

Can pre-teaching enable low attaining pupils to make accelerated progress when learning new concepts in mathematics?

Orchard Primary School, Upper Key Stage Two

Abstract

The rationale of this research was to measure the success of pre-teaching and establish whether it could enable low attaining pupils in maths to make accelerated progress when learning new concepts. Over the course of three months, a small group of low attaining pupils from Years 5 and 6 (4 from each year group), were pre-taught new concepts in mathematics. This was conducted by teaching assistants, who led 20 minute teaching sessions, which took place once per week.

This research was positively received by the teachers, the teaching assistants directly involved and the pupils. It was clear to see that all pupils were engaged, confident and comfortable working within a small group from the outset. Their positive behaviour and learning attitude was immediately transferred into their classes. Pre-teaching most certainly boosted their self-esteem and pupils displayed high levels of in lesson interaction.

The results show almost all pupils made accelerated progress and this was measured using teacher assessment from end of previous year to the end of the current year. Furthermore, this study supported pupils and enabled them to actively engage, thus improve their oracy in maths. In order for pre-teaching to be more successful, it should be embedded as a daily intervention at the beginning of each day.

Introduction

Orchard Primary School is a large school located in Hackney and is towards the end of the process of becoming a three form entry school. The school is culturally diverse. The proportion of pupils from minority ethnic groups and those who speak English as an additional language is much higher than the national average and so is the proportion of pupils eligible for pupil premium. In terms of pupil progress, pupils perform well above national average by the end of Key Stage 2.

Following a conversation with teachers across the phase, it became noticeable that pupils grasp challenging concepts at varying speeds and some, mainly the least able pupils, require additional time. It was agreed that pre-teaching would be used to give small groups of low attaining pupils an opportunity to explore and comprehend the content of the next maths lesson with the support of an adult.

There are many possible benefits to pre-teaching and the most obvious is that it can boost pupil self-esteem. Some pupils find understanding mathematical concepts very challenging and as a result, they may feel apprehensive, be reluctant to participate and contribute in class discussions. They may lack confidence and belief in their abilities and be afraid of making mistakes. Watching their peers flourish whilst they slowly fall behind can be demoralising.

Pre-teaching can equip pupils with some background knowledge, giving them a head start. It can bolster pupils' self-esteem, changing their attitude towards mathematics. Trundley et al (2017) explored the impacts of a pre-teaching action-research project supporting vulnerable children to be active and influential participants in mathematics. She concluded that 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, (Trundley et al. 2017, p.3).

Minkel (2015), who compared pre-teaching to remediation concluded that for 20 minutes investment of time, we can change the way a child see himself as reader, a think or mathematician. We can give Manuel the rare experience of being the kid who gets it first, who helps the other kids figure it out, who is ready with the answer the moment he hears the question, (Minkel, 2015, p4).

Pre-teaching could possibly reduce the need for remediation such as 'catch up' or even 'keep up' intervention which happens after teaching, (Dan Polak, NCETM). Pupils are likely to feel more positive about intervention prior to the lesson and therefore, that it may boost their self-esteem. When schools intervene after a lesson, the child has already struggled with a concept and could, potentially, feel deflated (Dan Polak, NCETM).

Another benefit of pre-teaching is that it provides pupils with additional time to understand challenging mathematical concepts. In Learning For Mastery (1968), Bloom identifies a critical assumption within mastery by saying given time enough, all students can conceivably attain mastery of a learning task. The phrase "given time,

enough” contains a challenge: The challenge of providing additional time for children who need it in a form that will maximise impact whilst minimising disruption to the rest of their learning (Bloom, 1968). As pupils learn at varying speeds, low attaining pupils with learning difficulties are more at a risk of falling behind if they are not given enough time. Pre-teaching can set up the condition where the main lesson actually becomes a period of over-learning, (Sobel, 2018), where pupils are given additional time, to revisit and consolidate skills that they have already practised, which could potentially be an opportunity for pupils to attain mastery.

Research Process

The project was coordinated by the Upper Key Stage 2 phase leader with the support of 4 class teachers and pre-teaching sessions were delivered by 2 teaching assistants. 20 percent of the lowest attaining pupils were identified in Year 5 and 6 and of that, 4 pupils were selected from each year group.

It was agreed that class teachers would share weekly planning and resources with the phase leader and the teaching assistants. Every Tuesday afternoon, focus pupils were taken out of class and pre-taught contents of Wednesday’s maths lesson. Sessions lasted between 20-25 minutes and were structured similarly to an input of a normal maths lesson. Just like a regular maths lesson, pupils were presented with a quick starter closely linked to the main focus. Then key vocabulary was introduced and a range of questions were posed. After that, the main concept was introduced and carefully modelled. Finally all pupils were given opportunities to apply pre-taught skills either verbally or written using mini whiteboards. Both teaching assistants kept written records of pupil performance for every session, (see appendix 1). All activities were based on fluency and reasoning opportunities were targeted through questioning. Immediately after each session, these were verbally communicated with the phase leader, as well as the class teachers and this informed planning and resourcing for the following day.

Two weeks into the research, both the adults and the pupils became familiar with the structure and small changes were made in order to maximise time for pupils to apply taught skills. For instance, adult input became shorter, focusing on key vocabulary and modelling of the concept just once. This meant pupils had more time to practise applying taught skills in a range of context with their partner until they demonstrated fluency. When misconceptions were identified, the teaching assistant would intervene

and re-model. In some cases, particular children were kept were behind for a few minutes longer as they required additional re-modelling.

Towards the second half of this research, more changes were made. Sessions focused on a progression of skills, (see appendix 2) and became a ‘my turn, your turn’ process in order to ensure a balance of adult modelling and pupil application. For instance, the adults would begin by modelling the basic concept carefully and then pupils would practise applying this skill on their mini whiteboards. Once they demonstrated fluency, the adults would move onto modelling a more challenging concept, followed by another opportunity for pupils to practise and this process continued.

Findings

When the research was proposed in the beginning, it was greatly received by all the staff involved. The teaching assistants took real ownership of the study, used their initiatives, created additional resources to help scaffold learning and made additional time to revisit areas with particular children. They also suggested small changes taking into account the learning needs of all pupils and these were implemented successfully.

Teachers expressed how they noticed an immediate change in the children’s behaviour and learning attitude, (see appendix 3). Pupils looked forward to Wednesday’s maths lesson and they were fully focused and frequently contributing. Some were courageous and willing to answer complex reasoning questions, build onto the answers of their peers as well as agree/disagree and challenge them. During application time, pupils were more independently accessing resources and completing work to a good standard, thus moving onto more challenging tasks. The shift in behaviour and learning attitude towards mathematics is reflected in fig 1, which shows pupils attainment from the end of last year to the end of the current year. Almost every pupil has made more than expected progress.

Fig 1.

<u>Year 5 Pupils</u>	<u>End of Year 4 Attainment</u>	<u>End of Year 5 Attainment</u>
MC	YR4E	YR5D
AG	YR4S	YR5S
JM	YR4D	YR5D
AS	YR4S	YR5D

<u>Year 6 Pupils</u>	<u>End of Year 5 Attainment</u>	<u>End of Year 6 Attainment</u>
DM	YR5D	YR6S
DC	YR4S	YR6D
KC	YR5D	YR6S
SOB	YR5D	YR6D

This research project has highlighted some areas, (see appendix 4) which will need to be addressed if pre-teaching is going to be successfully implemented as an intervention in Upper Key Stage 2. Most of the adults involved agreed that pre-teaching should take place on the same day as the mathematics lesson and this could be as part of early morning work. Not all pupils are able to retain information as effectively as their peers; therefore having pre-teaching on the same day could enable pupils to be more engaged and more actively participating.

As pre-teaching proved to be very popular amongst pupils, it would have further benefited them, if it happened on more than one occasion. Some units were more challenging than others and therefore required more than one session during that week to better support pupils. In order for pre-teaching to be more successful, flexibility is required, where number of sessions vary depending on pupil and learning needs.

Teachings assistants expressed that the number of focus children in each year group was small and very easy to manage. This project could have benefited more pupils if groups were larger. Instead of having two assistant pre-teaching pupils from across four classes, all four teaching assistant should have been trained and given focus pupils within the class they work in.

Impact and Conclusion

The evidence concludes that pre-teaching can enable low attaining pupils to make accelerated progress when learning new concepts in mathematics. This research created opportunities for pupils to practise a range of skills within small groups away from their classes, in an environment where they had a bigger voice, felt more confident and therefore could freely express themselves. When pupils went back into their classes, they were in control and more actively involved in their own learning as well as the learning of others. As a result, all pupils made the expected progress, with the majority making more than expected.

For pre-teaching to be implemented successfully, it would require some adaptation. Firstly, it needs to be taught in class on the day of the mathematics lesson and as part of early morning work. In addition, pre-teaching needs happened more than once per week, although as there are other interventions already in place, timetabling additional pre-teaching session would be no easy task. These changes would ensure more consistency in exceptional behaviour, learning attitude and active participation, which will enable continuous progress in mathematics.

All pupils involved demonstrated high levels of engagement throughout this research and both groups were small and easy to manage. This research needs to reach out to more pupils and can be managed by teaching assistants from all four classes, similar to other interventions such as precision teaching. This will ensure more effective communication between the teaching assistant and the class teacher, informing differentiating and pitch of future planning.

References

Minkel, J. (2015) Why I prefer pre-teaching to Remediation for struggling students. Published Online: May 18, 2015 <https://www.edweek.org/tm/articles/2015/05/18/why-i-prefer-pre-teaching-to-remediation-for.html>.

Trundley, R. et al. (2017) Final Report July 2017: Supporting children to be active and influential participants in mathematics lessons through effective use of assigning competence and pre-teaching. The full project report can be accessed at: <http://www.babcock-education.co.uk/ldp/PTAC>.

Bloom, B. (1968) Learning for mastery instruction and curriculum. Regional Education Laboratory for the Carolinas and Virginia, Topical Papers and Reprints, Number 1.

Polak, D <https://www.ncetm.org.uk/resources/49967>

Sobel, D. (2018) <http://www.sec-ed.co.uk/best-practice/teaching-interventions-pre-and-over-learning/>

Appendices

Appendix 1 – Pre-teaching session annotations

<p>U and comments:</p> <ul style="list-style-type: none"> everyone but Sophia finished 6x tables all children struggled to start question 2 all children couldn't find 10% of a number - had to use place value again to divide by 10 <p>U and comments:</p> <ul style="list-style-type: none"> Starter 6x tables/able confident finding low struggled with All confident with factor pairs to 36 $9 \times 6 = 54$ All didn't put cm² as an answer to area Very confused with compound share/area 	<p>U and comments: mixed number to improper fractions</p> <p>They all understood how to convert the fractions once explained</p> <p>U and comments: fraction of amount</p> <p>They all seemed to understand the fluency after doing 99s together. They were able to do last two independently</p> <p>They need to work on times tables! Struggled with the reasoning of</p> <p>U and comments:</p> <p>They were familiar with $\times \frac{1}{2}$ Struggled with $\frac{1}{2}$ of 100. Tablata seemed confident</p> <p>U and comments: no prior knowledge on converting mixed to improper. Struggled w/ reasoning 99s. Times-table work! Alex = 99</p>
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Appendix 2 – Pre-teaching session which shows progression of skills

<p>Convert the following fraction into decimals:</p> $\frac{4}{5}$	<p>Which is greater? How can you find out?</p> $\frac{3}{5} \text{ or } \frac{4}{6}$
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Appendix 3 – Teacher Evaluation

Action Research - Pre-teaching

Teacher Evaluation

- How well do you think pre-teaching was implemented?

Pre-teaching happened once per week with the same adults, who the children became familiar with Times were not always consistent; sometimes early and sometimes late afternoon. Some sessions lasted almost 30 minutes and some were as short as 15 minutes.
- How have the selected pupils responded to this intervention?

Pupils responded well to the adults. There were very compliant and looked forward to being pre-taught. Pupils became more confident and this was most evident in the maths lesson immediately after the intervention. They displayed better listening, independence and were more willing to contribute. They were able to produce good work and move on quickly to the next challenge/s.
- If this or a similar intervention was introduced in the future, what changes would make it more effective?

It should be more regular. Once per week is not enough. It would be better if it happened 3/4 times per week just before a maths lesson. The groups could be larger as I am sure more pupils would benefit from and it will encourage more pupils to be independent.

Appendix 4 – Teacher Assistant Evaluation

Action Research - Pre-teaching

Teaching Assistant Evaluation

1. How well do you think pre-teaching was implemented?

It was a good intervention. Skills were broken down into smaller parts and this supported pupils to understand. It should be for longer. Some children needed extra time and support.

2. How have the selected pupils responded to this intervention?

Pupils were well-behaved, engaged and willing to learn. They should have more confidence working within a smaller group. All pupils wanted to contribute regardless of whether they were right or wrong. Some accessed the learning with ease and others needed more support.

3. If this or a similar intervention was introduced in the future, what changes would make it more effective?

It should happen just before the maths lesson or just before bedtime for the following day. All TAs could do this with a small group of children in their classes. This can happen in the morning. It needs to happen more than once and it needs to be on the timetable.