If your school is selected, you will be contacted by the CEE research team at the start of Term 3 (after April) to discuss your participation. Conducting these interviews may require a short visit to the school by the research team; however the timing will be agreed with the school and teacher(s) to ensure disruption is minimized.

9. *Achievement Data Collection*

   To explore the impact of the Parent Engagement Project on academic outcomes for all children in Years 7, 9 and 11 the CEE research team will collect achievement data in July 2015 using the following tests:

   - Year 7 will be tested using a web based version of the Hodder Access Reading, Access Mathematics and Science Progress
   - Year 9 will be tested using the Insight Maths, Science and Reading tests
   - For Year 11 GCSE results will be used and these data will be collected by the evaluation team directly from the National Pupil Database

   The research team will pay for and coordinate the testing of Years 7 and 9 in close consultation with the school in order to minimize disruption. Schools will be provided with the data from the Year 7 and 9 tests. The research team will provide ongoing support to the school throughout the testing period.

10. *Addition pupil information*

    The school will provide the CEE research team with the UPN for each child, name, date of birth and postcode. This information will enable the research team to link to the National Pupil Database records.

Will participation in the study be kept confidential?

Pupils' test responses and any other pupil data will be treated with the strictest confidence. The responses will be collected by the CEE research team. Named data will be matched with the National Pupil Database and shared with Bristol University, the Centre for Effective Education (the research team), the Education Endowment Foundation and the UK Data Archive for research purposes. No individual school or pupil will be identified in any report arising from the research.

I understand that participation in this programme and evaluation is entirely voluntary and I am clear about my school's role in this research study. I have been given the opportunity to ask questions and any concerns that I may have raised have been addressed.

_____ _____

Signed Date

_____

Position

Appendix 3: Parent Information Sheet and Consent Form

Evaluation of the Parental Engagement Project

Parent Information Sheet and Consent Form

Hello,

We are a research team from the Centre for Effective Education at Queen's University Belfast, and we are working with a team from the University of Bristol to determine whether text messages are a good way for schools to communicate with parents about their child's learning. We have been funded by the Education Endowment Foundation to carry out this research, and we would like you and your child to take part. Before you make a decision it is important for you to know why the research is being done and what it will involve. If you **do not** want you or your child to take part, we will ask you to sign the attached consent form and return it to your child's teacher. If you do wish to participate, you do not need to do anything, you will be automatically enrolled in the programme.

Please take your time to read the following information carefully and discuss it with others if you wish.

Why are we doing this study?

Your child's school is rolling out a new programme called the **Parental Engagement Project**, for the academic year beginning in September 2014. The programme involves different strategies for communicating with parents, via text message, about their child's progress in school. The research aims to find out whether this is effective in improving young people's performance at school.

What will happen if my child takes part?

If your child takes part, their class will be randomly chosen to either be part of the programme (meaning that you will receive text messages) or to continue as normal in which case you will not receive these additional text messages (only those that your school would normally send out).

If your child's class is not selected to be part of the programme then you will not receive these text messages but we would still like to monitor your child's performance in school.

The evaluation is being coordinated by the Queen's Univeristy Belfast research team, and involves the following:

- Survey of parents: this short survey will take place in the Spring of 2015 and will ask for your feedback on receiving text messages from your child's school. We will also ask for your consent to be contacted again for a short telephone interview to find out more about your experience, however you do not have to agree to this.
- Student academic achievement: in July 2015 students in Years 7 and 9 (both those who were part of the programme and those who were not) will be asked to take an English, maths and science test (as they usually would at this time of year). The tests will be delivered by the research team in your child's school. For students in Year 11, we will access their GCSE results from the National Pupil Database.
- Focus groups with young people: we will ask a small number of young people who have been part of the programme to give us their views on the programme. This will take place in your child's school.

Students' test scores will be shared with the school and all data will be treated with the strictest confidence.

Named data will be matched with the National Pupil Database and shared with Bristol University, the Centre for Effecive Education, the Education Endowment Foundation and the UK Data Archive for research purposes. We will not use your child's name or the name of the school in any report arising from the research.
This study has been approved by the Research Ethics Committee in the School of Education at Queen's University Belfast.

Does my child have to take part?
You are free to agree for your child to take part in the evaluation of the programme. If you do NOT want your child to take part in the evaluation, please complete and return the form below.

How long will the study last?

This study will begin in September 2014 and will finish in August 2015.

What if I change my mind?
You can change your mind at any time during the study and decide that you do not want your child to take part anymore in either the focus group or the tests. You do not even have to give a reason why. Your decision to take part will in no way impact on your relationship with your child's School, Queen's University Belfast or Bristol University, now or in the future.

Will our participation in the study be kept confidential?

All information that is collected about you and your child during the course of the research will be kept strictly confidential. Research folders will be kept securely in a locked office at all times. Access to these folders will be restricted to study investigators and statisticians. Any information that is stored electronically will be kept securely on Queen's University computers.

How to contact us to find out more about the study
If you would like to find out more about the study (even if you decide not to take part), please contact Dr Sarah Miller, at the address or phone number below:

Dr Sarah Miller
Centre for Effective Education
School of Education
Queen's University Belfast
69-71 University Street
Belfast
BT7 1HL

Telephone: 028 9097 5944
E-mail: s.j.miller@qub.ac.uk

Evaluation of the Parent Engagement Project

Parent Consent Form

If you want to participate in this study, you do not need to do anything.

If you **DO NOT** want to receive these text messages, or participate in the study, please complete this form and return it to <<INSERT SCHOOL ADMIN NAME>> by <<INSERT DATE 2 WEEKS AFTER ISSUE>>.

Parent Name: _____

Student Name: _____

School Name: _____

Please tick the boxes that apply.

1. [ ] I **do not** want to receive these text messages.
2. [ ] I **do not** give consent for my child to take part in any focus groups
3. [ ] I **do not** give consent for my child's achievement data to be collected by the research team

Signed _____ Date _____

Appendix 4: Coefficients and standard errors

Table A4.1 Coefficients and standard errors for all models reported in Tables 8, 9 and 10 in the main report (English)

English	**Simple model**		**Addditional covariates (bootstrap)**		**MI simple model**		**MI additional covariates**	
	coefficient	*SE*	*coefficient*	*SE*	*coefficient*	*SE*	*coefficient*	*SE*
Intervention	0.034	0.015	-0.007	0.014	0.008	0.013	-0.026	0.014
Pre-Reading score	0.616	0.007	0.616	0.006	0.641	0.006	0.641	0.006
Key Stage Group			-0.145	0.018			-0.150	0.014
FSM eligibility			-0.072	0.023			-0.077	0.020
Ethnicity (white)			0.005	0.018			0.046	0.019
School Size			-0.008	0.007			0.009	0.024
School Attainment			0.080	0.011			0.075	0.034
School Pupil Premium			0.000	0.012			0.001	0.031
Constant	0.033	0.028	0.175	0.021	0.015	0.029	0.123	0.031
School level variation	0.019	0.005	0.113	0.008	0.145	0.021	0.118	0.017
Pupil level variation	0.490	0.006	0.697	0.007	0.718	0.005	0.714	0.005

Table A4.2 Coefficients and standard errors for all models reported in Tables 8, 9 and 10 in the main report (maths)

Maths	**Simple model**		**Addditional covariates (bootstrap)**		**MI simple model**		**MI additional covariates**	
	coefficient	*SE*	*coefficient*	*SE*	*coefficient*	*SE*	*coefficient*	*SE*
Intervention	0.067	0.013	0.029	0.014	0.067	0.012	0.039	0.013
Pre-Maths score	0.753	0.006	0.751	0.006	0.759	0.006	0.759	0.006
Key Stage Group			-0.126	0.012			-0.128	0.014
FSM eligibility			-0.107	0.018			-0.115	0.017
Ethnicity (white)			-0.110	0.016			-0.110	0.017
School Size			0.003	0.007			0.015	0.024
School Attainment			0.025	0.009			0.028	0.034
School Pupil Premium			-0.029	0.009			-0.014	0.032
Constant	0.000	0.024	0.214	0.016	-0.008	0.024	0.194	0.030
School level variation	0.014	0.004	0.117	0.005	0.120	0.017	0.120	0.017
Pupil level variation	0.345	0.005	0.583	0.006	0.604	0.005	0.599	0.005

Table A4.3 Coefficients and standard errors for all models reported in Tables 8, 9 and 10 in the main report (science)

Science	**Simple model**		**Addditional covariates (bootstrap)**		**MI simple model**		**MI additional covariates**	
	coefficient	SE	coefficient	SE	coefficient	SE	coefficient	SE
Intervention	-0.013	0.018	0.017	0.021	-0.034	0.015	-0.026	0.015
Pre-Maths score	0.582	0.008	0.579	0.007	0.631	0.007	0.625	0.007
Key Stage Group			0.074	0.019			0.039	0.015
FSM eligibility			-0.116	0.024			-0.136	0.020
Ethnicity (white)			-0.107	0.019			-0.099	0.020
School Size			-0.020	0.009			0.000	0.046
School Attainment			0.068	0.012			0.070	0.065
School Pupil Premium			-0.068	0.012			-0.044	0.060
Constant	0.045	0.050	0.077	0.024	0.013	0.049	0.086	0.050
School level variation	0.069	0.019	0.243	0.009	0.256	0.034	0.236	0.032
Pupil level variation	0.556	0.008	0.743	0.005	0.762	0.006	0.759	0.005

Table A4.4 Coefficients and standard errors for all models reported in Tables 8, 9 and 10 in the main report (absenteeism)

Science	**Simple model**		**Addditional covariates (bootstrap)**		**MI simple model**		**MI additional covariates**	
	coefficient	SE	coefficient	SE	coefficient	SE	coefficient	SE
Intervention	-0.013	0.018	0.017	0.021	-0.034	0.015	-0.026	0.015
Pre-Maths score	0.582	0.008	0.579	0.007	0.631	0.007	0.625	0.007
Key Stage Group			0.074	0.019			0.039	0.015
FSM eligibility			-0.116	0.024			-0.136	0.020
Ethnicity (white)			-0.107	0.019			-0.099	0.020
School Size			-0.020	0.009			0.000	0.046
School Attainment			0.068	0.012			0.070	0.065
School Pupil Premium			-0.068	0.012			-0.044	0.060
Constant	0.045	0.050	0.077	0.024	0.013	0.049	0.086	0.050
School level variation	0.069	0.019	0.243	0.009	0.256	0.034	0.236	0.032
Pupil level variation	0.556	0.008	0.743	0.005	0.762	0.006	0.759	0.005

Appendix 5: Number of texts sent

Table A5 Number of texts sent for each subject per school

School	English	Maths	Science	Total
1	11	17.9	11.7	40.6
2	25.5	25.6	26.2	77.3
3	12.1	16.6	10.2	38.9
4	16.3	18.5	12	46.8
5	12.2	15.4	14.9	42.5
6	6.5	10.3	3.7	20.5
7	15.6	16.3	25	56.9
8	3	9	3	15.0
9	27.3	21.8	12	61.1
10	10.3	12.4	10.7	33.4
11	18	21.3	22.8	62.1
12	13.5	9	6	28.5
13	20	9.3	18.5	47.8
14	18.3	27.8	22.1	68.2
15	25.6	4.8	13.2	43.6
16	18.8	18.1	33.9	70.8
17	20.7	13.4	12.8	46.9
18	26.7	15.4	26.6	68.7
19	23.3	27.6	22.3	73.2

20	23.7	30.8	18.4	72.9
21	13.9	29.9	26.7	70.5
22	19.8	16.9	13.7	50.4
23	11.2	22.3	30.3	63.8
24	13	15.9	9	37.9
25	14.2	6.9	9	30.1
26	19	25.7	23.4	68.1
27	9.9	20.6	10.4	40.9
28	7.2	12.5	7.3	27.0
29	14.4	15	7.3	36.7

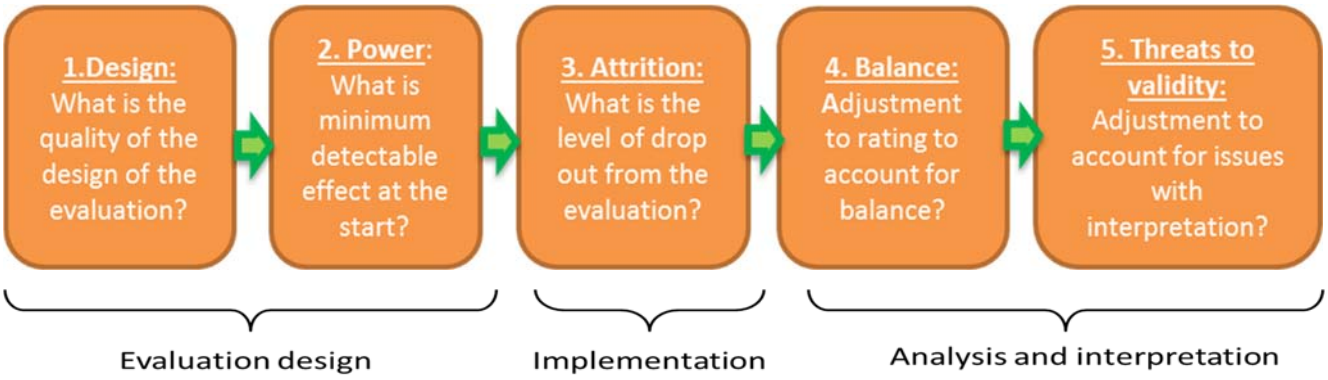
Appendix 6: Cost rating

Cost ratings are based on the approximate cost per pupil per year of implementing the intervention over three years. Cost ratings are awarded using the following criteria.

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

Appendix 7: Padlock rating

7th July 2016 Complete by Anneka Dawson



Rating	1. Design	2. Power (MDES)	3. Attrition	4. Balance	5. Threats to validity
5 🔒	Fair and clear experimental design (RCT)	< 0.2	< 10%	Well-balanced on observables	No threats to validity
4 🔒	Fair and clear experimental design (RCT, RDD)	< 0.3	< 20%		
3 🔒	Well-matched comparison (quasi-experiment)	< 0.4	< 30%		
2 🔒	Matched comparison (quasi-experiment)	< 0.5	< 40%		
1 🔒	Comparison group with poor or no matching	< 0.6	< 50%		
0 🔒	No comparator	> 0.6	> 50%	Imbalanced on observables	Significant threats

The final security rating for this trial is 3 🔒.

Appendix 8: Post-publication analysis

This appendix was added to the published report in June 2017

The evaluation team was asked to consider whether all sources of variation were appropriately accounted for in the two-level model that was originally used to analyse the data from the PEP evaluation (see the 'analysis' section of the main report).

A summary of the findings of this original (complete case) analysis are reported in Table A8.1, below (taken from Table 8 of the main report). As can be seen, the intervention results in a small but statistically significant improvement in maths and absenteeism and no improvement in science attainment. These three results were supported by further sensitivity analyses i.e. the inclusion of additional covariates, bootstrapping and multiple imputation (to account for the large proportion of missing pre-test (KS2) data) – see the full report for further details.

Whilst the original primary analysis also indicates that the intervention improves English attainment, this was not supported by subsequent sensitivity analyses and so the evidence for this outcome is much less certain or consistent than the evidence relating to maths, absenteeism and science.

Table A8.1: Original primary analysis using a two-level model and two covariates: group allocation and pre-test score

	Effect size	sig
English	0.033	0.024
Maths	**0.067**	**<0.001**
Science	-0.013	0.467
Absence	**-0.054**	**<0.001**

Further analysis using a three level model

The data were further analysed using a three level (random intercepts) model with pupils (level 1) nested within year groups (level 2) nested within schools (level 3). Year group rather than key stage group was used as the level two cluster variable to take account of any clustering effects associated with differences between years 7 and 9 (Key Stage 3). As per the original models, the new models included the relevant post-test score as the dependent variable and just two variables as independent variables: group membership (intervention or control) and the relevant pre-test score.

As can be seen from Table A8.2, the positive effects for maths and absenteeism remain relatively unchanged and whilst the p values have increased, the results for these two outcomes remain statistically significant. Science, as per the original analysis, remains not statistically significant. The positive effect for English however has all but disappeared. Given that the evidence for the effect of the intervention on this outcome was identified as weak originally, this finding is perhaps not surprising.

Table A8.2: Primary analysis using a three-level model and two covariates: group allocation and pre-test score

	Effect size	95% CI	sig
English	0.015	[-.061, .091]	0.697
Maths	**0.067**	**[.006, .128]**	**0.032**
Science	-0.051	[-.243, .141]	0.605
Absence	**-0.050**	**[-.084, -.015]**	**0.005**

Multiple imputation

All four new models were also estimated using multiply imputed data (Table A8.3). This sensitivity analysis confirms - as per Table 2 - the positive effect of the intervention on maths and absenteeism and no effect in relation to English and science.

Table A8.3: Primary analysis using a three-level model on multiply imputed data

	Effect size	sig
English	0.004	0.920
Maths	**0.070**	**0.026**
Science	0.026	0.767
Absence	**-0.049**	**0.006**

Calculation of effect sizes

The effect sizes reported in Tables A8.1, A8.2 and A8.3 were calculated using a conservative estimate of group variance, based on the pre-test scores of the sample for each outcome. Using instead the total variance from the model to calculate effect sizes results in a slight inflation of effects, see Table 4.

Table 4: Effect sizes arising from using two alternative sources of variance in the effect size calculation

	Effect size using SD of pre-test scores	Effect size using total variance from model
English	0.015	0.021
Maths	**0.067**	**0.111**
Science	-0.051	-0.065
Absence	**-0.050**	**-0.066**

Conclusion

Given all of the above, it is our conclusion that taking into account the additional source of variation at the year group level does not substantially change the main conclusions of the original analysis.

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