

How scaffolds can effectively support children in their development of spoken reasoning in maths

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Key Points

The skills of reasoning are key to creating successful mathematicians. Internalisation of these skills is the first step but the ability to voice your ideas is key to truly deep understanding.

Purpose

What were your reasons for doing this development work?

This has been an area for development over the past 2 years and I have been developing my understanding and a range of resources since becoming maths coordinator..

Through our participation in the Camden lesson study and our whole school focus on the development of maths teaching and learning, we identified a clear need.

We identified that, despite reasoning skills being effectively developed through teaching and learning, children lacked the language that helped them to articulate their reasoning in maths.

Reflections tended to rely on explanation of procedural information rather than skills such as generalising and proving.

Throughout the project, my focus expanded to include reasoning and justifying of strategies when calculating through the introduction of 'Number Talks'

Who were the identified target learners?

As I currently teach year 5, these were the target of my research however through my role as maths coordinator, I was able to introduce and develop strategies across the school through planning support and INSET.

What specific curriculum area did you intend to have impact on?

This initiative focused on the articulation of understanding in maths although it was part of a wider whole school focus on speaking and listening which helped to support the children in developing new skills.

How were you intending to improve pupil learning?

The intention was to support children' spoken and written reflections on their learning through the use of scaffolded sentence structures focussed on different elements of the problem solving process.

The intention was that these would be highly scaffolded to begin with and that this support

would be gradually withdrawn as children took ownership of the language of reasoning.

The process relied heavily on the children being used to using such prompts in other sessions such as reciprocal reading as well as talking with learning partners which has been fully embedded in the school for many years.

What were your success criteria?

Samples of children's work were taken from their year 4 books for comparison with samples over the year.

Discussions with the many adults who work within the class were used to debate and discuss the progress made by the children.

The aim was that children would be able to effectively complete the scaffolds with the support of the class discussions.

Methodology

What did you do - what teaching approaches did you use?

Investigations were selected for their ability to support high quality generalising, justifying and proving.

These investigations were grouped in to themes so that children had the chance to revisit ideas and skills within their explanations.

Scaffolds were carefully planned and tested to ensure that they supported explanation rather than stunting children's ideas.

Oral rehearsal was used and insistence on the use of full sentences.

Emphasis and value were placed on the process of investigating over the finding of a correct solution. (this was something which the class previously struggled with)

Modelled and shared writing techniques were used (already well embedded in literacy) to help children to understand the thought processes and language needed to write an effective reflection

The use of Dear Chloe's was developed to give children opportunities to discuss ideas and interesting elements of investigations.

Pink and green marking was used to edit and improve reflections (already well-established in literacy writing)

What specific teaching resources did you use?

Nrich reasoning skills article

Camden-led Partnership assessing reasoning documents

Scaffold bank to support teachers in creating effective scaffolds

Word banks to help children to complete scaffolds

What CPD experiences, materials, research and expertise have you drawn on?

The project was very much inspired by our findings made during the Camden Lesson Study (year 5+6 Autumn 14) where we specifically focussed on girls' underachievement in maths.

Having been trained on the NRich course along with many others of my colleagues this focus on communicating maths seemed a natural and necessary progression to drive forward our children's learning.

As an SLE for maths, I am somewhat obsessed with the teaching of maths and true mathematical understanding. Working closely with a colleague, we often dissect our rationale for how and why we teach certain strategies and skills and these discussions were invaluable when analysing the best ways to develop our children in this area.

Through my Work with Eleanor Palmer writing the Camden-Led Partnership Assessing Reasoning documents, discussions made us realise that certain (more difficult) skills such as generalising and proving were not receiving enough focus perhaps through lack of teacher confidence in these areas. With these skills being so central to deepening children as mathematicians it felt like time well spent to develop strategies for address these skills.

Throughout the project (and in fact prior to the project) INSET time was used to disseminate some of the resources and to train people in how to adapt scaffolds to support the development of skills.

Outcomes and Impact

What has been the impact on pupil learning?

Children's awareness of the importance of expressing and discussing in maths has improved.

Children are generally more willing to share ideas and there are for more occurrences of children spontaneously commenting on patterns or interesting aspects of investigations.

The quality of talk during investigations has improved as has the quality and focus of written reflections.

Evidence of impact on pupil learning

Although overall attainment is not high in the class, the impact of the scaffolding is evident in both attitudes and children's willingness and ability to undertake investigative tasks.

This has been part of a wider initiative with the class which has drastically changed attitudes towards and confidence in maths.

What has been the impact on teaching?

I am now far more structured in my approach to reflections in maths lessons. I am able to identify and pre-empt interesting aspects of investigations and more rigorous in my modelling of certain skills.

I feel even more confident to support colleagues across the school to tailor scaffolds to their children and the investigations being undertaken

Evidence of impact on teaching

Weekly planning has a place for scaffolds to be pre planned as part of the lesson planning process.

Scaffolds are being used effectively across the school and this needs to be consolidated and developed.

What has been the impact on school organisation and leadership?

Inset has allowed this to be introduced across the school and this continues to be the case as teachers develop the skill of creating supportive and not restrictive scaffolds. This is working particularly well in year 3.

Evidence of impact on school organisation and leadership

What is the crucial thing that made the difference?

Time to dissect the skills and to experiment with scaffolds – refining and tweaking throughout the project.

What would your next steps be?

To provide more support to teachers across the school.

To roll out Number talks across the school as a way of getting children to engage with

strategy selection and expressing ideas.

Sharing Practice

If another individual or school was attempting to replicate this work, where should they start?

Read the Nrich reasoning skills article to fully understand the elements and skills of problem solving.

Try to attend NRich training as a solid pedagogical understanding of teaching through problem solving is vital.

Get stuck in and have a go – the refinement process is invaluable

What would be the essential elements to include?

Partner talk

Carefully created and sometimes restrictive scaffolds

Oral rehearsal

Visual prompts

Word banks