Supporting children to be active and influential participants in mathematics lessons through effective use of assigning competence and pre-teaching

Final Report July 2017

Report of an action research project

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Summary of findings

This project explored how vulnerable children could be supported to be active and influential participants in maths lessons, accessing age-appropriate mathematics, through the use of pre-teaching in advance of maths lessons and assigning competence within maths lessons.

> *The impact has been extraordinary. We have had the privilege of witnessing teachers change children's lives through this project. Children who had no belief in themselves as learners in mathematics now believe in themselves, and are actively involved in their own learning and in the learning of others* – Maths Adviser

Both teachers and children involved in this project report that the combination of the two strategies (pre-teaching and assigning competence) had a positive impact on levels of participation and the ability to be influential in lessons. For many of the children it not only allowed them to access age-appropriate mathematics, it also had a positive impact on their attainment in tests (see Appendix 5)

This combination of the two strategies led to the following findings, starting with the most important finding:

1. **Pre-teaching must be run by the class teacher** - if the pre-teaching is going to benefit the children in the maths lesson it must be run by the class teacher. The children value the time because it is with their class teacher. Because the children and class teacher have a shared experience it gives them a shared understanding and common references which they take into the whole class lesson.
2. **Pre-teaching and assigning competence maximise learning in lessons** - by having class teachers provide the 'additional time' and putting it *before* the learning happens in a maths lesson, rather than *after* it, children are provided with even more additional time and opportunities for learning than just in the pre-teach. This is because it makes the lesson a meaningful experience for the children, rather than them experiencing it as a time when they don't understand and feel they have failed, and teachers are better placed to support their learning in the lesson.
3. **Pre-teaching and assigning competence have a positive impact on children's confidence in themselves as mathematical thinkers.** This was demonstrated by:
    a. **Engagement from the start of the lesson –** both the focus children and the teacher benefit from pre-teaching in terms of their focus and engagement with the mathematics at the start of the lesson.
    b. **Offering contributions and being ready to respond –** the children offered contributions more frequently, which demonstrated a shift in attitude and resulted in positive feedback which then led to further participation and the teachers were alert, looking for the children to contribute.
    c. **Asking different questions and seeking out a challenge** - the children were able to think more mathematically in the lessons because they were less anxious and therefore paying less attention to their emotional wellbeing. This resulted in the children being prepared to ask questions that focused on the mathematics, rather than emotional reassurance, and to want to tackle challenging mathematics.

d. **Accessing resources independently** - this included children using: their pre-teach journal as an aide memoire; working walls; and maths equipment.
e. **Explaining thinking –** the pre-teaching meant the children were better able to explain their thinking; this in turn meant they had the opportunity to deepen their understanding, in the lessons, when asked to explain.
f. **Supporting others –** this included using resources, drawing and explaining
g. **Active participation in conversations –** the children became willing to challenge others, including high-status children, and defend their own thinking.
h. **Changes in behaviour and attitude outside of the classroom –** parents reported positive changes in terms of children's interest in and attitude towards their learning reflected in an increased willingness to talk about their learning at home.

4. **Pre-teaching can have different structures and focus on different things**. Key to pre-teaching sessions being successful, along with them being taught by the class teacher, are the following:
    a. **Pre-teaching must provide children with access to the mathematics in the maths lesson**, allowing them to actively participate. It is **not** about being able to replicate in the lesson the maths from the pre-teach session **nor** is it about teaching the whole lesson in the pre-teach session. It is about preparing the children to be able to engage in the struggle of the mathematics in the lesson by removing additional barriers.
    b. **Identify one thing that will allow the children to access the mathematics in the lesson.** This could include:
        i. Introducing new mathematics, new contexts and new contextual resources
        ii. Rehearsing prior learning
        iii. Rehearsing language
        iv. Allowing confusion to happen
        v. Using misconceptions
        vi. Using images/resources (especially for the first time)
    c. **Timing** - most teachers found that having the pre-teach on the same day as the maths lesson worked best although some did run sessions at the end of the day in advance of the lesson the next day. Some teachers liked to run the session immediately before the lesson whilst others liked a gap as it allowed them time to reflect on how they might want to adjust the lesson in light of the pre-teach session.
    d. **Frequency -** teachers varied in terms of how frequently they ran pre-teach sessions but at least weekly seemed to work best. For vulnerable children there is a need to provide regular sessions at least in the early part of the year. These children benefited from being involved for the whole year; flexibility may be important in terms of making pre-teaching work in the long term with the option to vary at least some of the children who are involved, but the impact on the focus children in this project relied on their sustained involvement in the pre-teach sessions for the full year.

e. **Length –** there is no set length for a pre-teach session, the important thing is clarity about the purpose of the session and taking the time needed. Fifteen minute sessions were often needed, for example when the focus was on introducing a new bit of mathematics, but sometimes a few minutes immediately before a lesson prepared the children for participation, for example through rehearsing language.

5. **Assigning competence is a powerful tool but can be more challenging for teachers to use effectively.** The following were found to be important when considering assigning competence:
    a. Be subtle – it is not about a performance or memory test
    b. Comment on the thinking/idea not the child
    c. Use simple phrases to draw attention to valuable thinking
    d. Anticipate and monitor
    e. Support other children to publicly state how they have been helped by a class member
    f. Subvert hierarchies that exist in the classroom
    g. Attend to classroom culture and school culture.

Professional Development for Teachers

In addition to the findings above, the year-long project allowed teachers to engage in a sustained piece of professional development which had a direct impact on them in their work.

The two elements of the project identified by the teachers as being most influential on their own practice, were the collaborative lesson research cycles and the support of a 'knowledgeable other' (maths adviser). It is important that any professional development is planned into the school day, so that it is valued both by participating teachers and by their senior leadership team.