



Education
Endowment
Foundation

MathsFlip: Flipped Learning

Evaluation report and executive summary
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Institute for
Effective Education



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The project was independently evaluated by a team from the Institute for Effective Education at the University of York.

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Executive summary

The project

The MathsFlip intervention aimed to improve the attainment of pupils in Years 5 and 6. The programme, developed by Shireland Collegiate Academy, used a ‘flipped learning’ approach involving pupils learning core content online, outside of class time, and then participating in activities in class to reinforce their learning. The programme used an online learning environment which provided teachers and pupils with resources for learning mathematics outside the classroom, allowed collaborative communication between colleagues and pupils, and provided information to teachers on pupils’ progress prior to planning and teaching a lesson. Staff from Shireland trained Year 5 teachers from 12 primary schools in the West Midlands over two days and provided some ongoing support.

The project was a randomised controlled trial involving 24 schools: 12 schools received the intervention from April 2014 until April 2015 using MathsFlip to deliver lessons at the start of a new maths topic for the cohort of pupils in Year 5; 12 schools acted as control schools delivering maths lessons in the usual way. Impact was measured using pupils’ Key Stage 2 (KS2) maths scores in summer 2015. The process evaluation involved lesson observations and collecting teachers’ and pupils’ perceptions of the programme through interviews with staff, focus groups, and online teacher surveys. The project was funded as part of the EEF Digital Technology funding round in collaboration with the Nominet Trust.

Key conclusions

1. Children in MathsFlip schools made the equivalent of one additional months’ progress in maths, on average, compared to children in comparison schools. The three padlock security rating means this result is moderately secure.
2. The impact on maths was slightly higher for children eligible for free school meals (‘FSM pupils’) than for all children in the trial. These results are less secure than the overall findings because of the smaller number of pupils.
3. Children in MathsFlip schools made three additional months’ progress in reading and writing, on average, compared to children in the other schools. However, this result should be treated with caution. First, there is not an obvious route by which this maths intervention could improve literacy results so much more than maths results. Second, the relatively small number of schools involved increases the likelihood that we would see a result like this just by chance rather than due to the intervention itself.
4. The majority of teachers in the trial were very positive about the flipped learning approach and the technical and professional support they received from Shireland staff. The process evaluation suggests this support was necessary for successful implementation.
5. Some teachers experienced technical problems with the online platform; these were generally dealt with quickly by the developers. Some pupils did not have internet access at home: this led some schools to set up homework clubs providing online access.

EEF security rating

These findings have moderate security. This trial was an efficacy trial which tested whether the intervention worked under developer-led conditions in a number of schools. The trial was a well-designed two-armed randomised controlled trial. Relatively few pupils—only 7% of those who started the trial—were not included the final analysis. The pupils in MathsFlip schools were similar to those in the comparison schools in terms of levels of FSM eligibility and prior attainment. However, the trial was

powered to detect an effect of 0.37, higher than the expected EEF maximum of 0.2. Therefore, two padlocks were lost, reducing the security of the trial.

Additional findings

MathsFlip appeared to have only a small impact on KS2 mathematics achievement at the end of Year 6. The impact observed for KS2 reading and writing outcomes was higher, however this result should be treated with caution for two reasons. First, there is not an obvious route by which this maths intervention could improve literacy results so much more than maths results. Second, the relatively small number of schools involved increases the likelihood that we would see a result like this just by chance rather than due to the intervention itself.

Despite some initial start-up problems and challenges with teachers' lack of familiarity with the technology, both teachers and pupils reported very positive perceptions of the intervention. Some teachers did comment that it demanded a high level of independence from pupils and support from parents to make the approach work. There were issues with accessing the online platform at home for some pupils. Teachers positively rated the support that they received from the Shireland implementation support staff.

Cost

MathsFlip cost about £4,400 per school, or £147 per pupil per year when averaged over three years. Schools also need to meet the cost of staff cover for 3 days of training for each participating teacher. Participating pupils also need access to the internet to complete activities outside of class time, either at school or at home.

Summary of impact on main outcomes

Outcome/ Group	Effect size (95% confidence interval)	Estimated months' progress	No. of pupils	p-value	EEF security rating	EEF cost rating
KS2 Maths	0.09 (-0.28 to 0.46)	1	1,129	0.62		£££££
KS2 Maths FSM pupils	0.10 (-0.21 to 0.40)	2	426	0.49	N/A	£££££

Introduction

Intervention

'Flipped learning' (often referred to as the 'flipped classroom' or 'blended learning') is an approach in which pupils are given assignments to do at home on computers or tablets and teachers collect feedback prior to the lesson. These may include video lessons made by the teacher or online activities related to the content. This pre-learning experience enables the teacher to use classroom time for activities such as co-operative learning, problem-solving, projects, and attending to individual difficulties. Prior to the lesson, pupils access concepts and acquire knowledge at home, thus teachers spend more lesson time working on problem-solving and on higher order thinking tasks in class to help develop pupils' thinking.

The intervention was delivered from April 2014 to April 2015 to the treatment group and from April 2015 to the control schools (with the new Year 5 pupils). The MathsFlip programme was developed by Shireland Collegiate Academy taking as a basis the flipped learning approach that was implemented by Shireland teachers.

The key element of the MathsFlip programme was the online learning environment, based on the Microsoft Office 365 platform, which provided teachers and pupils with resources for learning mathematics outside the classroom. The learning platform was developed by Shireland staff and consists of two main elements: (1) the class site and (2) the learning zone. The class site was a personalised page for each class. It contained individual areas where teachers could upload resources for colleagues and pupils to access (such as videos, links, and documents) and shared areas that allowed collaborative communication among the members of the class (for example, announcements, calendar, discussions).

The learning zone was a resource bank based on the learning objectives for mathematics according to the national curriculum. The learning zone allowed teachers to access resources specific to the topics they selected. These selected resources were then shared with the pupils through class sites. Resources were organised by topic, Year (that is, level of difficulty), and presentation type (for example, video, Power Point). Resources included maths games and teaching programmes such as Mangahigh and MyMaths.

The MathsFlip approach depended on the pupils having access to laptop computers (Shirelands supplied 30 laptops to each school which pupils could take home). In multiple form entry schools, staff had to manage this process to ensure equality of access for pupils. It also depended on pupils having internet access at home to work on learning activities after school. Where this was not the case, schools provided lunchtime, before-school, or after-school sessions during which pupils could complete these activities.

Year 5 teachers were trained in the use of the MathsFlip platform in two hands-on day-long sessions. This was repeated with Year 6 teachers as pupils progressed to the next academic year. The project directors, project manager, and the e-learning team (members of the Shireland Collegiate Academy staff) delivered the training using the MathsFlip methodology. The aims of the training were to:

- introduce the flipped learning methodology;
- explain how MathsFlip could be used to support the delivery of mathematics; and
- access the MathsFlip online area (the learning zone) and work with the different tools (for example, to enable the embedding of videos or uploading work).

On the first day of the training, teachers were introduced to the flipped learning approach and shown how this might look in mathematics. They were also shown how to use the MathsFlip resources in their mathematics teaching. Following an evaluation at the end of the day, the second day focused on technical support and how to use the class sites. For the second day, teachers self-selected the right

level of training based on their previous knowledge and confidence of flipped learning and their use of technology. These initial sessions were followed up by a further session six months later where teachers evaluated the kind of extra support they needed resulting in the creation of a support plan to meet their individual needs. As a result, one large school with four Year 5 teachers asked for additional training; in response, the project manager attended the school to deliver two more sessions.

In addition to the initial training, treatment schools received ongoing support. The project manager made regular visits to the treatment schools to help them with the planning and delivery of some activities. She visited every school and helped teachers to write an action plan to think about how the programme could be implemented in their school. She provided feedback on the lessons and coached teachers who needed extra support. Furthermore, hands-on workshops were organised in schools to explain the approach to parents and to show them how to access the resources and how to assist their children in using the learning materials.

Background evidence

The flipped learning approach has been widely used in the last decade, largely in secondary and higher education contexts (Bentley, Allan and Belton, 2014; Dunn, 2013; Educause, 2012; Flipped Learning Network, 2014; Vincent, 2013). Opinions exist, published mainly in blogs, teachers' forums, and practitioner-oriented magazines, suggesting that the approach might work in other settings (Bergmann and Sams, 2012; Fulton, 2012, Moran and Young, 2015). Teachers all around the world are trying the approach in their classrooms and many report positive perceptions in the Flipped Learning Network (FLN).

A recent review suggests rationales for why flipped learning might improve learning, but they do not present actual comparisons of flipped learning and traditional teaching (Hamdan *et al.*, 2013). Most of the studies are from higher education settings. However, caution should be employed as sometimes students can become disengaged with flipped or blended learning programmes, with one study suggesting that up to 25% of pupils had become disengaged with the approach (Loch and Borland, 2014). If students do not complete the prerequisite activities or readings before class they are less likely to be able to engage with the in-class activity. Although the flipped learning methodology is now used in the U.K. it has not been assessed rigorously in a U.K. context. Furthermore, there do not seem to exist any rigorous studies with comparison groups at the primary education level. Therefore there are no studies to base effect size estimates on. It is important to conduct a study to determine if there is evidence behind what is becoming a popular approach.

Given the popularity of flipped learning and the weakness of the evidence base, the EEF and Nominet Trust co-funded a one year randomised controlled trial (RCT) to provide some high quality evidence on the impact of flipped learning in English schools. This was part of a funding round focused on digital technology.

Shireland Collegiate Academy is widely acknowledged as a leading school in its use of technology. Shireland had been using technology and flipped learning in its classrooms for several years and believed that it was able to take the model to other schools. As such, it developed the MathsFlip project to train primary school teachers to implement a flipped learning approach to maths with Year 5 and Year 6 pupils.

An efficacy trial was conducted to provide evidence of impact using a robust RCT design.

Evaluation objectives

The Institute for Effective Education (IEE) conducted an impact and process evaluation to rigorously test the effectiveness of the intervention by means of a randomised controlled trial. This efficacy evaluation was designed to assess whether flipped learning had an impact on pupils' numeracy attainment and pupils' performance in mathematics at Key Stage 2. A process evaluation was also

conducted to develop an understanding of the MathsFlip approach and assess teacher and pupil perceptions of it.

Ethical review

The evaluation team obtained ethical approval from the Department of Education, University of York Ethical Review Panel on 29 January 2013. Headteachers signed an agreement outlining the main commitments of the three parties in the study: the school, the project developers, and the evaluators. The evaluation team provided information and opt-out consent forms for parents and guardians.

Data management was in accordance with the Data Protection Act (1998). The trial database is securely held and maintained on the University of York's research data protection server, with non-identifiable data. Confidentiality is maintained and no one outside the trial team has access to the database. Data was checked for missing information and double entries. All outputs were anonymized so that no schools or students can be identified in any report or dissemination of results.

Project team

Dr Peter Rudd, Principal Investigator (retired January, 2016).

Dr Alaidde Berenice Villanueva Aguilera, Research Associate.

Ms Louise Elliott, Data Manager.

Professor Bette Chambers (took over write-up of final report February, 2016).

Trial registration

This trial was registered at ISRCTN, number 20851469.

<https://www.isrctn.com/search?q=&filters=intervention%3AMathsFlip%2CfunderName%3AEducation+Endowment+Foundation&searchType=advanced-search>

Methods

Trial design

A two-armed randomised controlled efficacy trial was carried out. Randomisation at school level was preferred over randomisation at class level to avoid 'contamination' within schools and increase the possibilities of collaboration among teachers within each school.

Schools participating in the project paid £1,000 each and received training and support for their Year 5 teachers from the MathsFlip team from Shireland Collegiate Academy in spring 2014 for the treatment schools, or after the evaluation was completed for the control schools. These teachers implemented the MathsFlip approach from April 2014 through to April 2015. The developers intended that Year 5 teachers would follow their pupils into Year 6, however this is not common practice in schools so most pupils in Year 6 had different teachers (who were also trained in MathsFlip). Shireland responded by training the teachers in Year 6 at the end of July and beginning of September. This made the intervention a year-long treatment spanning two academic years. However, limited engagement from Year 5 teachers who only had one term with pupils did delay the embedding of the approach with these pupils.

Teachers in the control group delivered 'business as usual' maths lessons. Year 5 teachers in control schools received the training and support from April 2015 and worked with their current Year 5 pupils who then continued with the approach into Year 6.

Participant selection

All primary schools with high proportions of pupils with FSM eligibility in Birmingham and the Black Country area were eligible to express an interest in the project. Schools were invited to participate by Shireland Collegiate Academy project staff. Although the schools were geographically close they were not a network or a fixed group prior to participation in the project.

Fifty-two schools expressed an interest in participating in the study; 24 were selected by the IEE, choosing those that had low prior attainment and high levels of socio-economic deprivation (based on the proportion of pupils receiving free school meals).

Prior to randomisation, a launch event took place at the Botanic Gardens in Birmingham. Staff members from all 24 schools selected for the project were invited to meet the project partners (funder, deliverer, and evaluator) and learn about their role in the project. Nearly all the headteachers and Year 5 teachers from the 24 schools, along with other interested parties (such as governors) attended this event.

Also prior to randomisation in March 2014, headteachers of each school were briefed on the objectives of the programme. Consent was obtained from each school by means of a letter sent to the headteacher and the potential MathsFlip co-ordinator (the latter identified when the schools volunteered to participate). The letter explained the purpose and nature of the evaluation and was signed by the headteacher at each school once it was chosen to participate.

Headteacher consent was obtained before randomisation. In January 2014 a letter was sent, via the schools, to parents and this included an opt-out form if a parent did not wish for their child to take part in the evaluation activities. Parent assemblies were also organized to provide further information on the programme and evaluation. (See Appendix 8 for the headteacher consent forms and Appendix 9 for the parent letter and opt-out forms.)

Thirty laptops were delivered to each school. If schools were larger than single form entry schools the school either provided laptops to the children or classes shared the laptops that Shireland gave them. Control schools were loaned laptops, but only after the trial had finished.

Outcome measures

KS1 mathematics assessments were used as the primary baseline measure. However, since KS1 SATs are assessed by the class teachers, an additional test—Progress in Maths (PiM)—was administered to establish baseline equivalence between treatment and control groups.

There was some discussion about whether to use the PiM test (an online test developed by GL Assessment had been administered by teachers in March 2014 prior to randomisation under examination conditions) or use national Key Stage tests. It was not possible to obtain all the data from the pupils who sat the baseline test and so it was collectively decided—between the EEF and IEE—that the KS1 results would be the key baseline measure in the final intention-to-treat analysis and the PiM scores would not be used.

The KS2 maths score was the primary outcome measure, obtained by the evaluator from the National Pupil Database. The schools sent the unique pupil numbers (UPNs) of the pupils in the study to the evaluator who requested the matched KS1 and KS2 scores for each pupil. These measures are high in contextual validity as they constitute the main indicators of pupils' academic performance in England. Pupils in the intervention and control arms of the trial cohorts sat the KS2 tests in May and June 2015.

The secondary outcomes were KS2 average point score, and English—defined as reading and writing scores at KS2. Writing and reading outcomes were chosen to examine the potential spill-over effect of MathsFlip to other subjects. The protocol also states that attendance data and pupil engagement with the flipped learning virtual learning environment would be collected. Shireland collected this data but it was not requested by the IEE at the time of analysis therefore it is not possible to include in this evaluation report.

Statistical power was assessed using Optimal Design software. Based on prior experience with similar clustered analyses, assumptions and details were made as follows and included in the protocol:

- number of schools: 24;
- students per school per year group: 60;
- classes per school: 2;
- pre-post (KS1-KS2) correlation (squared): 0.60;
- intraclass correlation (KS2): 0.15;
- criterion for statistical significance: $p < 0.05$;
- Minimum Detectable Effect Size: in the protocol, 0.20 (calculations made after the study was finished suggest that the MDES at the protocol stage should have been 0.33 not 0.20 as stated in the protocol; the number of schools in the trial limits the power to detect an effect size of 0.33); and
- power: 0.80.

Randomisation

As described above, the IEE selected 24 schools to participate. The lead evaluator matched schools in pairs based on similarities in prior attainment (percentage of pupils achieving level 4 or above in KS2 maths scores in 2013), pupil premium eligibility, and proportion of FSM pupils (EVERFSM). The IEE data manager, who knew nothing about the specific schools, then assigned one school of each pair to the treatment group and the other to the control group using a random number generator.

Analysis

The ITT (intention to treat) analysis of the primary outcome—pupils' KS2 maths fine grade scores (KS2_KS2MATFG)—used multilevel modelling (MLM), an analysis in which pupils were nested within schools. Because randomisation was carried out using matched pairs, the pairings were accounted for by including them as an extra level in the analysis. This resulted in a three-level model, with Pupil nested within School nested within Pair as random effects. The MLM analysis used degrees of freedom associated with the number of schools, not the number of students. Pupils in schools randomly assigned to flipped learning were compared to those in the randomly assigned control group schools, controlling for their KS1 maths scores (KS1_MATPOINTS).

Secondary analyses of pupils' KS2 fine grade Average Point Score (KS2_KS2APSG), fine grade reading (KS2_KS2READFG), and fine grade writing (KS2_KS2WRITAFG) scores were conducted using the same model controlling for the corresponding subject's KS1 points scores. The protocol also states that data on attendance would be included as a secondary outcome. However, this data was not requested by the evaluators so this analysis could not be done.

Subgroup analyses were conducted for KS2 mathematics outcomes for boys, girls, and pupils eligible for FSM, controlling for their KS1 maths points scores. An analysis comparing high, average, and low achievers was conducted. The pupils were categorised as 'high', 'average', or 'low' achievers based on a division of the KS1 mathematics scores into three levels of similar size.

It was also intended that an analysis of pupil engagement with the flipped learning VLE would take place to analyse if the degree of engagement had an impact on outcomes for those pupils in the treatment arm. We did not collect this data, therefore this analysis could not be conducted.

The effect size was calculated using Hedges' *g*. Since this was a cluster randomised trial, there are options for the calculation of the effect size (Hedges, 2007). Accordingly, we calculated the effect size using the difference between the arms in the adjusted means (accounting for pairing) divided by the unadjusted total standard deviation in the KS2 outcome.

Implementation and process evaluation

A process evaluation was conducted to develop an understanding of the context of the MathsFlip approach, of the day-to-day delivery of the intervention, and the teachers' and pupils' perceptions. Five research instruments were developed to provide a detailed picture of implementation of the programme and of perceptions of it. It also helped to inform and explain the impact evaluation findings. The five elements were:

- interviews with implementation staff (see Appendix 1);
- online teacher surveys (see Appendices 2 and 3);
- telephone interviews with teachers (see Appendix 4);
- school visits that included class observation (see Appendix 5); and
- focus groups with teachers and pupils (see Appendices 6 and 7 respectively).

Interviews with implementation staff

In order to obtain a full understanding of the context and the rationale for MathsFlip, five in-depth face-to-face interviews were conducted with implementation staff from Shireland Collegiate Academy including the Headteacher, the Project Director, the Project Manager, the Director of Learning and the IT technicians who supported the project (see Appendix 1).

The interviews were conducted to gain an in-depth understanding of the nature of the programme including its origins and development as well as the process for training and implementation. The interviews were conducted by two members of the evaluation team and were fully transcribed. The

transcripts were analysed via qualitative content analysis (Schreier, 2014). A coding frame was developed and the transcripts were analysed in a systematic way to develop a detailed understanding of:

- the design and development process;
- the aims and intended outcomes of MathsFlip;
- the core and flexible components of the model;
- how the approach can be differentiated from standard classroom practice;
- training and implementation support offered to schools; and
- barriers and potential challenges for implementation and delivery.

Online staff surveys

Two online surveys were administered to all Year 5 and Year 6 teachers in both treatment and control groups (those teachers who were implementing or were likely to implement MathsFlip in the future). The first survey was administered in April–May 2014. Results from this first survey provided a ‘baseline’ view of teachers’ perceptions regarding MathsFlip. The second survey was administered to the same teachers in May–June 2015, a bit later than planned to give more time for implementation of the intervention.

Topics covered by the surveys included:

- details of the school context and contexts for mathematics teaching;
- teachers’ role, experience, age, and qualifications;
- previous experience of other mathematics approaches or interventions;
- current approaches to teaching mathematics;
- views about methods for teaching and learning mathematics;
- (for treatment schools) views about the programme, challenges, and successes in the MathsFlip approach; and
- (for control schools) the extent to which new technologies are used in mathematics teaching and learning.

The protocol also stated that ‘patterns of achievement in the schools generally and in mathematics as a subject’ would be collected. This was not collected via the process evaluation (but was via the impact evaluation).

The survey findings were analysed longitudinally to compare views over one year, and cross-sectionally, prior to the start of the intervention and towards the end of the evaluation, in order to control for previous perceptions and to compare control and treatment schools.

Telephone interviews

Eleven telephone interviews were conducted in March 2015 with the flipped learning co-ordinator at intervention schools. The aim of these interviews was to collect detailed information about the implementation of the programme and challenges and successes up to the day of the interview (see Appendix 4). These were conducted later in the school year than outlined in the protocol to better capture what was happening in the implementation. Results from the interviews provided formative findings to the evaluation. Two members of the evaluation team conducted these semi-structured interviews following a predetermined set of questions based on topics featured in other research instruments, including the online surveys. When appropriate, the evaluators prompted the teachers to provide further details or additional examples.

School visits

Four school visits to treatment schools were carried out by two members of the evaluation team to allow triangulation of the results. The visits included:

- an observation of a mathematics lesson (30–60 minutes);
- a 30-minute focus group with teachers; and
- a 20-minute focus group with pupils.

Four schools were randomly chosen and invited to participate by hosting a school visit. One of these schools declined a visit due to pressure from a forthcoming Ofsted inspection, and this was replaced with another randomly selected school.

A pre-set observation sheet was developed using the cognitive dimensions of Bloom's taxonomy (Bloom *et al.*, 1956; see also Anderson and Krathwohl, 2001) as this is linked to the Higher Order Thinking Skills (HOTS) encouraged by MathsFlip and the principles of MathsFlip delivered in the training day. This observation sheet was used to evaluate the activities, engagement, and mathematical processes carried out during the lesson (see Appendix 5). The observation sheet was based on the aims of MathsFlip and was developed in consultation with Shireland's project staff.

Two schedules were developed to guide the discussions in the focus groups with teachers and pupils. The questions asked for views, challenges, and successes of the project as well as the extent to which the approach could be used in other subjects. The teachers were selected by the schools based on their availability (groups ranged from one to four teachers) and the students were randomly chosen from the observed lesson by the evaluator (groups ranged from four to ten pupils).

Costs

Costs were collected from the Shireland staff. These included costs for setting up the technology and the virtual environment resources, annual software licenses, as well as costs for training teachers and providing ongoing support.

We considered the equipment costs for laptops and trolleys a prerequisite cost for two reasons. First, the laptops were loaned to the schools and at the end of the evaluation they returned them to Shireland so they could be used by the delayed-treatment control schools. Second, with the increasing use of laptops or tablets in schools, it is more likely that schools will already have this equipment.

To calculate the cost per pupil, we divided the total cost over three years by the number of pupils at the time they were randomised. The total cost per pupil was divided by three to obtain a per pupil per year cost.

School staff time was not estimated as an additional cost because the training was completed on scheduled days for professional development so supply cover was not required. The time for implementation of MathsFlip was during regularly scheduled teaching time.

Timeline

A two-armed randomised-controlled trial was conducted from spring 2014 to spring 2015, with 12 schools in the treatment group and 12 in the control group. Schools participating in the treatment group received training and support in the MathsFlip intervention beginning in spring 2014. They implemented the MathsFlip approach from April 2014 through to April 2015, with pupils beginning in Year 5 and following on into Year 6. Thus the intervention overlapped two school (academic) years, but actually lasted one calendar year. Schools participating in the control group acted as a delayed treatment group and received the training and support for their Year 5 teachers from April 2015—one year after the first implementation cycle had begun.

Since the Key Stage results were our main outcome, we focus on these results in this report. A full timetable for the main project activities is presented in Table 1.

Table 1: Timetable for the evaluation

Date	Activity
November–December 2013	Recruitment of schools
January 2014	Teacher and parental consent sought
March 2014	Randomisation
April–May 2014	Online teacher surveys (baseline)
April 2014	Intervention with treatment schools began
April 2014–April 2015	Intervention implemented in treatment schools
July 2014	Interviews with Shireland project staff
March 2015	Teacher telephone interviews
March 2015	School visits (observation and focus groups)
May–June 2015	Online teacher surveys (post-intervention)
May 2015	All treatment and control pupils sat KS2 SATs
April 2015	Delayed intervention with control schools began
April 2014–April 2015	Intervention implemented in control schools

Impact evaluation

Participants

The recruitment process was very successful. Details of the school characteristics, presented in Table 2, show that the control group had more pupils, on average, than the treatment group and a higher percentage of the control schools were academies (33% compared to 25%). A third of the control schools were urban schools, while none of the intervention schools were. The proportion of pupils receiving FSM was similar (23% for treatment schools versus 26% for control schools). A smaller proportion of pupils in treatment schools had English as an Additional Language (EAL) compared to control schools. The treatment schools had somewhat higher Ofsted ratings than the control schools. The control and treatment schools had similar KS1 average mathematics point scores. These averages, all under 16, were out of a maximum possible score of 27.

A couple of characteristics might have benefitted the intervention group, those being the smaller size (average 380 pupils for intervention schools and 442 for control) and a smaller proportion of EAL pupils, and that none of the intervention schools were categorised as urban. However, the fact that the proportion of FSM pupils was quite close would make them seem more similar.

Table 2: Baseline characteristics

Variable	Intervention group		Control group		Difference
School-level (categorical)	n/N (missing)	Percentage	n/N (missing)	Percentage	
Academy	3/12 (0)	25%	4/12 (0)	33%	1
Ofsted rating:					
Outstanding	3/12 (0)	25%	3/12 (0)	25%	0
Good	8/12 (0)	67%	5/12 (0)	42%	3
Requires improvement	1/12 (0)	8%	4/12 (0)	33%	-3
Inadequate	0	0	0	0	0
Urban	0	0%	4	33%	
Town and fringe	12	100%	8	67%	
School-level (continuous)	n (missing)	Mean	n (missing)	Mean	
KS1 maths score	12/12 (0)	15.75	12/12 (0)	15.44	0.31
Pupil-level (categorical)	n/N (missing)	Percentage	n/N (missing)	Percentage	
Eligible for FSM	87/380 (0)	23%	114/442 (0)	26%	-3%

EAL	111/380 (0)	29%	195/442 (0)	44%	-15%
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Figure 1 presents the number of participants at each stage of the evaluation. At follow-up, data from 74 pupils (25 from treatment, 49 from control) was unavailable. A sensitivity analysis was not conducted because the attrition rate was less than 6% and no school was eliminated from the main analyses.

Figure 1: Participant flow chart

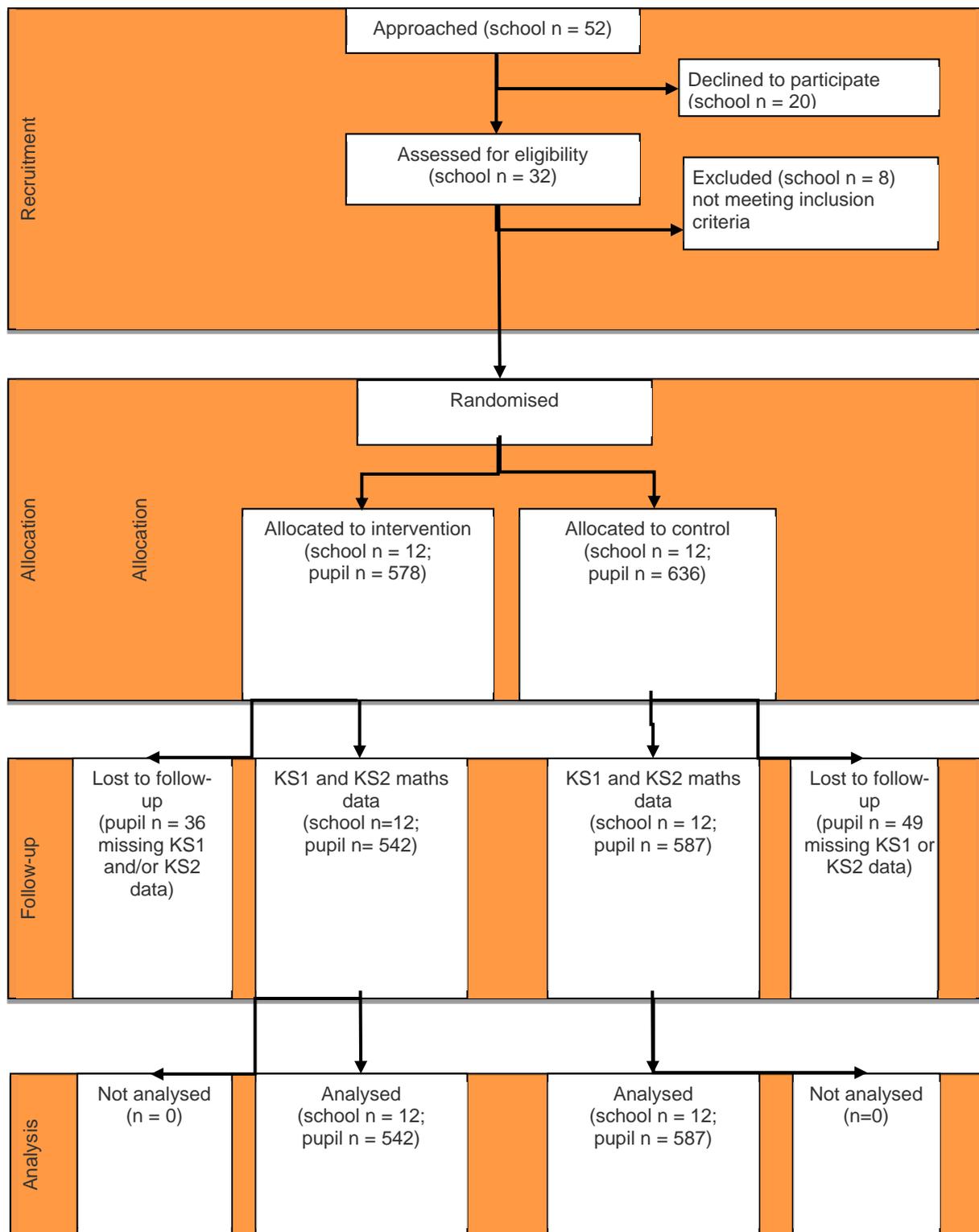


Table 3 demonstrates calculations of the minimum detectable effect size at different points in the evaluation: in the protocol, after randomisation, and in the ITT analyses.

Table 3: Minimum detectable effect size at different stages

Stage	N [schools/ pupils] (n = intervention; n = control)	Correlation squared between pre- & post-test	ICC	Pair matching	Power	Alpha	Minimum detectable effect size (MDES)
Protocol	24 schools/ 1,440 pupils (720; 720) Average cluster = 60	0.60	0.15	12 matched pairs of schools	0.80	0.05	0.33
Randomisation	24 schools/ 1,214 pupils (578; 636) Average cluster = 51	0.52	0.16	12 matched pairs	0.80	0.05	0.37
Analysis	24 schools/ 1,129 pupils (542; 587) Average cluster = 47	0.52	0.16	12 matched pairs	0.80	0.05	0.38

Outcomes and analysis

Overall analyses for primary and secondary outcomes

The MathsFlip approach had little impact on the mathematics achievement of pupils at the end of KS2. It had more impact on the secondary outcomes, controlling for their KS1 scores (see Table 4), particularly on reading and writing. In each analysis the covariate was the corresponding KS1 score, with Maths KS1 being used in the analysis for KS2 Maths outcomes and the KS1 ReadWrite score being used in the analysis for both Reading and Writing outcomes and the Average Point Score. The KS2 fine grade score was used for all of the post-test outcomes.

Missing Data

For the primary analysis, 7% of the data is classed as missing. A sensitivity analysis was not conducted because the school-level attrition rate was low and no school was eliminated from the main analyses.

Table 4: Analyses for primary and secondary outcomes

Outcome	Raw means				Effect size		
	Intervention group		Control group		n in model (excludes missing) (intervention; control)	Hedges g (95% CI)	p-value
n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)				
KS2 Maths (fine grade)	542 (36)	29.10 (28.63; 29.56)	587 (49)	28.68 (28.26; 29.09)	1,129 (542; 587)	0.09 (-0.28; 0.46)	0.62
KS2 Average Point Score	545 (33)	28.75 (28.36; 29.14)	587 (49)	28.28 (27.93; 28.64)	1,132 (542; 587)	0.21 (-0.20; 0.62)	0.30
KS2 Reading (fine grade)	546 (32)	28.51 (28.13; 28.88)	587 (49)	27.85 (27.48; 8.22)	1,133 (542; 587)	0.22 (-0.13; 0.57)	0.21
KS2 Writing (fine grade)	546 (32)	28.44 (28.05; 28.83)	587 (49)	27.92 (27.55; 28.30)	1,133 (542; 587)	0.24 (-0.11; 0.59)	0.17

Subgroup analyses

Further analyses were conducted for each sub-group: no significant impact of MathsFlip on KS2 maths scores was detected. Almost all outcomes had positive effect sizes but there was a fractionally negative effect of -0.01 for low achievers and -0.03 for high achievers. However, none of these effects were significant. (See Table 5 for the sub-group analyses.)

Table 5: Subgroup analyses for KS2 maths fine grade scores.

Subgroup	Raw means				Effect size		
	Intervention group		Control group		n in model (intervention; control)	Hedges g (95% CI)	p-value
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)			
Boys	287 (14)	29.27 (28.60; 29.93)	319 (11)	29.07 (28.47; 29.66)	606 (287; 319)	0.06 (-0.32; 0.45)	0.72
Girls	255 (11)	28.90 (28.26; 29.55)	268 (13)	28.21 (27.66; 28.77)	523 (255; 268)	0.13 (-0.27; 0.53)	0.51
Ever FSM	195 (8)	28.76 (27.95; 29.57)	231 (10)	27.46 (26.87; 28.04)	426 (195; 231)	0.10 (-0.21; 0.41)	0.49
Low Achievers	136 (2)	24.35 (23.47; 25.23)	168 (2)	24.32 (23.61; 25.03)	304 (136; 168)	-0.01 (-0.30; 0.27)	0.92
Medium Achievers	154 (0)	28.41 (27.87; 28.95)	183 (0)	28.12 (27.67; 28.57)	337 (154; 183)	0.20 (-0.32; 0.72)	0.43
High Achievers	252 (1)	32.24 (31.69; 32.79)	236 (1)	32.28 (31.76; 32.80)	488 (252; 236)	-0.03 (-0.30; 0.36)	0.85

Cost

This section estimates the cost of a school purchasing MathsFlip. Table 6 outlines the estimated costs for schools delivering MathsFlip over three years. These costs include the costs of technology set-up and integration, virtual environment set-up, and Shireland staff time for training teachers, but assumes that the schools already have computers or tablets and basic internet services.

The cost per pupil was calculated by dividing the total cost over three years provided by Shireland staff (£536,600) by the number of pupils at the time they were randomised (1,219), making £440.20. That estimated cost was divided by three to obtain a per pupil per year cost of £146.73.

Table 6: cost of delivering MathsFlip over a three-year period

Item	Type of cost	Cost	Total cost over 3 years	Total cost per pupil over 3 years
Technology set up and integration and virtual environment set-up	Start-up cost	£140,000	£140,000	£114.85
Annual licenses and ongoing technological support	Running cost per school	£58,700	£176,100	£144.46
Training	Start-up cost	£4,500	£4,500	£3.69
Ongoing pedagogical support	Running cost per school	£72,000	£216,000	£177.19
TOTAL			£536,600	£440.20

The equipment costs (£136,000 or £5,667 per school for 30 laptops and a trolley) were considered a prerequisite cost. School staff time was not provided by Shireland as there were no supply cover costs and the intervention took place during normal teaching hours. It should be stressed, however, that there are many costs, including teacher time, which are not included in these figures. It does not include the additional time that the intervention teachers spent planning lessons. They attended training, studied MathsFlip materials, and spent time assisting pupils with the new programme, though we do not have figure for these activities.

Process evaluation

The results from the five research instruments that were administered provide a detailed picture of implementation of the programme and of teachers' and pupils' perceptions. These results come from the lesson observations, interviews with Shireland implementation staff, focus groups with teachers and pupils participating in the intervention, telephone interviews with teachers, and online surveys. Data collected from these instruments was analysed and combined by means of triangulation and is summarised below to provide information about how school staff and pupils viewed the MathsFlip approach.

The teacher surveys, pre- and post-intervention, were one of the main sources of information for the process evaluation. Fifty-four teachers from 21 schools completed the baseline survey but only 11 teachers from 8 schools completed the post-intervention surveys. As there were so few post-implementation surveys and not all of them completed by the same teachers as the baseline survey, no conclusions can be made about changes from baseline to post implementation.

Implementation

Two key elements were identified which indicated the likelihood of successful implementation: ongoing support for teachers and ample mathematics resources.

Ongoing support for the duration of the intervention from Shireland staff—both technical and professional—was highly valued by teachers. Teachers reported that in the early stages of implementation they had concerns about their own lack of technical knowledge and that these concerns were relieved by the technical and professional support received. Technical problems with online connectivity and maintenance of the laptops were solved promptly by the IT support staff. The IT expert had the knowledge to sort out school-specific issues related to connectivity. The prompt responses translated into pupils having the adequate tools when needed and teachers focusing their efforts on the teaching aspects rather than sorting out technical problems.

Professional pedagogical support was provided by the Shirelands project manager. After the initial training, she visited the schools on a regular basis to help teachers who requested it and also to provide training for new teachers joining the schools partway through the intervention. Teacher interviewees indicated that her constant support and use of coaching techniques was invaluable, especially at the beginning of the project when teachers were experiencing difficulties in implementing the programme.

Mathematics resources provided in the MathsFlip platform were the second element identified by teachers as making the intervention successful. The maths support provided during the project included a suite of online resources linked to the programme of study. These resources included advice and guidance about how to use the MathsFlip methodology and links to individual online mathematics resources provided by the project partners such as MyMaths, Mangahigh, and MathsWatch. Teachers commented positively on the variety of resources and the ease with which they provided pupils with extra practice tailored to their level. They also commented on the immediate feedback received from the software on the areas where pupils had had problems. This allowed them to plan and prepare the in-class activities in advance that best suited pupils' different abilities. The pupils, in their focus groups, also commented on how they enjoyed and benefitted from using these resources.

Challenges

There were two kinds of challenges faced during the implementation: technical and human. Regarding the former, teachers and pupils reported having problems with online access or with the laptops—both at school and at home. Teachers acknowledged their lack of IT knowledge to solve daily problems with the laptops. One even mentioned being 'afraid of touching the laptops'. However, all teachers recognised that the support provided by Shireland had been crucial in the continuity of the intervention. They emphasised the quick response to their problems, sometimes within the same morning. At home,

the main challenge was internet access. Despite the technical problems, alternatives were found to provide pupils with the materials and activities if they could not access them at home. One common example across the schools was the use of after-school or lunch clubs. Students who did not have home internet access, or who had not done the work at home, were invited to participate in the clubs in order to ensure that all the pupils had covered the content necessary to participate in the maths lesson. One teacher also mentioned that some activities could be downloaded at school to avoid problems with the internet at home.

The second group of challenges were the human ones. Within this group, the main concern of teachers was the lack of time to plan lessons—teachers reported that extra time was needed. However, they recognised, with the exception of one teacher, that the amount of resources and support provided by Shireland had been outstanding.

Parents' responses to the project were generally positive, with the exception of one school where teachers perceived a limited involvement from parents (this was not a reflection on MathsFlip—these parents generally lacked involvement with the school). Parents' support is key to motivate and supervise students' activities at home. This lack of involvement resulted in a small percentage of students (estimated at 10% to 15%) not doing the tasks at home. This proportion is less than the 25% of disengaged pupils reported by Loch and Borland (2014).

Two further factors that played an important role in a successful implementation were mentioned in the teacher interviews. One teacher reported that it was difficult to ensure that all the staff (full time and part time) would have access to the same information during the implementation stage. Second, it was emphasised that pupil independence is necessary for the approach to work. Pupils are responsible of their own learning at home which is later transferred and applied at school. If pupils are not independent learners and fail to learn to organise their time, it can hinder the aim of the activities planned for the lessons.

Overall, teachers found the intervention attractive and some mentioned that they are using similar approaches in other subjects such as history, geography, and science. They were confident in recommending the approach to other schools and some had even mentioned it to their local networks.

Fidelity

Because objective implementation fidelity data was not collected by the evaluators, we cannot definitively say how well the programme was implemented nor its effect on pupil achievement. This section reports on some indicators of implementation fidelity assessed through teachers' attendance at the training sessions, direct observation of maths lessons in four of the treatment schools, and through Year 5 teachers' views on the follow-up support provided by the Shireland project manager. A total of 16 teachers from the 11 treatment schools attended the two-day sessions in spring 2014. Where new staff joined the project at later stages, the project manager delivered the same training sessions in the school.

Two members of the evaluation team observed an hour-long maths lesson in each of four schools. These observations took place in March and April 2015. An observation form was used to reach consistency in the observed areas (see Appendix 5). The observation aimed to detect whether the use of Higher Order Thinking Skills (HOTS) were used in class as a result of the pre-learning at home via the MathsFlip platform.

All the observed lessons included mixed ability groups. Pre-lesson tasks had been given to complete at home. The online tasks were mainly activities designed to review or test pre-learned concepts. It was evident from the observations that pupils had plenty of opportunities during the lesson to share what they had learned at home and to explain the strategies used to solve real-life problems. Enough time was also allowed for pupils to analyse the information of the problems posed in class. Deeper learning was observed when students solved the problems using both the analysis of information and their prior knowledge.

Learning activities catered for pupils with different abilities. It was observed that teachers provided tasks with different levels of difficulty so students could choose an activity suitable to their level and, if they succeeded, could challenge themselves and try a more difficult one. Teachers kept pupils engaged through the use of 'challenged' and 'super-challenged' activities. Pupils were also engaged through games and real-life activities, for example planning a trip to London.

In-class activities were designed to create discussions of how to solve problems. Pupils had to consciously share with their peers the steps to solve a problem so they could demonstrate understanding of knowledge and also help other pupils to address any misconceptions. This allowed them to break down complex problems into simpler parts.

In summary, the data from the surveys, focus groups, and observations suggests that MathsFlip was delivered well and behaviour in the class reflected the key components of a flipped learning approach. This implementation overview does not suggest that failure to implement the intervention was responsible for the lack of impact on pupils' achievement; however, there was limited data collected on actual implementation fidelity so we cannot be sure about this.

Perceptions

Teachers

Teachers' perceptions of the MathsFlip programme were very positive, as demonstrated in the surveys, interviews, and focus groups. Although most teachers said in surveys and interviews that the programme did not have a major impact on their teaching style, they recognised that the approach greatly influenced their planning. This change was perceived to be at least partly a consequence of the accurate pupil assessment gained before the pupils entered the classroom. Teachers accessed the online resources to see what their pupils did at home and how successful they were. Pre-assessment information helped teachers plan activities accordingly to support the weak areas faced by pupils in their homework. Moreover, teachers were able to plan differentiated activities suitable for each student resulting in a more personalised teaching experience. Teachers mentioned that they were more flexible with the working groups in the lessons. They could divide their class into smaller groups, based on the information received, to target smaller pupil groups and provide further assistance to the pupils that needed it the most.

MathsFlip helped to cover and revise more areas than if the knowledge was exclusively delivered in the classroom. The pre-learning time at home provided teachers with extra lesson time to do more interactive activities and to help struggling students. Teachers mentioned they moved more quickly through tasks and that they could spend more time in application activities and problem-solving activities. They identified that they had a more investigative approach where they could design real-life maths problems for students to work on in class. It was also mentioned that the approach helped students to become more independent learners who were in charge of their own learning. This allowed students at different levels to recognise their weak areas and work on them.

The changes in teaching practice reported by MathsFlip teachers in the post-intervention surveys were, however, also mentioned by control teachers: they, too, had confidence in their teaching and that lessons were learner-centred. The difference was that control teachers reported using ICT 39% of the time in maths lessons, while the MathsFlip teachers reported using it 50% of the time. Due to the limited data that this is based upon, we cannot be sure that this is representative of the whole sample.

Pupils

Both teachers and pupils reported on the surveys that pupils enjoyed working with laptops. In some schools the laptops were not only used at home but pupils had them available during the lessons to access and review concepts if needed. Some schools set up lunch-time and after-school sessions for pupils who either did not have internet access at home, or were too busy with other activities to do the work at home.

Teachers and pupils responded that there was an increase in engagement and enthusiasm due to the games-based approach of the programmes. Mangahigh, for instance, was one of the most popular tools for maths activities. Teachers mentioned that its competitive approach suited boys in particular.

Overall, teachers and pupils who responded to the survey believed that MathsFlip generated individual learning even though the analyses of the outcome data did not reflect this. Teachers perceived that pupils' participation increased in lessons. As a result of the extra practice, pupils were keener to participate in class. The extra practice and preparation at home, as well as the opportunity to review at their own pace, boosted the confidence of less able pupils and pupils from deprived backgrounds. Other teachers also perceived that high ability students benefitted from the programme because they were able to work on extension tasks while the teachers worked with less able students meaning that their learning was not slowed down. Teachers reported that pupils' overall scores in practice tests had improved. As a side result, teachers felt students had gained ICT skills.

Although the intervention was delivered to all the pupils at all levels of attainment, teachers considered that both less able and more able pupils benefitted more from the intervention. For the less able, it was felt that MathsFlip helped to boost their confidence. Teachers believed that because the students had to work at home they were more prepared during the lessons which resulted in more participation. It was also important that they could access the resources many times and work at their own pace. Also, pupils from deprived backgrounds were provided with an opportunity to have a laptop—access to technology which might otherwise have not been available to them.

The more able pupils were felt to have benefited from the multiple resources available in the MathsFlip platform. Moreover, pupils of different abilities used the class site to communicate with each other and collaborate in order to solve their problems. In some schools, teachers reported that girls benefitted from the independent learning and self-pace work. A special mention was also made about the benefits that boys, kinaesthetic and visual learners, obtained from the games-based activities such as Mangahigh. The nature of the competitive activities appealed and helped to motivate these types of pupils which resulted in higher engagement.

Formative findings

Overall, the intervention was considered—by teachers, students, and parents—as being a success. However, two points were identified by participants that could help to improve the intervention. First, despite the constant support from the project manager, teachers felt that they would benefit from online support (such as videos with model lessons) to review at home what had been learnt during the training sessions. Such support would also help teachers who are not available for training sessions or who like to work at their own pace. Second, planning and preparation time should be taken into consideration for the planning stages. Teachers reported that implementation and lesson preparation took a lot of their time; they therefore recommended implementing the programme in year-groups with lower academic workload, however, no objective data was collected on how much time this preparation took.

Because of the small number of responses to the surveys (and often from different teachers) we cannot say whether there were changes over time.

Control group activity

From the survey data, it appears that the control teachers were very similar to the intervention teachers in their characteristics and teaching style. Even on the post-intervention survey, both groups of teachers reported that they employed a mixture of whole-class, group, and individual activities. They reported having a similarly high level of confidence in their teaching ability. There was no indication that the control teachers were implementing aspects of MathsFlip with their pupils. The only aspect in which they seemed to be different was that 50% of intervention teachers reported using ICT regularly in their classes compared to 39% of control teachers. However, this was only based on the 11 teachers who completed the post-intervention survey.

Conclusion

Key conclusions

1. Children in MathsFlip schools made the equivalent of one additional month of progress in maths, on average, compared to children in comparison schools. The three padlock security rating means this result is moderately secure.
2. The impact on maths was slightly higher for children eligible for Free School Meals than for all children in the trial. These results are less secure than the overall findings because of the smaller number of pupils.
3. Children in MathsFlip schools made three additional months' progress in reading and writing, on average, compared to children in the other schools. However, this result should be treated with caution. First, there is not an obvious route by which this maths intervention could improve literacy results so much more than maths results. Second, the relatively small number of schools involved increases the likelihood that we would see a result like this just by chance rather than due to the intervention itself.
4. The majority of teachers in the trial were very positive about the flipped learning approach and the technical and professional support they received from Shireland staff. The process evaluation suggests this support was necessary for successful implementation.
5. Some teachers experienced technical problems with the online platform which were generally dealt with quickly by the developers. Some pupils did not have internet access at home; this led some schools to set up homework clubs providing online access.

Interpretation

We can be moderately to highly confident that the impact seen was due to the intervention. However, it is interesting to note that there was more impact seen in elements of the curriculum not targeted by the intervention—writing and reading. One explanation might be that the intervention allowed teachers to spend more time preparing, planning, and assessing other subjects. However, without a more detailed process evaluation it is difficult to understand if this occurred. It should also be noted that the relatively small sample size means that the results from this trial will be more variable and could result in an overestimation of effects or a false positive (Type I error).

MathsFlip received positive comments from the teachers and pupils that used it. Evidence from a small sample of lesson observations indicated that the approach was being implemented as planned. The intervention had a small impact on the mathematics achievement of pupils at the end of KS2. However, the estimated effect sizes were larger for reading and writing and for the average points score at the end of KS2, although these effects were not statistically significant. There were positive impacts of the intervention for some of the subgroups, including FSM pupils, on the KS2 mathematics scores.

Access to MathsFlip was reported by some pupils to be an issue. This could represent a serious issue for the program if pupils were unable to access material at home prior to class. This did not seem to be an important issue because a number of schools scheduled lunch-time or after-school sessions during which pupils could access the online content and activities. However, we cannot be sure that these extra sessions sufficiently compensated for not having access to the programmes at home.

To date, most studies evaluating flipped learning have been small scale, non-U.K. based, and without a comparison group. The findings from these studies suggest that a flipped learning approach to

teaching and learning is popular but does not provide improved attainment when compared to 'business as usual'.

It should also be noted that most of the research that has been conducted on flipped or blended learning has been in higher education classes, not primary schools as is the case for this evaluation. However, it seems that Shireland Collegiate Academy had experienced very positive results implementing the intervention in their secondary school, which they expected would generalise to upper primary school.

Limitations

This evaluation began with Year 5 pupils and followed these pupils into Year 6. Year 6 is a key year in U.K. education with pupils sitting high stakes national tests (KS2 SATS). As such, many schools put a lot of resources into their Year 6 classes, including high performing teachers, experienced teaching assistants, and extra support. It could be argued that testing MathsFlip against Year 6 classes with these extra resources was a hard test. However, one could also assume that schools in both conditions were also putting the same amount of resources into their classes.

We had intended to collect objective data on school attendance and pupil engagement to determine an effect of dosage but this data were not collected. However, there was no indication of a difference between treatment and control school attendance.

An insufficient amount of process evaluation data was collected and analysed to provide explanations as to why the intervention did not have the level of predicted impact on children's mathematics achievement.

Finally, the original power calculations from the protocol stated that the trial was powered to detect an effect of 0.20. However, when this was recalculated at the end of the study, an MDES of 0.33 was obtained. This is a more reasonable estimate with only 24 schools. This trial did not detect statistically significant effects on the primary outcome, but it should be noted that the MDES at the analysis stage was 0.37.

Future research and publications

Previous studies have suggested that flipped learning is effective, however these have been carried out in other countries (especially the U.S.A.) and in higher and secondary education contexts rather than in primary schools. Conducting a randomised controlled trial with this number of schools in one particular part of the U.K. was an important step forward. In addition, this evaluation focused on flipped learning in mathematics for Years 5 and 6 and numerous questions were raised by project participants about the applicability of this approach for other subjects and other age groups.

Practitioner, as well as researcher, interest in this topic is on the increase. It would be useful to use the evaluation findings to inform future development of flipped learning. It would also be useful to hold seminars or conferences on the origins and definitions of flipped learning, with examples of effective implementation, so that teachers can be efficiently equipped to evaluate the approach in their classrooms.

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Appendix 1: EEF cost rating

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

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

Appendix 2: Security classification of trial findings

1. Criteria for rating: in each column highlight the relevant cell in green.
2. Initial score: write how many padlocks the trial has received based on the first 3 columns (“x🔒”) and highlight in green (initial score is the lowest rating from the first three columns – see guidance on security classification for more detail).
3. Adjust: record adjustment for balance and threats for validity in the adjust column
4. Final score: write the number of padlocks (“x🔒”) in the relevant cell and highlight in green
5. Provide a brief summary of your classification, following the bullet point prompts below

Rating	Criteria for rating			Initial score	Adjust	Final score
	Design	Power	Attrition¹			
5 🔒	Well conducted experimental design with appropriate analysis	MDES < 0.2	0-10%		Adjustment for Balance []	
4 🔒	Fair and clear quasi-experimental design for comparison (e.g. RDD) with appropriate analysis, or experimental design with minor concerns about validity	MDES < 0.3	11-20%			
3 🔒	Well-matched comparison (using propensity score matching, or similar) or experimental design with moderate concerns about validity	MDES < 0.4	21-30%	3 🔒	Adjustment for threats to internal validity []	3 🔒
2 🔒	Weakly matched comparison or experimental design with major flaws	MDES < 0.5	31-40%			
1 🔒	Comparison group with poor or no matching (E.g. volunteer versus others)	MDES < 0.6	41-50%			
0 🔒	No comparator	MDES > 0.6	over 50%			

- **Initial padlock score:** RCT, attrition was 7%, but MDES was 0.37 at analysis = 3 padlocks
- **Reason for adjustment for balance** (if made): no adjustment made
- **Reason for adjustment for threats to validity** (if made): no adjustment made
- **Final padlock score:** initial score adjusted for balance and internal validity = 3

¹ Attrition should be measured at the pupil level (even for clustered trials) and from the point of randomisation to the point of analysis.

Appendix 3: Interview Schedule for Shireland Collegiate Academy Staff

- 1) How did the development of MathsFlip come about?
 - a. What is the historical context for MathsFlip?
 - b. Who was critical to the development of the programme? Was there an individual designer or a team?
 - c. What influences did you draw on? Theories? Other programmes? Evidence? Own experience?
 - d. How have the materials and training evolved?
 - e. Have you undertaken any in-house evaluations of MathsFlip?

- 2) What are the aims of MathsFlip?
 - a. What outcomes is it designed to achieve?
 - b. What is the problem that MathsFlip is trying to solve?

- 3) Can you describe how MathsFlip works?
 - a. What are the key components?
 - b. How do those components achieve the desired aims of the approach?
 - c. What is the role of technology in MathsFlip?

- 4) How does MathsFlip differ from what traditionally happens in primary maths lessons?
 - a. In what way does it 'flip' teaching and learning?
 - b. How would you explain the 'flip' element to someone who has never heard of this term?

- 5) How does the training and support package work?
 - a. What training is provided to teachers?
 - b. Who delivers the training?
 - c. What support, if any, is provided on an ongoing basis to schools?
 - d. Are there any measures in place to monitor implementation?

- 6) What are the main challenges in implementing MathsFlip and what have Shireland done to overcome those challenges?

- 7) What do you feel are/will be the main benefits of MathsFlip for participating schools and pupils?

- 8) How would you assess 'success' for the MathsFlip programme? What are you looking to achieve? What is the long-term vision for MathsFlip?

Appendix 4: Online Teacher Survey (pre-intervention)

Introduction

This short survey is for teachers taking part in the University of York's evaluation of the Flipped Learning programme (also known as MathsFlip). It should take no longer than 15 minutes to complete and your answers will be kept confidential to the research team. Please also note that individual teachers and/or schools will not be identifiable when the results of this survey are reported. If you experience any difficulties completing this survey please contact Sarah Blower on 01904 328107 or Peter Rudd on 01904 328163.

Some information about you

Q1. Your name

Free text

Q2. Your school's name

Free text

Q3. Which of the following most accurately describe your role in the school? (Tick all that apply)

Year 5 teacher

Other Year group teacher

Maths co-ordinator/subject leader?

Other (write in)

Q4. Your gender:

Female

Male

Q5. Your age

Under 25 years

25-34

35-44

45-54

55 and over

Q6. How long have you been teaching?

Less than a year

1-5 years

6-10

11-15

15 +

Q7. What is your highest qualification in Mathematics?

Up to GCSE or equivalent

A level

Degree

Masters/PhD

Other (write in)

Q8. On average, how many hours of Mathematics do you teach each week?

Less than an hour

1 hour

- 2 hours
- 3 hours
- 4 hours
- 5 hours
- 6 or more hours

Your school and the context for mathematics teaching

Q9. Does your school have specialist mathematics teachers?

- Yes
- No

Q10. Do you plan mathematics lessons collaboratively with other teachers?

- Yes
- No

Q11. Do teaching assistants help in mathematics lessons?

- Yes
- No

Q12. If yes, do any of the teaching assistants have mathematics qualifications?

- Up to GCSE or equivalent
- A level
- Degree
- Masters/PhD
- Other (write in)

Q13. Approximately what proportion of your mathematics lessons involve the direct use of ICT (e.g. computers, laptops, tablets, and interactive whiteboards)?

Slider showing percentage range

Q14. How often do you use the following resources in mathematics lessons?

	All lessons	Most lessons	Some lessons	A few lessons	Never
Maths textbooks					
Maths worksheets					
Maths websites					
Videos					
Interactive whiteboard					
Virtual learning environments (VLE)					
Handheld tablets or devices					

Smart phones					
Laptops or PCs					

Your views about methods for teaching and learning mathematics

Q15. In your view, how useful are the following teaching resources?

	Very useful	Mostly useful	Somewhat useful	Not useful	Don't know
Maths textbooks					
Maths worksheets					
Maths websites					
Videos					
Interactive whiteboard					
Virtual learning environments (VLE)					
Handheld tablets or devices					
Smart phones					
Laptops or PCs					

Q16. What do you feel about the availability of resources for primary mathematics teachers?

- Too many resources
- Plenty of resources
- Sufficient resources
- Not enough resources

Q17. On a scale of 1 to 10, how confident do you feel about teaching mathematics?

- 1 No confidence
- 2
- 3
- 4
- 5
- 6
- 7

8

9

10 Extremely confident

Q18. How would you describe your teaching methods (e.g. mainly whole class with some small groups, or a mixture of whole class, group and individual activities)?

Free text

Q19. On a scale of 1 to 10, how learner-centred would you say your teaching is?

1 Very teacher-centred

2

3

4

5

6

7

8

9

10 Very learner-centred

Q20. Had you heard of Flipped Learning before joining this project?

Yes

No

Not sure

Q21. Have you implemented Flipped Learning before?

Yes

No

Not sure

Q22. Why were you initially attracted to Flipped Learning?

Free text

Q23. How do you think Flipped Learning might benefit your students?

Free text

Q24. Do you anticipate any challenges in implementing the Flipped Learning approach?

Yes, because.....

No, because.....

Thank you for taking the time to complete this survey.

Appendix 5: Online Teacher Survey (Post-intervention)

Q1 Maths Flip This short survey is for teachers taking part in the University of York's evaluation of the Flipped Learning programme (also known as MathsFlip). It should take no longer than 15 minutes to complete and your answers will be kept confidential to the research team. Please also note that individual teachers and/or schools will not be identifiable when the results of this survey are reported.

If you experience any difficulties completing this survey please contact Berenice Villanueva on 01904 328108.

Q2 Some information about you

Q3 Please tell us your name

Q4 Your school's name

Q5 Your gender

- Male
- Female

Q6 Your age

- Under 25 years-old
- 25 - 34
- 35 - 44
- 45 - 54
- 55 and over

Q7 How long have you been teaching?

- Less than a year
- 1 - 5 years
- 6 - 10
- 11 - 15
- 15 or more

Q8 What is your highest qualification in Mathematics?

- Up to GCSE or equivalent
- A level
- Degree
- Masters/PhD
- Other (Please specify) _____

Q9 On average, how many hours of Mathematics do you teach each week?

- Less than an hour
- 1 hour
- 2 hours
- 3 hours
- 4 hours
- 5 hours
- 6 or more hours

Q10 Some information about your Mathematics teaching

Q11 On a scale from 1-10, how learner-centred would you say your teaching is?

- very teacher-centred 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- very learner-centred 10

Q12 How, if at all, has your Mathematics teaching changed from the period before you had any Maths Flip training to the present? (TREATMENT)

	Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
I talk at the class less than I used to					
My lessons include a bigger range of activities than before					
I use ICT/computer s more effectively (for teaching and learning) than I used to					
Pupils now take a more active part in lessons than they did previously					
Pupils work together more often than they used to do					
My lessons are more interesting than they used to be					
I feel better motivated to teach than I did before					
Pupils ask more questions than they did previously					
I provide more opportunities to use Higher Order Thinking Skills (HOTS)					

I tailor my class for different abilities by including differentiation activities					
Pupils do more working out of things for themselves than they did before					
All round, I am a more effective teacher than before					

Q13 Please indicate how often you include in your Mathematics lessons the following activities.

	All lessons	Most lessons	Some lessons	A few lessons	Never
Transfer of knowledge (i.e. from teacher to pupils)					
Discussions to clarify knowledge acquired outside the classroom					
Discussions to address misunderstandings of concepts learnt before the lesson					
Activities to demonstrate understanding of knowledge					
Experiments					
Analysis of problems					
Break down of ideas into simpler parts					

Comparison and contrasts of concepts					
Summary of ideas or new concepts					
Combination of knowledge that leads to new knowledge					
Draw conclusions from the lesson					
Discussion of arguments					
Evaluation of learnt concepts					

Q14 To what extent do you feel Maths Flip has changed the way you teach Mathematics? Please rate this on the following scale, where 1 means 'no change at all' and 10 means 'Maths Flip' has completely transformed the way I teach' (TREATMENT)

Q15 Please indicate the extent to which you agree with each of the following statements. The experience of the Maths Flip programme has... (TREATMENT)

	Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
... improved my confidence as a teacher					
... brought about more variety in my teaching styles					
... helped me to plan lessons better					
... led to a better exchange of ideas in my classroom					

... improved my classroom management skills					
... enabled me to facilitate more collaborative learning					
... has ensured that I make more effective use of ICT					

Q16 Some information about your pupils

Q17 To what extent do you feel your pupils have benefited from Maths Flip? Please rate this on the following scale, where 1 means 'no benefit at all' and 10 means 'Maths Flip has greatly improved their learning experience': (TREATMENT)

Q18 How confident are you that your pupils' results in maths will improve as a result of Maths Flip? Please rate this on the following scale, where 1 means 'It won't have any effect' and 10 means 'Their results will be positively improved' (TREATMENT)

Q19 Please tell us about one Mathematics lesson that you have delivered where you had perceived your pupils to be highly engaged

Q20 a) What was the topic of the lesson?

Q21 b) What activities did you use in the lesson?

Q22 c) Why do you feel the pupils were engaged?

Q23 Some information about Maths Flip (TREATMENT)

Q24 On a scale from 1 to 10, where 1 means 'I won't use them at all' and 10 means 'I will always include them in my lesson', how likely is it that you will keep using the skills learnt while using the Maths Flip programme? (TREATMENT)

Q25 On a scale of 1 to 10, where 1 means 'not at all useful' and 10 means 'extremely useful', how would you rate the Maths Flipped programme? (TREATMENT)

Q26 How likely are you to recommend the use of Maths Flip to other schools? (TREATMENT)

Q27 Is there any further comments you would like to make about your experience of Maths Flip? (If so, please write your comments in the space below) (TREATMENT)

Q28 Which of the following most accurately describe your role in the school? (Tick all that apply)

- Year 5 teacher
- Year 6 teacher
- Other year group teacher
- Maths co-ordinator/subject leader
- Other (Please specify) _____

Q29 How, if at all, has your Mathematics teaching changed from last year to the present? (CONTROL)

	Strongly agree	Agree	Not sure	Disagree	Strongly Disagree
I talk at the class less than I used to					
My lessons include a bigger range of activities than before					
I use ICT/computer s more effectively (for teaching and learning) than I used to					
Pupils now take a more active part in lessons than they did previously					
Pupils work together more often than they used to do					
My lessons are more interesting than they used to be					
I feel better motivated to teach than I did before					
Pupils ask more questions than they did previously					
I provide more opportunities to use Higher Order Thinking Skills (HOTS)					

I tailor my class for different abilities by including differentiation activities					
Pupils do more working out of things for themselves than they did before					
All round, I am a more effective teacher than before					

Q30 Approximately what proportion of your mathematics lessons involve the direct use of ICT (e.g. computers, laptops, tablets, and interactive whiteboards)?

_____ Time

Q31 How often do you use the following resources in Mathematics lessons?

	All lessons	Most lessons	Some lessons	A few lessons	Never
Math textbooks					
Math worksheets					
Math websites					
Videos					
Interactive whiteboard					
Virtual learning environments (VLE)					
Handheld tablets or devices					
Smart phones					

Laptops or PCs					
----------------	--	--	--	--	--

Q32 How would you describe your teaching methods (e.g. mainly whole class with some small groups; or a mixture of whole class, group and individual activities?)

Q33 On a scale of 1 to 10 how confident do you feel about teaching Mathematics?

Q34 In your view, how useful are the following teaching resources? (CONTROL)

	Very useful	Mostly useful	Somewhat useful	Not useful	Don't know
Maths textbooks					
Maths worksheets					
Maths websites					
Videos					
Interactive whiteboard					
Virtual learning environments (VLE)					
Handheld tablets or devices					
Smart phones					
Laptops or PCs					

Appendix 6: Teacher Telephone Interview Schedule

1. Do you feel you have had the necessary support and training to deliver the Maths Flip programme to your pupils?
2. How, if at all, has your teaching changed from the period before you used Maths Flip? What do you do differently now?
3. Are you able to give me any clear examples of how a Maths Flip activity has engaged pupils or improved their understanding?
4. Have you seen any changes in your pupils' attitudes since they started using Maths Flip?
5. Are there any groups or types of pupils who you think have benefited more from the programme? (e.g. high achievers, low achievers)
6. Do you think pupils' results in maths will improve as a result of Maths Flip? (If yes, why do you say that? Do you have any evidence for that?)
7. How do you perceive parents' response to the programme?
8. What do you, as a teacher, think about the programme? Could you tell me if and how you have benefited from the programme?
9. What have you, as a teacher, gained by flipping your class?
10. What have been the main problems you have faced while participating in the Maths Flip programme?
11. Do you think the use of Flipped Learning could be successfully translated to other subjects?
12. Would you recommend the use of Maths Flips to other primary schools? Why?

Appendix 7: Lesson Observation Sheet

School name _____ Time of observation _____
 Teacher's name _____ Class / Year _____
 Topic _____
 Observer's name _____ Number of pupils _____

Resources in class:

(i.e. laptops, whiteboards, handouts, etc)

Any comments on pupil characteristics:

(e.g. mixed ability, any SEN children, gender spread)

Lesson objectives:

Details of the nature of the Flipped Learning

(i.e. what preparation did pupils do before the lesson?)

Overview of main lesson activities

Please describe any examples of activities where you observed the use of HOTS during the lesson

Were there any problems or issues during the lesson? Please provide brief details

Please describe / list any examples of activities that promoted pupils' engagement

I. **Aims of Flipped Learning** - Please tick as many options as you observe during the lesson.

1st box – yes, definitely; 2nd box – yes, to some extent; 3rd box – no, limited

The activities in the lesson...

- provide opportunities to deepen the learning process
- allow the use of higher order thinking skills (HOTS)
- allow students to share the knowledge learned before the lesson
- provide plenty of time to refine HOTS
- include differentiation activities

II. **Bloom's taxonomy** - Which of the following processes can be observed during the lesson?

Knowledge

- transfer of knowledge (From teacher to pupils)

Understanding

- discussions to clarify the acquisition of previous knowledge
- discussions to address misconceptions of concepts learnt before the lesson

Application

- activities to demonstrate understanding of knowledge
- experiments

Analysis

- analysis of problems
- break down of ideas into simpler parts
- comparisons and contrasts of concepts

Synthesis

- summary of ideas/new concepts
- combination of knowledge that leads to new knowledge

Evaluation

- conclusions
- discussion of arguments
- evaluation of learnt concepts

Appendix 8: Schedule for Focus Groups with Teachers

Good morning. Thank you very much for your time. My name is I come from the IEE at the University of York. I am here because we are interested in knowing your views about the Maths Flip project. Your comments are relevant to the independent evaluation of the project. [Ask for permission to record the discussion]. All your comments today will be anonymised and only the researchers at IEE will have access to your comments.

To be completed before the interview

School: _____ Date of the visit: _____
No of teachers: _____ Visitor's name: _____
Role (select and write the number of people)
_____ Year 5 teacher

Views on the programme

1. How, if at all, has your teaching changed from the period before you used Maths Flip? What do you do differently now?
2. Have the pupils' attitudes changed in the classroom? How?
3. How do you perceive your pupils' engagement in class? Has it changed? How?
4. How do you perceive pupils' engagement at home?
5. How do you perceive parents' response to the programme?

Weaknesses

6. What do you consider have been the main challenges of the programme? Prompt with:
 - problems with pupils not doing the tasks at home?
 - any technical problems?
 - identified any gaps in the programme or need for extra training?

Strengths

7. Could you tell me how you, as a teacher, have benefited from the programme? What have you gained by flipping your class?
8. Are you able to give me any clear examples of how a Maths Flip activity has engaged pupils or improved their understanding?
9. Are there any groups or types of pupils who you think have benefited more from the programme? (e.g. high achievers, low achievers)
10. Do you think pupils' results in maths will improve as a result of Maths Flip? (If yes, why do you say that? Do you have any evidence for that?)
11. In summary, what do you think of Maths Flip overall? Would you recommend the use of Maths Flips to other primary schools? Why?
12. Do you think the use of Flipped Learning could be successfully translated to other subjects?

Thank you very much for your participation and your time. Your answers are really valuable to the evaluation of the programme.

Appendix 9: Schedule for Focus Groups with Pupils

Hello, I'm from the University of York and we are carrying out a project about maths in primary schools. Your teachers have agreed that we can come and talk to you about your maths lessons. I would be very interested in knowing a bit more about the work you are doing in mathematics.

[I hope you don't mind if I record this discussion, just so that I don't have to write it all down].

1. What do you think of working with laptops at home/school?
2. What are the tasks/activities you have to do at home with the laptops? Could you give me some examples?
3. Do you like this kind of homework? What do you like about it?
4. Could you name one of your favourite activities at home?
5. What do you do if you do not understand something from the tasks that you have to do at home?
6. Could you name one of your favourite activities in the maths lesson?
7. Which maths activities did you not like this year? Why?
8. Have you had any problems with the laptops? Which ones? How did you solve it?
9. Does your teacher give you enough help if you have not understood something?
10. Which maths lessons do you prefer, the ones you have had this year or the ones in your previous year? Why?

Appendix 10: Information and consent forms for headteachers and parents

INFORMATION SHEET / OPT OUT FORM FOR HEADTEACHERS

INSTITUTE FOR EFFECTIVE EDUCATION, THE UNIVERSITY OF YORK

Flipped Learning Evaluation Letter to Headteachers

Dear Headteacher

As you may be aware Shireland Collegiate Academy is planning to implement a new project called Flipped Learning with around 20 primary schools in the Birmingham and Black Country area. Shireland Collegiate Academy has much experience in this area and the project has great potential to improve the engagement and attainment of children in Mathematics and in other areas of the curriculum.

The Flipped Learning project is being funded by the Education Endowment Foundation (EEF) and is being independently evaluated by a team from the Institute for Effective Education at the University of York. This letter is a request for you to and your school to take part in this project and the associated evaluation.

In January 2014, when the project will commence, the evaluation team will work with Shireland Collegiate Academy to start collecting information about the impact of Flipped Learning, which will be delivered in Year 5 Mathematics.

Researchers at the Institute for Effective Education will conduct a trial of the approach to assess whether Flipped Learning improves children's mathematic attainment. They will randomly assign participating schools either to the intervention (experimental group) or to a group of schools which will continue with their regular mathematics teaching (control group) for 12 months. Control schools will be offered the Flipped Learning intervention after the first 12-month phase, so they will not miss out on the project.

The **requirements** of you and your school would be as follows:

- School groupings.** 24 participating primary schools will be **randomly divided** into 12 experimental schools (using Flipped Learning) and 12 control schools (not using Flipped Learning, but doing Year 5 Mathematics as normal) and we need you to **agree to be in either group**. There is a 50-50 chance you will be in the experimental group. Randomisation is an important part of the research and it helps us to obtain robust, reliable and valid findings. If your school is in the control group, your Year 5 will not receive the Flipped Learning intervention this year, but it will be offered to you next year.
- Pupil tests.** At the start and end of the intervention pupils in both the experimental and comparison classes will complete a standardised online mathematics test. The first test (the pre-test) will be taken by Year 5 pupils in January and the post-test will be taken by the same pupils (who will have progressed into Year 6) around December 2014. Online tests (GL Assessment's *Progress in Mathematics*) will be used and Shireland staff will assist with their administration, so there should be no extra burden on your staff. Marking is carried out automatically in this system and your school will receive feedback on the test results.
- Staff survey.** The evaluation will also involve a short online survey of teachers/school staff. We will ask the two members of your staff most closely involved in the Flipped Learning project to complete a questionnaire (taking around 15-20 minutes) in order to obtain their perspectives on the project.
- Researcher visits.** In addition we will make a request to visit **four** participating schools in order to observe Flipped Learning in action and to talk to pupils and staff about its effectiveness and impact. We would appreciate your willingness to host a visit if such a request is made.

We should like to stress that your participation in the evaluation is entirely voluntary and you can withdraw at any time. Confidentiality and anonymity are assured – no school or individual will be identified in any report on this evaluation. The pupil test data will be shared with the EEF in an anonymised format. The evaluation proposal has been approved by the University of York’s Ethics Committee.

We do hope you will be able to assist us with this important project. The study will provide valuable information about the effectiveness of this innovation and about its potential for improving mathematics teaching more generally.

Please complete and return the form below if you agree to take part in the Flipped Learning study and evaluation.

Sir Mark Grundy
Executive Principal
Shireland Collegiate Academy

Dr Peter Rudd
Principal Investigator
Institute for Effective Education
Berrick Saul Building
University of York
Heslington
YO10 5DD

Please complete and return the form below if you agree to take part in the Flipped Learning evaluation. We would also appreciate the name of a Year 5 Teacher who could act as a key contact person for the evaluation team.

I agree for my school _____ to take part in the Flipped Learning study.

Name of Head Teacher: _____

Signature of Head Teacher: _____

I agree to take part in the Flipped Learning study.

Name of Year 5 Teacher: _____

Signature of Year 5 Teacher: _____

Year 5 Teacher email address: _____

This completed form can either be sent electronically to peter.rudd@york.ac.uk, or by post to Peter Rudd at the address given above.

Appendix 11: Information sheet/opt-out form for parents

INSTITUTE FOR EFFECTIVE EDUCATION, THE UNIVERSITY OF YORK

Flipped Learning Evaluation

Information Sheet for Parents/Guardians

Dear Parent/Guardian,

We would like to request your permission for your son/daughter to take part in an educational evaluation study. The following information explains why the research is being done and what it would involve.

What is the Institute for Effective Education?

The Institute for Effective Education (IEE) is part of the University of York. It aims to find out what works in teaching and learning and why, and then use the evidence to improve education.

What is the purpose of this study?

This study is being done to see if using a Flipped Learning approach in Mathematics helps pupils to achieve better results. The Flipped Learning project involves the use of tablets and is being delivered by Shireland Collegiate Academy with a number of primary schools in your area.

Why is my son/daughter's class participating?

We will conduct this study with current Year 5 classes in 24 primary schools in the Black Country. The head teacher of your son/daughter's school has agreed to participate in this study.

What will my son/daughter's participation be?

In January 2014, and again later in the year, the current Year 7 students will do a standard online Mathematics test. The tests are widely used by schools. The tests will be administered by Shirelands Collegiate Academy staff working closely with your child's class teacher. We will use the test results to see if the Flipped Learning Programme has improved pupil learning, and the results will also be fed back to your child's school.

Does my son/daughter have to take part?

You may choose not to permit your son/daughter's test scores to be used in the evaluation. If so, please complete and sign the attached opt-out form by Friday 10th January. The right to withdraw your son/daughter from the testing will be fully respected.

What are the disadvantages and risks of taking part?

There are no known disadvantages or risks in participating in this study. The test data will be securely stored and managed, scored electronically. Pupils names' will be removed so that the scores are anonymised and the data will be shared with the Education Endowment Foundation (who are funding the Flipped Learning project). Teachers will continue to teach to the usual lesson objectives throughout the evaluation period.

What are the possible benefits of taking part?

By participating in this study, your son/daughter will experience an up-to-date online approach to learning Mathematics. The information gained from this study may influence how your son/daughter and others will be taught more effectively in the future.

What happens when the research stops?

IEE researchers will analyse the test scores to determine the overall effectiveness of the Flipped Learning Programme. Scores for individual pupils and classes will be kept confidential. When the research is over, the school will receive a report that will show if Flipped Learning makes a difference to pupils' achievement.

Will my son/daughter's information be kept confidential?

Yes. Student's names will be replaced with code numbers. No individual student's data will appear in any report. The research team will not have access to student or parent names.

What if there is a problem?

If you have a concern or question about your son/daughter's participation in this study, please contact Peter Rudd (e-mail: peter.rudd@york.ac.uk) Tel: 01904 328163.

Yours Sincerely,

*Dr Peter Rudd
Reader in Education
Institute for Effective Education
University of York*

THE UNIVERSITY *of York*

INSTITUTE FOR EFFECTIVE EDUCATION

Parent/Guardian opt-out form

If you **do not** permit your son/daughter's test scores to be used in the study, please complete this form and return it to your son/daughter's form teacher or the school reception by Friday 10th January 2014.

I **do not** wish my son/daughter's test scores be used in the study.

Student's name:
(Please print clearly).

Form Teacher's Name:
.

School:.....

Parent's/Guardian's name:
(Please print clearly)

Parent's/Guardian's signature:

Date.....

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