

Raising pupil attainment in number calculations in Year 6 (particularly low achievers)

Vicky Anderson
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Introduction

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

The Primary Strategy consultants for Cheshire identified a group of schools from the 2008 Key stage 2 Tests data that showed a significant difference between Maths and English (between 10 and 25% difference). Within each school a group of 6 children who were not on track to achieve a Level 4 at end of KS2 were targeted. This is based on the following data:

- School A: 78% Maths, 86% Literacy (2008) Differential of 8% (cohort of 64 Y6)
- School B: 79% Maths, 81% Literacy (2008) Differential of 3% (cohort of 57 Y6)
- *School B was identified to be in the programme in 2007 and asked to be part of the programme again in 2008 after receiving LA support for 2 years running, with a focus on Maths.

In addition to my work in targeted schools, I used the same approaches in my own school, Mill View Primary.

Who might find this case study useful?

- Headteacher
- Middle leader
- National Strategies consultant
- Senior leadership team (SLT)
- SIP (School Improvement Partner)
- Subject leader
- Teacher

Contacts

- Author: Vicky Anderson

School or setting

School: Mill View Primary School (Lead school in programme)

Type of school: Primary

Local Authority: Cheshire

Region: North West

Free school meals: Less than 20%

ISP aspect: Accelerating progress

Learners

Year groups: Year 6

Gender: Both

Performance: Below age-related expectation

Whole school: No

People involved: Teacher

Number of classes: 2

Number of adult learners: 4

What

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

- Mathematics

How did you intend to impact on pupil learning?

- To raise pupil confidence and efficiency in using written calculations (in particular multiplication)
- To provide focused learning opportunities for children who consistently make slow or little progress
- To raise pupil self esteem and enjoyment of maths using paired activities as a starting point to their learning

What were your success criteria?

- Improved pupil confidence in using range of written calculations (multiplication) so raising pupil self esteem and enjoyment of maths learning.
- Increased assertiveness of low achievers during paired and whole class discussion
- Increased number of children achieving National Curriculum Level 4 in Maths, so narrowing the attainment gap between Maths and English in the school in end of Key Stage 2 Tests 2009

PLEASE NOTE this page has three tabs - click 'Next tab' below or use tabs above to see Teaching approaches and CPD approaches

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

- Data comparison of cohorts

- Logs or interviews
- Observation outcomes
- Periodic teacher assessment
- Pupils' work
- Test results

What did you do? What teaching approaches (pedagogy) did you use to achieve the intended impact?

- Collaborative group work
- Independent learning
- Problem solving
- Use of pupil talk for whole-class teaching

Describe the teaching approaches you used

As a lead teacher I was required to make 6 visits to each of my supported schools. My focus was on a group of children who had been identified as being borderline Level 3/4 (referred to as Target group). During my early visits I identified barriers in their learning, using practice NC Test papers as a baseline. This was done in conjunction with recently published guidance material, 'Securing Level 4 in mathematics' and 'Overcoming Barriers'. (See links below)

Key barriers identified were in their use of written calculations (particularly multiplication) This in turn was having a 'knock-on' effect when tackling problems involving multiplication (particularly of 2/3 digit numbers by 2/3 digit numbers) It was apparent that no one method was favoured; this lack of consistency was also evident across the key stage when using multiplication methods. Only one child in the target group was familiar with the grid method as she had been taught it by a private tutor.

Since pupils' perceptions (from a questionnaire completed by the target group) showed a lack of confidence and a feeling of 'dislike' towards maths learning, I felt it necessary to focus on the 'fun' element of maths teaching and learning in an attempt to stimulate a renewed enjoyment of the subject.

Mathematical games were on the top of my list when gathering my resources - some personally made and some published.

I started with a game called 'Four in a row' which I had seen used in another school with great success. This game is played in pairs and made up of a 4 by 4 grid (just a smaller version of a multiplication square). Across the top row are multiples of 10 and down the first column are single digit numbers (the numbers can be adapted to suit the needs of the learners) One starts by choosing a square and calls out the calculation corresponding to that square e.g. 40×7 . The answer is calculated and either written on the square or covered with a coloured counter. Then the next one chooses a square and does the same. The object of the game is to get 4 correct calculations in a row, either across, down or diagonal. This was used as a starting point before introducing the grid method, whilst reinforcing the learners' understanding of multiplying by 10, 100 and 1000 and other multiples of 10.

The Interactive Teaching Program (ITP) 'Moving digits' was also used. This was enjoyed by all the class as it was interactive and fun. Using such models and images allows children to visualise concepts that can often be misunderstood <http://nationalstrategies.standards.dfes.gov.uk/node/47770> .

Other games and puzzles were used from the website 'Nrich maths' eg. Mystery Matrix, which consolidates use of multiplication tables http://nrich.maths.org/public/viewer.php?obj_id=1070

Introducing the grid method involved giving the children a blank grid to work on; starting with a 2 by 2 grid, progressing to a 3 by 2, then a 3 by 3 grid. Working again in pairs, each child was encouraged to talk through the process to their partner before sharing with others. The ITP 'Multiplication Grid' was also used.

<http://nationalstrategies.standards.dfes.gov.uk/node/47783>

After a few lessons 'getting to grips' with the grid method, problems were introduced which required the use of written calculations in multiplication. These were taken mainly from the 'Pitch and Expectations' document for Year 6 (see link below). The children were able to apply their newly-learnt method to the problems with renewed confidence and with a greater sense of achievement all round.

The following lessons involved pupils making their own choices of the 'most efficient' methods to use (grid, column, partitioning) This was further reinforced by the class teachers and feedback was provided.

Upload

 [4 in a row \(1\)](#)

 [4 in a row \(2\)](#)

 [4 in a row \(3\)](#)

 [4 in a row \(4\)](#)

What did you do? What approaches to CPD and learning for adults were used?

- Learning conversation
- Lesson observation
- Lesson study
- Modelling
- Work scrutiny

Describe the CPD approaches you used

Initial data analysis to identify 'target group', using Mapping attainment grids used by each school and analysis of end of Year 5 QCA Optional Tests results; alongside Fischer Family Trust data. Barriers of learning identified using APP (Assessing pupil progress) and review of practice end of Key Stage 2 Test papers.
Pupil perceptions of maths- questionnaire/interview.

Lesson study After the above had been carried out the Lesson Study model was introduced to the supported Year 6 teachers, using the 'Improving practice and progression through lesson study' National Strategies handbook (Ref. 00508-2008BKT-EN, see link below) This pre-planning session was held at one of the participating schools, together with the Year 6 teachers and myself leading the session. Key features and strengths of the model were discussed (as indicated in the handbook) Planning for teacher release time for all those involved in the lesson study is fundamental to this type of practice and requires prior consideration. In addition to this pre-meeting, I met with the Headteacher to discuss my plans for the lesson study and agreed to provide feedback once the lesson study had taken place.

The lesson study was planned during an afternoon meeting with both Year 6 teachers. Together we identified the focus of the lesson to be on the underlying barriers of learning in written calculations. During this meeting we identified the 'focus children' who were to be central to the study. It was decided that I would lead the lesson and the two Year 6 teachers would observe the progress of the focus children throughout. A lesson observation sheet was introduced to the Year 6 teachers on which they would make notes on each child at 15 minute intervals during the lesson (see attached lesson observation sheet below)

The teachers involved in the programme were very receptive to this type of approach to classroom- focused CPD, as it centres on 'peer ownership of the research lessons and focuses on learning and not the teacher' (Improving practice and progression through lesson study' National Strategies handbook Ref. 00508-2008BKT-EN). After this pre-planning meeting the teachers were asked to consider the types of activities they might like to use to support the chosen focus. The planning meeting was scheduled for the following week during which time the lesson would be planned together. It is important that the collaborative element of the lesson study model is emphasised at all stages of the process so having maximum impact on both teaching and learning.

A full afternoon was taken up with planning the lesson, again with all those who were going to be involved. Making sure sufficient time is allocated to the release of the teachers involved is fundamental to this collaborative CPD. Sharing of teaching approaches and resources took place during the planning meeting, resulting in an hour long lesson to be carried out the following week (see lesson plan)

Following the lesson study (see lesson described), the focus children were interviewed by myself. This could be done by any of the teachers involved, but due to difficulties in releasing the Year 6 teachers for a further lesson on this occasion, it was not possible. General questions were asked about the lesson, i.e if they had enjoyed it, which parts had they enjoyed or found difficult. I then spent time at the end of the day to feedback to the Year 6 teachers. The teachers found this a valuable part of the process and commented on the fact that as teachers we rarely ask children what they enjoy about their lessons and what parts they were not so happy about, and reasons why. Such interviews/pupil perceptions can inform teachers planning further and give them greater awareness of individual needs of their pupils.

In the afternoon following the lesson study, I met with the teachers who had been involved, to discuss their observations of the lesson and a detailed 'dissection' of the children's learning was carried out. This post-lesson meeting needs to be a full afternoon or morning so that a detailed analysis of the approach can be carried out and an action plan can be agreed in terms of next steps for the focus group.

Following up from the lesson study is fundamental to the process. A series of lessons followed this initial lesson study, with a direct focus on the children initially observed. The teachers involved were extremely positive about this approach to classroom-focused CPD, as it helped them to focus in on one small group of children; building on and recording their progress each time. It also gave the teachers involved the opportunity to work collaboratively, share ideas and teaching approaches, resulting in an improved impact for all children.

Throughout the project, CPD centred on recently published support materials: Overcoming Barriers, Pitch and Expectations, Securing Level 4 documentation and Assessing Pupil Progress guidelines for Level 3/4.

Upload

-  [Lesson Study Observation sheet](#)
-  [Lesson study Plan](#)
-  [Pupil perceptions of Maths questionnaire](#)

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

- APP (Maths) material - APP guidelines for Level 3/4 <http://nationalstrategies.standards.dfes.gov.uk/node/64627>
- Mapping attainment Grids
<http://nationalstrategies.standards.dfes.gov.uk/node/47890>
<http://nationalstrategies.standards.dfes.gov.uk/node/182287>
- 'Overcoming Barriers' document and CD (Levels 3/4)
<http://nationalstrategies.standards.dfes.gov.uk/node/84818>
- 'Pitch and Expectations' materials: Year 5 and Year 6
<http://nationalstrategies.standards.dfes.gov.uk/node/64423>
<http://nationalstrategies.standards.dfes.gov.uk/node/47412>
- 'Securing Level 4 in mathematics' Primary National Strategy document
<http://nationalstrategies.standards.dfes.gov.uk/node/165326>
- Year 6 mathematics timeline <http://nationalstrategies.standards.dfes.gov.uk/node/20232>
- 'Leading improvement using the Primary Framework' (Models of classroom-focused collaborative CPD that work) Primary National Strategy document <http://nationalstrategies.standards.dfes.gov.uk/node/64851>
- 'Improving Practice and Progression through Lesson Study' National Strategies handbook
<http://nationalstrategies.standards.dfes.gov.uk/node/132730>
- Fischer Family Trust Data - see http://www.fischertrust.org/dap_overview.aspx

Who provided you with support?

- Senior management

How were you supported?

As leading Year 6 teachers in this programme we attended two CPD days led by Cheshire Primary Strategy consultants.

During these sessions we were given guidance and support on how to conduct our school visits and cluster meetings with the Year 6 teachers we were working with.

In addition to this we were introduced to the following:

- Overcoming barriers materials
- Pitch and Expectation materials
- Securing Level 4 material
- Implementation of Lesson Study

The funding provided facilitates the time needed for collaborative lesson study.

Upload

 [A Lesson Study Approach \(CPD\).ppt](#)

 [Y6 Lead Teacher Maths project \(CPD\)](#)

Impact

What has been the overall impact on pupil learning?

- Targeted pupils showed improved confidence when using written multiplication methods, this resulted in successful solving of problems involving multiplication calculations.
- Targeted pupils were more focused than previously observed and were genuinely excited about learning how to use the grid method for their multiplication calculations.
- Targeted pupils were able to talk with growing confidence about the strategies they used, displaying a better understanding of place value and moving digits when multiplying by 10, 100 and 1000. The use of mathematical games and interactive whiteboard materials had a positive impact on the overall enjoyment of maths learning, not just for the targeted group but for the whole class.
- Targeted pupils were seen to be 'taking more risks' when tackling problems.

Thoughts you think are relevant to overall impact on learning

Providing pupils with a focused, creative and hands on approach to learning resulted in a renewed confidence in maths and in turn improved the self esteem of these pupils who when interviewed at the start of the visits did not consider themselves to be good at maths or enjoy maths.

Quotes you think are relevant to overall impact on learning

'Multiplying big numbers is much clearer in my head. I can do it now!'

'I liked the 4 in a row game, it was fun to play and really helped me with my maths!'

'I am good at adding at the end of the grid method, at first I kept missing off the zeros, but I am fine with it now'

'I liked sharing with a partner and holding our answers up on a whiteboard'

Target pupil A

'I am now confident multiplying 3 digit numbers by 2 digit numbers using the grid method, I often get confused when I do the other (column) method, the grid is much easier'

'It makes me feel good when I get the answer right!'

'I am getting so much better at maths'

Target pupil B

'Playing games in maths was fun, we usually just get a text book and do the answers'

'I liked using the whiteboard and playing 4 in a row, it's fun but teaching you stuff you didn't know'

'I liked using the grid method, it's quite short and easy and not at all longwinded'

Target pupil C

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

Target pupils interviews provided sound evidence of the impact this work had on their learning. All interviews carried out were very positive with regard to their renewed confidence and enjoyment of maths. Pupil perceptions of maths were recorded earlier in the program and the general feeling for maths learning was poor, due to low self esteem and inadequacy for the subject. Progress of these pupils was accelerated and by the end of the programme which coincided with the end of Key Stage Tests the results were very positive, with all except one child achieved NC level 4 in Maths.

Overall standards of attainment in Maths for end of Key Stage 2 were higher this year (2009) than last, with 88% achieving Level 4 and above, compared to 79% achieving Level 4 and above in 2008.

What has been the impact on teaching?

Teachers are more aware of the individual needs of low achievers (target group) in their class and the diagnosis of their specific learning needs.

Use of assessment process (APP) to identify next steps - use of APP guidelines to inform planning and key objectives (for pupils at working at border line level 3/4)

Better use of Teacher Assistant role within the classroom, focusing more on small target group rather than individual children.

Teaching the process of working through strategies using variety of learning opportunities.

Use of lesson study approach in sharing and evaluating of alternative teaching and learning approaches.

Thoughts you think are relevant to impact on teaching

Involvement of other Year 6 teachers (in another school) in offering appropriate pedagogical guidance.

Quotes you think are relevant to the impact on teaching

'The time to reflect with other Year 6 teachers has been invaluable, it has made me focus on my current practice so much more.' – Year 6 teacher

'I really enjoyed the lesson study approach, as teachers we never really just have the time to simply stand back and observe what is going on in our classroom - it is so interesting' – Year 6 teacher

'The children have a renewed sense of self-worth, it is great to see them responding to the challenge.' – Teaching Assistant

Evidence of impact on teaching

- Evidence from observation and monitoring
- Teacher perceptions

Describe the evidence of impact on teaching

Teachers are more aware of pupils' perceptions of maths (initial interview questions/answers conducted by class teachers) and addressing their individual needs.

Teachers planning for more opportunities where pupils use talking partners to help them discuss strategies and problem solving situations. They are using a more creative approach to teaching, using models and images (ICT) to impact learning, and mathematical games to stimulate pupil enjoyment and interest.

What has been the impact on school organisation and leadership?

Shared understanding between teachers involved, subject leader and senior management team in addressing ways to tackle under achievement at upper KS2.

Highlighted the emphasis for subject leader to challenge the school's capacity to raise overall attainment in maths - particularly in identifying gaps in pupils' learning using APP materials and focusing on the use of curricular targets to ensure progression of skills in maths (in particular the use of grid method for multiplications being established lower down the school)

Targeted intervention put in place in upper KS2 as a result (in one school)

Thoughts you think are relevant to overall impact on school organisation and leadership

Identification of gaps in pupils' attainment using APP materials as well as regular analysis of backdated NC Test papers

More focused use of APP materials (Overcoming barriers), Securing Level 4 documentation and Pitch and expectations material.

Lesson study used as a model to be implemented throughout school in coming months as evidence of good practice.

Quotes you think are relevant to overall impact on school organisation and leadership

'This is great practice (lesson study) and something our school will definitely look to implement across key stages and across other subject areas in the future.' – Headteacher

Evidence of impact on school organisation and leadership

Evidence came from discussions with Head teacher and subject leader (feedback on programme)

Summary

What is the crucial thing that made the difference?

Use of lesson study; providing year 6 teachers the opportunity design a lesson collaboratively, focusing on one aspect of teaching which evidence tells them could improve in relation to the children's learning and progress.

As the document 'Leading improvement using the Primary Framework' states lesson study 'encourages risk-taking in supportive context and incisive observation.....Collaborative honing of techniques then sharing the new approach boosts impact for all children'

The work carried out in these schools allowed teachers to reflect collaboratively on their own practice and provided them with the opportunities to challenge their own teaching and in turn challenge their pupils to improve.

What key resources would people who want to learn from your experience need access to?

- Overcoming barriers materials (CD/document)
- Pitch and Expectation materials
- Securing Level 4 in mathematics document
- Year 6 mathematics timeline
- 'Improving Practice and Progression through Lesson Study' National Strategies handbook (all available on Primary National Strategy website)

What CPD session and resources were particularly useful?

- CPD session led by Cheshire Primary Strategy team on 'Lesson Study'
- Leading classroom-focused collaborative CPD. These materials are now part of Senior Leadership team CPD section of the National Strategies website: <http://nationalstrategies.standards.dfes.gov.uk/node/20473>

(See Day 1 and Day 2, and Attachments and Resources on right of each page.)

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

- CPD session led by Cheshire Primary Strategy team on 'Lesson Study'
- Leading classroom-focused collaborative CPD. These materials are now part of Senior Leadership team CPD section of the National Strategies website: <http://nationalstrategies.standards.dfes.gov.uk/node/20473>

(See Day 1 and Day 2, and Attachments and Resources on right of each page.)

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

Continuation of lesson study approach with Year 5 colleagues in own school - sharing of good practice, experiences and materials. Time to evaluate with colleagues on the lead year 6 programme and use experience to develop continued good practice in own school.

Case study status

Approved

Coordinator

Lorraine Dawes

Related case studies

[Essex lesson study: Year 4 mathematics – Problem solving](#) [Lead Teacher Programme in Maths](#) [Creative maths to engage pupils and raise standards](#) [Using Creative Maths to Raise the Standard of Teaching and Learning](#) [Supporting maths subject leaders in monitoring teaching and learning](#) [The Nintendo DS Lites project](#) [Thought Bubble Accelerating progress in Year 6 using Leading Teachers](#) [How to make significant improvements to the standard of attainment at NC level 4 in mathematics](#)

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