

Maths Teaching in Your School: Questions to Clarify and Change Practice

by Seán Delaney, Registrar, Marino Institute of Education

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Only changes in practice - not changes to written school plans - can change what children learn. A good school plan is a written record of discussion among teachers in a school about how a subject is taught, learned and assessed. Each school must decide when the discussion takes place, and for how long it lasts. New teachers and inspectors may want to see the written plan, but only those who experienced the discussion can appreciate the plan's full value. Here are thirteen questions to generate discussion about mathematics teaching. Use the answers to revise your school plan and guide the teaching of maths in your school.

1. How are number facts - tables - taught and tested throughout the school?

Before leaving primary school, all children must know their number facts, from $1+0$ to $100\div 10$. Learning tables by rote works well for some children. But learning tables is an inefficient way of learning number facts when applying the commutative property would halve the number of addition and multiplication facts to be learned. Learning tables also conceals relationships between addition and subtraction facts; once you know that $3+4=7$ and $4+3=7$, you should also know that $7-4=3$ and $7-3=4$. How is knowledge of number facts assessed?

2. What algorithms (recipes for doing calculations) for each operation are preferred/used?

Is decomposition or equal additions (borrow and pay back) used to subtract? Why? What prior knowledge is needed for the method used? If decomposition, how are awkward numbers such as $2000 - 78$ done? What language is used in teacher demonstrations? What about division, multiplication, addition?

3. How is children's mathematical language developed?

Do teachers encourage children to talk about maths? Help children learn maths terms, such as odd number, rectangle, average, by developing, displaying and modifying "working definitions" together in class. Teach explicitly words that have different meanings in maths like factor, face, odd.

4. How are problems used in class and where can you get good problems?

Children can *learn* mathematics by solving well-chosen problems; children needn't be shown what to do before they solve a problem. Learners only get good at problem solving by solving problems. In tests children must decide which operation to use when solving problems; in textbooks, multiplication problems are mostly found at the end of the multiplication chapter, removing an important decision for learners. Solving and discussing one good problem a day can be more effective than solving several routine problems. Find problems at <http://rich.maths.org/public/> and <http://www.nctm.org/resources/content.aspx?id=16387> (subscription needed for this one).

5. How are individual differences accommodated?

Choose open-ended problems that children can attempt at different levels (e.g. I have 5-cent, 2-cent and 1-cent coins in my money box. If I take out three coins, how much could I have?). If a child has a condition that affects a competence needed for learning maths (e.g. memory, attention or psycho-motor skills), how will the teaching compensate for the affected competence? Children can help each other to learn by explaining their ideas and having others express the ideas in their own words.

6. What opportunities do staff have to develop their teaching methods and their own mathematical knowledge?

Although many teachers had no opportunity to learn maths for teaching in college, most CPD opportunities focus on developing teaching methods. Discuss with colleagues problems such as these and create similar problems for discussion:

http://sitemaker.umich.edu/lmt/files/LMT_sample_items.pdf. Watch the documentary *Fermat's Last Theorem* on YouTube, and discuss its relevance for teaching. Join www.nctm.org and subscribe to the journal *Teaching Children Mathematics* for articles about maths teaching.

7. How are children's mathematical skills developed?

Are children asked to reason in response to questions such as why? how do you know? can you put that into your own words?

8. How do teachers motivate children to learn maths?

Children learn more and learn better when they are motivated to do so. How does your school motivate children to see themselves as people who are good at maths?

9. How is maths assessed?

How are standardised test results used to plan future teaching and to inform parents? What other forms of assessment complement standardised test results? Do children self-assess?

10. What kind of written and oral feedback do learners receive?

Photocopy a page from a child's maths copy; ask all teachers to respond to it in writing as they usually would. Which responses help most? Identify principles for responding to children's written maths work. Do teachers tell children if their answers are right or wrong? Children's independent learning can be helped when they say if they are confident in their answer and why.

11. How do textbooks help teachers in responding to the questions above?

What textbooks are used? What are their limitations? How do teachers overcome the limitations? Are the textbooks followed diligently from task to task and from page to page?

12. What role is envisaged for parents in developing their children's knowledge of mathematics?

How can parents complement the work of school? How can they create high expectations in maths for their child? How much help should they give with homework? Are parents consulted about the plan? Do they know the answers to the questions above? What is said and written about children's maths performance in parent-teacher meetings and in school reports?

13. What do you want to achieve in teaching maths?

Maths teaching can promote disciplined thinking among children. What are the maths teaching goals in this school? What is the time frame for achieving them? How will you know if the goals are achieved?

These questions might be difficult to answer. But engaging, even with some of them, and recording the discussion should contribute to a school plan that can change practice.

Seán's research interests are in mathematical knowledge for teaching, teacher education and mathematics textbooks. His website is www.seandelaney.com. You can contact Seán by e-mail to sean.delaney@mie.ie.