



CASE STUDY REPORT

How to make significant improvements to the standard of attainment at NC level 4 in mathematics

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This study was originally published in 2009 as part of the 'What Works Well' initiative, part of the National Strategies for Education in England.

Abstract

Background: The purpose of the study was to reduce the gap in attainment between English and mathematics at National Curriculum Level 4 in selected schools by providing targeted intervention and CPD approaches.

Aims: The main aim of this development work was to reduce the gap in attainment between English and mathematics at National Curriculum Level 4 in selected schools by providing targeted support and CPD.

Methods: The participants included Primary Strategy Consultants, supported teachers, and their students. The project focused on targeted children with barriers to progress in mathematics, and aimed to increase the percentage of children attaining NC level 4 in mathematics. Methods used included four school visits with hands-on learning, four cluster meetings, two CPD days, and use of resources such as ITPs, excel spreadsheets, and Beam's online 'Maths of the Month' games and puzzles.

Findings: The main findings of the project were that targeted children with barriers to progress in mathematics had increased confidence and improved performance, with 80% of them being able to confidently identify the place value of 10th and 100th. Teachers also had a clearer understanding of the standard expected to attain NC level 4.

Implications: The findings suggest that providing targeted support and creative teaching methods can help narrow the gap in attainment at the National Curriculum Level 4, resulting in improved confidence and enthusiasm for mathematics.

This abstract was generated by Camtree using a large language model (LLM) and added to the original report in 2023.

Keywords: Primary education; Mathematics

Introduction

What were your reasons for doing this type of development work?

Primary Strategy Consultants identified a group of schools from the 2008 Key Stage 2 National Curriculum test data that showed a significant difference in the level of attainment in English to that of mathematics. Essentially schools that had comparatively high levels of attainment at NC level 4 for English did not have the same high level of attainment in mathematics at NC level 4.

These selected schools had a 'high capacity' of improving their school's and subsequently the local authority's levels of attainment at NC level 4.

- School A 17% lower attainment in mathematics compared to overall English result. (two form entry)
- School B 20% lower attainment in mathematics compared to overall English result. (single form entry)
- School C 11% lower attainment in mathematics compared to overall English result. (single form entry)

Who might find this case study useful?

- Support staff
- Carer
- Head of school improvement
- Headteacher
- Middle leader
- National Strategies consultant
- Parent
- Senior leadership team (SLT)
- SIP (School Improvement Partner)
- Subject leader
- Teacher

Description

What specific curriculum area, subject or aspect did you intend to have impact on?

- Mathematics

How did you intend to impact on pupil learning?

The focus was on targeted children with barriers to progress, in key skills for understanding number, mental calculation, reasoning and communicating in mathematics.

We were trying to expedite the progress of targeted children in mathematics by;

- challenging the schools capacity to improve
- promoting the need for targeted intervention for mathematics
- promote the use of wave 2 and wave 3 intervention rather than more general 'boosting'
- demonstrate the potential of using the APP materials to celebrate attainment, track achievement and plot the next steps of learning.

What were your success criteria?

Increase the percentage of children attaining NC level 4 in mathematics thus narrowing the attainment gap between mathematics and English in 2009 NC tests.

Reduce the differential from between 10% to 20% to less than 10% across all schools within the project.

What information or data did you use to measure progress towards your success criteria?

- Periodic teacher assessment
- Test results

Describe the CPD approaches you used

As a Lead Teacher, working with a targeted group of pupils in a supported school, I would always lead by example. Each school had four school visits.

On my school visits I would always exemplify the visual, auditory and kinaesthetic models of teaching and learning. Seeing 'how' something works through models and images allows children to visualise concepts. On one visit I used the ITP (Interactive Teaching Program) 'moving digits' to illustrate the multiplying or dividing by ten, hundred or thousand. We then continued into the hall to physically move places on chairs to the accompanying music of the Cha-cha slide. The multiplying and dividing by ten, hundred or thousand rule then became known as the Cha-cha slide rule, thus helping children to retain the concept.

Other key approaches would include a high level of practical equipment. Hands-on learning was always of high importance on my visits to demonstrate the value of children manipulating and exploring 'how' and 'why' things worked. Coloured counters were used by the children to investigate patterns and sequences for example when investigating triangular numbers and if successful, demonstrating how this linked with square numbers.

An importance was placed on the resources I used to ensure that they were free and easily accessible for the supported teacher to use after I had left. Resources such as the ITPs, excel spreadsheets for mathematics, and Beam's online 'Maths of the Month' (games and puzzles) which would help children retain mathematics vocabulary such as; prime number, square number etc... in a fun and enjoyable way.

What CPD materials, research or expertise have you drawn on?

Alongside the four school-based visits as highlighted above, each supported teacher was invited to four cluster meetings. These were held at each of the participating schools which helped foster a unity within the group. The cluster meetings were chaired by myself the 'lead' teacher but we were also supported by our link Primary Strategy Consultant. The supported teachers were also given two half-day support sessions direct from the Primary Mathematics Team.

The first cluster meeting was extremely important to the success of the project. A heavy emphasis was put on the core reasons for the differential in attainment; the identification of children with underlying misconceptions in prerequisite skills that were posing barriers to progress. A tone of mutual respect and supportive colleagues was struck, rather than an inspectorial role.

The subsequent school visits and cluster meetings took on a bespoke feel to suit the needs of the individual supported teachers and the specific learning needs of their children. Primarily CPD centred on recently published support materials such as Overcoming Barriers, Pitch and Expectation materials, Securing Level 4 document and the Assessing Pupil Progress grids.

However on an individual basis, supported teachers were given guidance on the structure of the renewed

framework, planning clinics and key messages regarding the revision period. Further guidance was given regarding the amount and types of recording needed in children's work in order to identify weaknesses in children's performance.

Related National Strategies resources:

Who provided you with support?

- Other

How were you supported?

- Two CPD days led by Primary Strategy Consultants
- CPD session on Overcoming barriers material
- CPD session on Pitch and expectations materials
- CPD session on Securing Level 4
- CPD session on the Lesson study
- General support and guidance on how to conduct cluster meetings and school visits.

Impact

What has been the overall impact on pupil learning?

Pupil learning has changed in these ways:

- As pupils are receiving focused support around identified needs, their confidence has grown back in the classroom.
- E.g. over 80% of the targeted children can now confidently identify the place value of 10th and 100th. This means that they were able to successfully order numbers with up to two decimal places, find the difference between numbers to two decimal places, but most significantly interpret a calculator display when solving a problem involving money.
- The more creative and hands-on approach to teaching mathematics has resulted in pupils being more positive about mathematics.
- E.g. small apparatus a regular element of lessons
Informal recording now evident in children's books allowing teachers' to address misconceptions
children taking mathematics games home to play with parents and siblings
- small apparatus a regular element of lessons
- Informal recording now evident in children's books allowing teachers' to address misconceptions
- children taking mathematics games home to play with parents and siblings

Thoughts you think are relevant to overall impact on learning

Teachers now have a clearer understanding of the standard expected to attain NC level 4 and thus are able to plan learning opportunities that are challenging yet attainable.

Quotes you think are relevant to overall impact on learning

I think maths is more fun now because we play more games and they are helping me get better at maths

Girl B aged 11

Quantitative evidence of impact on pupil learning

- Periodic teacher assessment
- Test results

Qualitative evidence of impact on pupil learning

- Logs or interviews
- Observation outcomes
- Pupils' work

Describe the evidence of impact on pupil learning

Statistical data below shows that all schools have significantly narrowed the gap in attainment at National Curriculum Level 4

- 07-08 School A attainment gap 17% 08-09 School A attainment gap reduced to 5%
- 07-08 School B attainment gap 20% 08-09 School B attainment gap reduced to 5%
- 07-08 School C attainment gap 11% 08-09 School C attainment gap reduced to 3%

(source NC results 07-08 / 08-09)

Pupil interviews have been used to identify core issues to ensure that any intervention work tackled underlying misconceptions, rather than more of the same. Where schools have adopted this approach there is clear evidence of accelerated progress for targeted children.

What has been the impact on teaching?

Teachers given time to plan in more depth using the most up to date guidance.

Use of assessment procedures (APP) to identify next learning steps – thus having a direct impact on planning.

Teachers' confidence has grown in diagnosing children's learning needs. Being more adept at unpicking 'why' a child has difficulties with specific concepts.

All abilities having an equal amount of teachers and available TAs time in structured, focused group teaching, addresses learning needs.

Differentiation for all abilities within the Yr6 cohort was greatly improved, not just the targeted group.

Emphasis on supporting targeted children in-class by way of equipment or alternative methods of recording.

Emphasis on building skills that the children would then use in a problem-solving situation.

Quotes you think are relevant to the impact on teaching

Sharing good practice in a supportive and informal environment improved teachers' confidence and thus outcomes for children.

Deputy headteacher

Evidence of impact on teaching

- Evidence from observation and monitoring
- Evidence from planning
- Teacher perceptions

Describe the evidence of impact on teaching

Teachers are using a more creative approach to teaching mathematics, using relevant and freely available model and images. Practical apparatus is now a regular element of the mathematics lesson, evident from planning and lesson study feedback.

What has been the impact on school organisation and leadership?

Renewed emphasis by SLT to challenge their school's capacity to raise attainment in mathematics.

Better balance of support between English and mathematics at strategic level.

- One school used evidence from this project to track back through their Raise online data to highlight groups of underperformance. Boys with SEN were highlighted as not making the correct level of progress and hence underachieving thus having a detrimental affect on the school's CVA.

Targeted intervention for mathematics is now being planned across KS1 and KS2 where historically support had always been geared to English.

Clear focus for mathematics subject leaders monitoring

- planning cycle
- assessment procedures
- the amount and types of recording needed in children's work in order to identify weaknesses in children's performance
- use of teaching/support assistants

Evidence of impact on school organisation and leadership

Focus on standards and subsequent tracking of vulnerable/ under-performing groups given high priority.

Strategic deployment of teaching assistants to support learning reviewed annually.

CPD opportunities planned and implemented.

Summary

What is the crucial thing that made the difference?

By challenging a school's capacity to improve – teachers need to reflect on their own practice and continually challenge themselves and their children to improve.

What CPD session and resources were particularly useful?

A supportive environment to challenge current practice.

If another individual or school was attempting to replicate this work, where would they start and what would the essential elements be?

Renewed emphasis by SLT to challenge their schools capacity to raise attainment in mathematics.

- Raise online data can support this process, comparing overall attainment as well as celebrating achievement.
- QCA analysis can show areas that children find hard to learn, and in turn teachers find hard to teach.

Pupil progress meetings using Fischer Family Trust data to identify target children and use Mapping pupil attainment grids to plot progress from KS1 NC test results.

Teachers need to reflect on their own practice and continually challenge themselves and their children to improve.

Use of assessment procedures (APP) to identify next learning steps - thus having a direct impact on planning process.

CPD in diagnosing children's learning needs. Teachers and support assistants being more adept at unpicking 'why' a child has difficulties with specific concepts.

Teachers are using a more creative approach to teaching mathematics, using relevant and freely available model and images. Practical apparatus needs to be a regular element of the mathematics lesson.

All abilities having an equal amount of teachers and available TAs time. Structured, focused group teaching ensures learning needs are addressed.

Where needed, promote the use of wave 2 and wave 3 intervention for specific underlying misconceptions rather than more general 'boosting'.

What further developments are you planning to do (or would you like to see others do)?

In the summer term the supported teachers will share their experiences, relevant materials and outcomes with Year 5 colleagues in their own school.

About Camtree

Camtree: the Cambridge Teacher Research Exchange is a global platform for close-to-practice research in education. Based at Hughes Hall, University of Cambridge, Camtree draws on high-quality research from around the world to support educators to reflect on their practice and carry out inquiries to improve learning in their own classrooms and organisations. You can find out more about Camtree and its digital library at www.camtree.org.

About 'What Works Well'

This case study was originally published as part of the 'What Works Well' section of the National Strategies for Education in England. The National Strategies were professional programmes aiming for improvements in the quality of learning and teaching in schools in England. 'What Works Well' involved teaching practitioners from all phases and areas of education sharing accounts of real developments which had improved learning and teaching, and made a difference to pupil progress. 'What Works Well' case studies were designed to support practice transfer and include sufficient detail and resources to enable others to implement the effective practice described. They were reviewed by experts prior to publication as 'User Generated Content' (UGC) under a licence which encouraged reuse and derivative works, but which precluded commercial use.

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