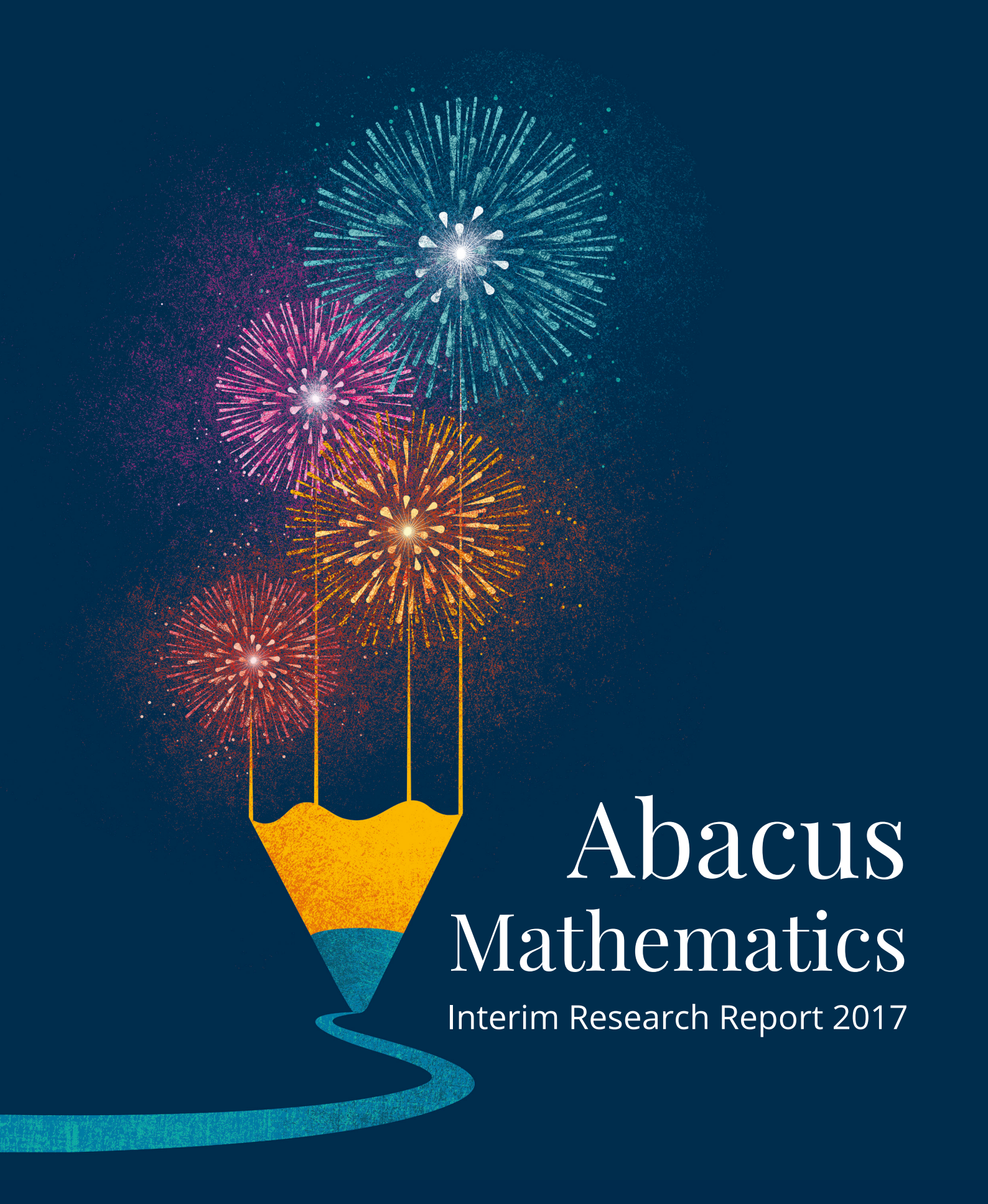




Abacus Mathematics

Interim Research Report 2017

Acknowledgements

This summary report is based on the full interim technical report, which was released internally in September 2017 and written by:

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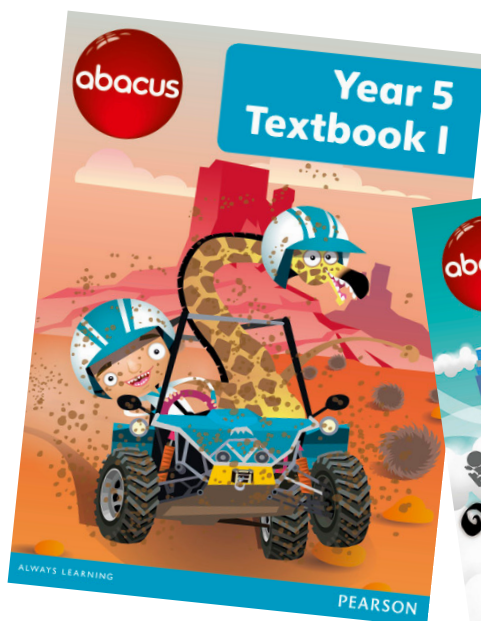
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1 Product Summary and Context

Product Summary

Abacus is a coherent set of mathematics materials for use in Key Stages 1 and 2 (usually age 5–11, Years 1 to 6) in England. The resources consist of both digital and print resources. The print resources include a variety of textbooks and workbooks. Abacus online resources ('ActiveLearn') include both an online toolkit for teachers and an online 'pupil world' that can be used to plan, develop, track and assess. They offer lesson plans, worksheets, whole class and interactive activities, and a variety of assessment and tracking tools and tests, together with reporting tools.



Product Context

Together, Abacus materials cover the variety of areas in the Primary mathematics curriculum – counting, number bonds, place value, four operations, shapes, measures and development of mathematical vocabulary.

The 2014 National Curriculum describes the aims of learning mathematics to be that all pupils should:

- 1) Become fluent in the fundamentals of mathematics
- 2) Reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- 3) Solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication

2 Research Product Summary

This study is being carried out by the Pearson UK Efficacy and Research team in conjunction with UCL (University College London) Institute of Education. Following the implementation of the new and more challenging curriculum, this research asks whether teachers are finding what they need in the Abacus materials, how they are using those resources with their classes and what the impact on teacher and children's enjoyment and confidence is, as well as what the impact is on children's attainment.

Building on a previous exploratory study, this is a two-year project and this short report outlines the first year's results. During the first year (2016–17), data was collected from nine schools: from teachers and pupils in nine KS1 classes and nine KS2 classes, and from the schools' Maths Coordinators.

How did we get the data?

-  Teacher and Maths Coordinator phone interviews
-  Face-to-face Teacher and Maths Coordinator interviews
-  Student focus groups
-  Lesson observations

Who was involved?



What were the highlights of the findings?



The high volume and variety of activities saw an increase in pupil engagement, enjoyment and confidence in maths.



Teachers felt the resources were flexible, easy to use and saved lots of time in planning.



Teachers were confident in the assessment of pupil progress and in the resources comprehensively covering the curriculum.

At the beginning of the study, we set out to define what we would want learners to achieve and experience when they are using the Abacus resources. Aiming to evaluate the success of these intended learner outcomes, research questions were adopted as follows:

- 1 How is Abacus being implemented in schools? (How do pupils experience use of print and digital learning resources?)
- 2 Are there any barriers for pupils in accessing the digital resources? (Can the Abacus digital resources be accessed on appropriate tablets, smartphones and computers at any time?)
- 3 In what ways does Abacus encourage pupils' confidence in and a positive attitude towards learning mathematics?
- 4 Do teachers value the overall content, specific features of the platform (planning, assessing, reporting) and the CPD element?
- 5 How well is the resource perceived to help pupils understand and master the fundamental mathematical processes (problem solving, reasoning and fluency) laid out in the National Curriculum? (How, and with what effect, does Abacus support teaching and learning needs?)
- 6 How well is Abacus perceived to prepare pupils for progression to the next stage of study?



At this stage there was no attempt to *measure* pupil progression in the mathematics curriculum as that will be addressed at the end of the second year of the study. Consequently, the first year of the study was purely qualitative.



Fieldwork and Data Collection

The first year of the main study was conducted in three phases of fieldwork, collecting primary data from nine schools that have adopted Abacus either in print or digital form or both.

Fieldwork Phase	Methods Used
Phase 1: Autumn Fieldwork	External standardised age-appropriate assessments used as attainment baseline, also giving also a variety of individual and class-level characteristics.  Telephone interviews with Maths Coordinators and Teachers
Phase 2: Spring Fieldwork Schools visit	 Lesson observations  Teacher interviews  Pupil focus groups
Phase 3: Summer Fieldwork	 Teacher and Maths Coordinator interviews
Year 2	Activity broadly mirroring first year activity – to give a longitudinal picture of how use and learning develops over time. This will also include analysis of progress made in assessments (quantitative data), drawing on both teacher and external national assessment data.

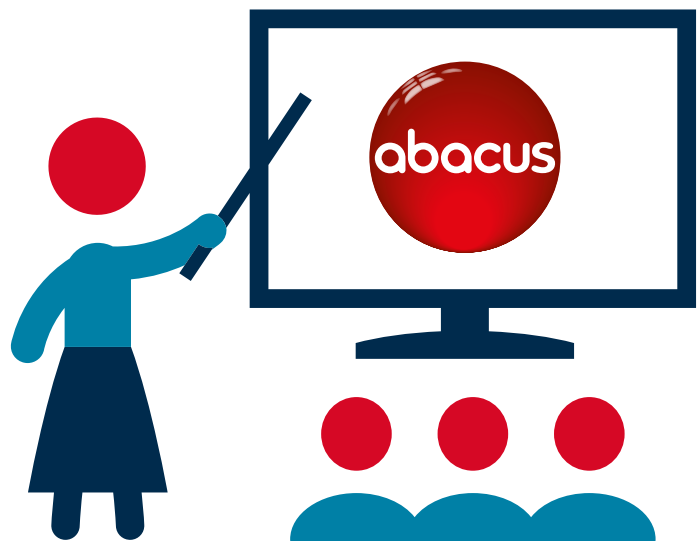
Participant Classes

The participant schools were selected because they have a variety of characteristics, and have purchased various combinations of resources. However, given the sample size, there is no claim to generalisability here. Instead, the research

aims to provide an in-depth understanding of an indicative range of the use and impact of the Abacus resources. If you are interested in seeing more detailed school characteristics, please see page 16.

During analysis, the data was structured into different themes related to the research questions. There were five overarching categories created that we will report on here:

- 1 Background and school organisation
- 2 Access and experience: teachers
- 3 Access and quality of pupil experience
- 4 Standard of achievement
- 5 Timeliness of completion and progression



1 Background and school organisation

The backgrounds of the teachers in the study varied widely in terms of experience and specialisms. Some were newly qualified, or only in the formative years as a teacher, whereas some had over 15 years of experience teaching in a range of schools. All the schools allocated a one-hour maths lesson each day, and the content and style of this would often vary depending on the theme running through the year group at that time.

The reasons for purchasing Abacus varied, although responses tended to focus on the planning materials and online elements that were viewed as a core strength of the scheme. None of the schools had bought Pearson CPD, with many choosing to engage in more ad hoc or school-initiated development; several teachers said that they felt they needed to invest more time in getting to know specifics of the resources.



"A lot of the other schemes that we looked at were, just, so much more faffy...The fact that Abacus is all in one place was just the overriding factor...The interactive teaching programmes which have consistently improved with every time that Abacus has been updated, they've just got better and better. The fact that everything's there on the interactive whiteboard. And the service we had from Pearson was also really good, compared with some other companies."

– Maths Coordinator, Autumn interview 2016

5 Findings

2 Access and experience: teachers

Textbooks were the most commonly used resource for Year 5 whereas workbooks were most commonly used by Year 1. Praised for the colours, variety of activities and spiral structure, teachers commented on the ability of Abacus resources to engage children. In particular, the interactive whiteboard activities proved very popular with all classes and teachers. They allowed teachers to put learning in a different context which increased pupil engagement and enjoyment of maths.

The planning materials were highly valued by teachers and were thought to reduce workload and planning time significantly, as well as provide them with a range of ideas for activities. The support provided by the planning materials also made a positive impact on teacher confidence.

"You can literally hand it over to anyone else and they could use it but there's also enough flexibility there to use it yourself and there's not just a scheme, it has practical tasks, worksheets and everything is there: it is a range of things to use."

– Year 1 Teacher, Autumn interview 2016

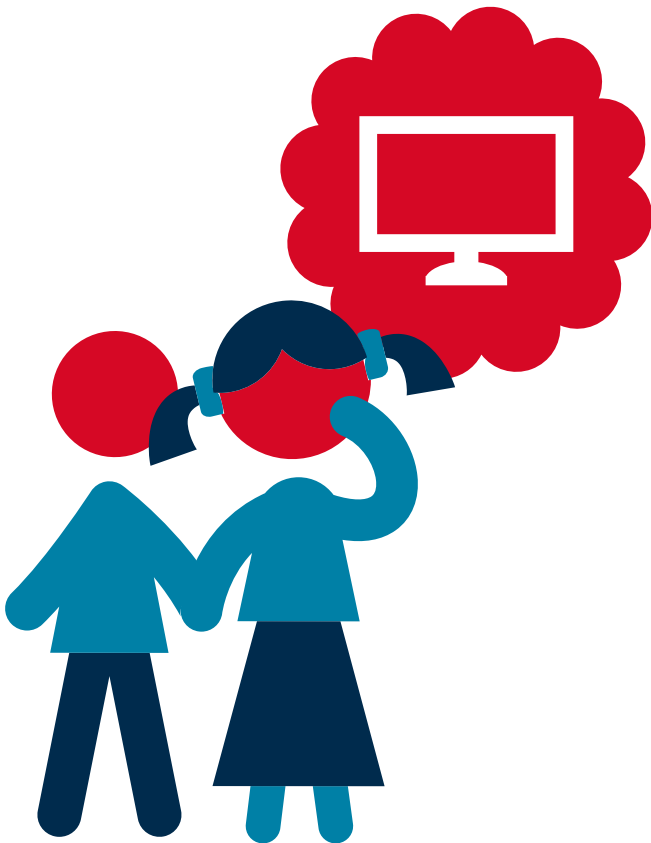


3 Access and quality of pupil experience

All teachers were happy with their class' progress and felt that Abacus supported the needs of the learners. Teachers felt resources catered better to the **middle-range and lower** end of the maths abilities. Some teachers found it challenging to stretch the higher ability pupils, although not all teachers concerned were making frequent use of further resource links. Overall, teachers at both KS1 and KS2 saw pupil **confidence in, engagement with** and **enjoyment** of maths develop.

What did teachers consider the most useful elements for pupil development?

- Cyclical revisiting of focus
- Visual activities (particularly popular with Year 1)
- Scaffolded progression
- Differentiated and progressive approach to the activities



Elements for pupil development: key quotations

Repetition of focus

"I think the scheme does help in that way because of the way it's sort of cyclical revisiting things so if they didn't get it the first time you come to it another time and it's presented in a slightly different way. And they think, 'Oh, actually I have seen this before and I think I can do this...' A lot of them are sort of emerging as more confident mathematicians."

– Year 5 Teacher, Summer interview 2017

Differentiated activities

"A lot of the children enjoy doing the, like, the support work first before they move onto the core... So usually if there's an issue with confidence, I suggest to the children, 'Well you can do the support work first. But then you need to get onto the core.' And they're quite happy to do that, and I think that does help build their confidence."

– Year 5 Teacher, Summer interview 2017

Scaffolded progression

"Thinking of some of the number work, how it progresses each time and they see their own progress and they can see how they're starting things a little bit more simply and we'll say to them, 'Right this is kind of the next step' and when they're able to achieve it they do, they really love it and it does make them feel good about themselves, it does make them feel confident about their abilities."

– Year 1 Teacher, Summer interview 2017

Visual activities

"I think definitely the visual stuff and the fact, you know, it's all done through all the characters and, you know, it's just the visual stuff is just amazing. And they love that. And the sound effects and everything like that that just makes it, it makes it fun basically. And the activities. Any of the activities that they do, I think they just appeal to them, they bring it alive."

– Year 1 Teacher, Summer interview 2017

5 Findings

4 Standard of achievement

Fluency

The spiral structure of the planning, repetition, snappy activities and the interactivity were all cited as great aspects for developing fluency. All 18 class teachers felt that Abacus supports fluency well although it appeared that teachers' understanding of fluency was not always consistent with that adopted in the National Curriculum; something that was noted for further clarification in the resources.

"It revisits everything... [pupils are] using the same resources all the time with regards to number squares and number lines, the beaded lines, the money lines. So whether they're on the whiteboard or they're the printed-off copies, [pupils are] familiar with them, and the repetitiveness of the different concepts definitely helped with fluency."

– Year 1 Teacher, Summer interview 2017



Reasoning and Problem Solving

Practical activities appeared very popular in interviews and teachers spoke positively about how they can help to embed the problem-solving element of the curriculum (though this was often in relation to just the quicker graspers in the class). Generally, children started the year very unsure about problem solving but had made **progress** by the end of the year. This parallels increasing teacher confidence as they gain experience with the new curriculum/increased engagement with the Abacus resources.

"...every week there is a new problem that's being added. I haven't had chance to use many, but it does really deepen that thinking of the children... The Nnrich is that sort of larger stretch, but I've definitely noticed a positive thing about the problem solving that is coming on a week-by-week basis."

– Year 5 Teacher, Summer interview 2017



5 Timeliness of completion and progression

There was confidence in the **assessment** of pupil progress and in the resources **covering the National Curriculum**. The Maths Coordinators widely valued the structure and consistency Abacus offered to the maths curriculum so they felt confident that all of the staff and pupils were having similar experiences in maths while ensuring the National Curriculum was being comprehensively covered.

Similarly, teachers were generally happy with the **progress** that pupils had made over the year although some felt they weren't yet quite where they needed to be. Real life and practical links were also considered useful aspects of the planning materials in engaging pupils.



Areas for development

Naturally, for any resource, there are areas that could be improved. Some of the key areas suggested for consideration are:

- Revisiting timings, coverage and support around the end of Key Stage assessments, to **ensure completion** and time to **synthesise understanding** across the curriculum.
- Consideration of the **development of a toolbox** for the variety of modelling tools included in ActiveLearn.
- Revisiting the **maturity pitch** of any new materials, to ensure they are **age-appropriate**.
- Revisiting messaging and signposting around the importance for teacher understanding of both Abacus and the curriculum, of teachers fully **engaging** with both the **Abacus-included specific CPD opportunities**, and with the **teachers' notes** supporting lesson plans.
- Re-evaluating signposting to, and communication of, **key messages** about interpretation of mastery, fluency, problem solving and reasoning – for all children.



Key Strengths

High volume and variety of activities

This consistently featured in interviews as a positive aspect of the Abacus resources. While some teachers did not use the resources to their full capacity, a wide variety and volume of activities allowed them to be flexible in planning and structuring their lessons to the perceived needs of their class, including where that class was of mixed year-groups.

"I like it because there are loads of resources available on Abacus and it gives you lots of different ways of being able to teach maths."

– Year 1 Teacher, Autumn interview 2016

Structure

The spiral structure of the resources proved to be very popular, providing a means of deepening aspects that may not have been understood the first time.

"It is nice to be able to trust that it will be covered throughout the year and you will be able to develop skills over the year, it is carefully thought out and there's smaller progressive steps and more regular and revisiting things."

– Year 5 Teacher, Autumn interview 2016

Engaging

Teachers saw pupil's engagement in and enjoyment of maths develop through using Abacus. This was particularly enhanced by the interactive whiteboard and other practical activities.

"They tended to be a bit disengaged, I mean, less interested as a group of children, particularly this class, but it's really kind of pumped them up and made them want to engage with maths and they kind of almost, like, eager to get off... the carpet and go to the activity, so that's how excited they are to go and have a go."

– Year 1 Teacher, Summer interview 2017

Time saving

A strong message that also came through in interviews was the amount of time teachers saved on planning. This gave teachers more time to focus on teaching. Similarly, alongside the flexibility of the planning resources this meant that the planning element of Abacus was suitable to varying types of experience and confidence levels.

"That is the best part. It can save two hours in planning."

– Maths Coordinator, Autumn interview 2016

At the end of this first year of the study, we are in a position to present some initial answers to our research questions. Here we have tried to summarise our answers to the research questions, without going into too many complexities.



1) How is Abacus being implemented in schools? (How do pupils experience use of print and digital learning resources?)

Resources are implemented in broadly conservative (but rewarding) ways; resources are often not being utilised to their full capacity.

2) Are there any barriers for pupils in accessing the digital resources? (Can the Abacus digital resources be accessed on appropriate tablets, smartphones and computers at any time?)

Digital resources are used to very varying degrees; teacher unfamiliarity, unreliability of internet access, and lack of access to the technology necessary are among factors that limit use.

3) In what ways does Abacus encourage pupils' confidence in and a positive attitude towards learning mathematics?

Increased teacher confidence, including for the sample trainee teacher, appears to indirectly impact pupil confidence; the variety of approach, and the interactive, colourful presentation particularly enhance children's confidence in, motivation for and enjoyment of maths.

4) Do teachers value the overall content, specific features of the platform (planning, assessing, reporting) and the CPD element?

Teachers are highly positive about the time and energy saved by having high-quality planning materials; flexibility and scope of the materials are also considered as valuable assets. Most teachers make limited use of the more demanding materials, and CPD resources are rarely used.

5) How well is the resource perceived to help pupils understand and master the fundamental mathematical processes (problem solving, reasoning and fluency) laid out in the National Curriculum? (How, and with what effect, does Abacus support teaching and learning needs?)

The resource is considered valuable and reliable in covering the curriculum and supporting these mathematical processes. However, teachers have a variety of conceptualisations of the processes which can limit depth of enactment.

6) How well is Abacus perceived to prepare pupils for progression to the next stage of study?

Teachers are generally confident that Abacus gives a comprehensive, coherent and well-structured progression through the Primary years.

Going into the second year of the research, we shall be looking at the development of current findings and probing new areas. Of particular interest will be quantifying the progress pupils will have made over the two years.

Other research focus areas include:

- How **pupil needs** coming into years 2 and 6 are **changing** with more experience of the new curriculum, and to what extent the resources are (more or less) appropriate for that.
- Teachers' **changing perceptions of curriculum expectations**, and of the justification and extent of use of Abacus CPD to support those. What would have to change for teachers to make greater use of the CPD available?
- Developing enactment of **fluency, of reasoning and of problem solving** as the new curriculum beds down, and in the light of 2017 Year 2 and 6 assessments.
- Teacher and pupil understanding of different forms of **mathematical communication**, a key aim of the new curriculum, and the extent to which they value the resources that support this (how and where could they be better?).
- Effectiveness of Abacus for supporting teacher **formative assessment**.
- Effectiveness of the **spiral approach** for pupils' learning.
- Probe further the role of **real-life applications** in the resources: what do pupils and teachers perceive and what would they choose?



Illustration by Lauren Rolwing

School 1

- City state school
- Average attainment
- 900 pupils
- Ofsted 'good'

School 6

- Semi-rural state school
- Above average attainment
- 200 pupils
- Ofsted 'good'

School 2

- City independent school
- Average attainment
- 150 pupils
- Independent, Ofsted 'good'

School 7

- Semi-rural independent school
- Above average attainment
- 187 pupils
- ISI 'good'

School 3

- Urban academy
- Average attainment
- 420 pupils
- Ofsted 'requires improvement'

School 8

- City state school
- Average attainment
- 450 pupils
- Ofsted 'good'

School 4

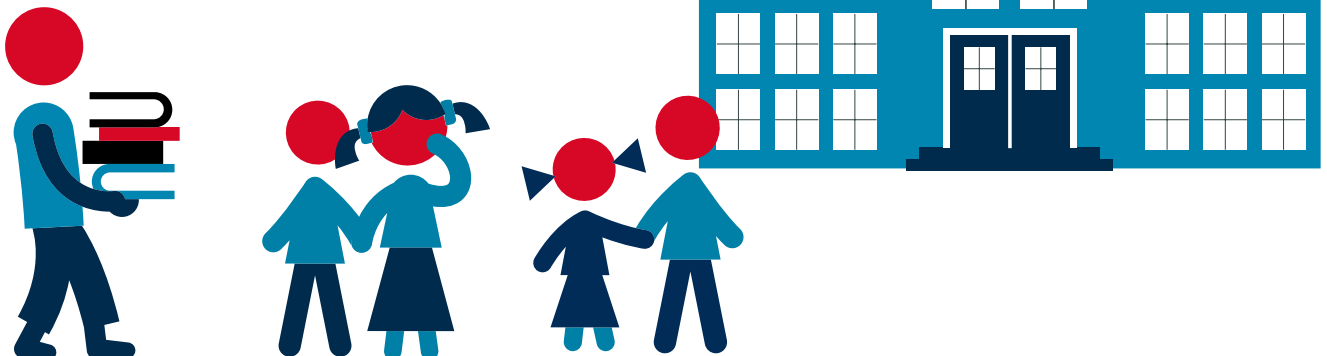
- Semi-rural state school
- Average attainment
- 200 pupils
- Ofsted 'good'

School 9

- Semi-rural state school
- Average attainment
- 250 pupils
- Ofsted 'outstanding'

School 5

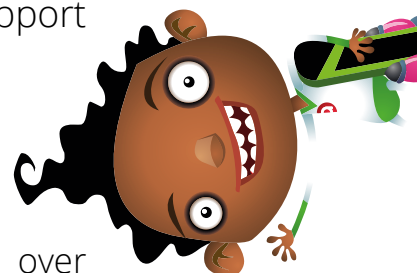
- Rural state school
- Average attainment
- 100 pupils
- Ofsted 'good'



9 Appendix: Resources in detail



Abacus is a maths toolkit that has been carefully crafted to inspire a genuine love of maths and help you support every child to master the National Curriculum.



What do you get?

- A flexible toolkit that **puts you in control**, with over 10 000 resources, activities, plans and assessment tools.
- An online world filled with lively and exciting maths games and rewards that **your digital-savvy kids will love**.
- Textbooks and workbooks for independent practice, designed to **capture children's interest and inspire a genuine love of maths**.
- Progress and Assess tests (including end-of-year tests), and clever assessment tools to **track children's attainment** and their progress towards 'age-related expectations'?

You can find more information on Abacus at:

<http://www.pearsonschoolsandfecolleges.co.uk/Primary/Mathematics/AllMathematicsresources/Abacus/Abacus.aspx>



ALWAYS LEARNING