Mathematics Departmental Workshops
Topic: Teaching low attainers

Overview
This module will enable your team to consider the entitlement of low-attaining students through your mathematics curriculum. The activities explore values and beliefs, alternative presentations of learning activities, and how different representations of situations aid understanding. Some resources will need to be prepared in advance. Details are in the activities below.

Where are you now?
Before your meeting, read through the range of questions on Resource Sheet 1 and select just a few for your team to discuss. You may wish to use questions that fit with the developments you are currently planning and working on with your team.

Activity 1: Establishing core beliefs and values
Research by National Foundation for Educational Research (NFER, 2003) into the outcomes of the Trends in International Mathematics and Science Studies (TIMS) appeared to show that teachers’ views of ability was the most important factor in limiting the learning of students with lower levels of attainment.

To establish a framework within which to situate the following discussion it would be first helpful to establish working definitions of mathematical attainment and mathematical ability.

Resource Sheet 2 contains a set of statements made by a group of teachers considering how to improve the progress of their low attaining students. Ask your team (individually or in pairs) to choose two or three that they strongly agree or disagree with and prepare an argument to support their view. Ask each pair to explain their argument for a statement chosen by the remainder of the team.

Consider as a team what the responses tell you about your core beliefs and values.

Activity 2: Arithmetic hell, algebra joy
‘Algebraic reasoning is appropriate for all.’
The research project: ‘Identifying factors limiting pupils’ progress in Key Stage 4’ (DfES, 2004) states that ‘pupils complained about boring lessons from textbooks and worksheets. Several reports linked the restricted teaching and heavy reliance on textbooks to pupils becoming demotivated and, sometimes, disruptive.’ The algebra activity described here takes learning away from a textbook, and is designed to help students use algebra as a language to describe a geometric situation.

Resources
You will need Resource Sheets 3 and 4 (Algebra and Areas 1, and Algebra and Areas 2). Resource sheets 5 and 6 are templates for cards that could be printed in advance of the meeting, but the shapes do not necessarily have to be cut out. Have some scissors / a guillotine ready in case!

Activity
Ask your team to work in pairs or threes, to evaluate the activities. Explain that they are based on Geoff Giles’ ‘Algebra Through Geometry’ resources (DIME, 1994), which no longer appear to be in production. However the resources provided here can be used independently to explore the ideas.

Ask your team to read through and try out the activities themselves, considering and discussing the following questions:
How are students using algebra in this situation?
What are the benefits of students speaking algebraically?
How could this activity address algebraic objectives such as ‘simplify expressions by collecting like terms’ or ‘multiply a single term over a bracket’?

Finally, as an extension, consider:
What practical contexts do we / could we use to address objectives such as ‘use linear expressions to describe the nth term of a simple arithmetic sequence, justifying its form by referring to the activity or practical context from which it was generated’?

Activity 3: Developing Multiple Representations of Mathematics
Research has shown that one key way of improving the understanding of all pupils, especially those who are low attainers, is to offer them multiple representations of mathematical ideas and concepts. However it is important that these representations are carefully introduced and developed and the links between them explained if they are to support understanding and students are not to revert to the mechanical use of algorithms that are not understood (and the errors that they can bring with them) (Rousham, 1997).

Resource Sheet 7 models several examples of different representations and images of a mathematical procedure. As a team, use the ideas to discuss the similarities and differences between:

- strategies and algorithms
- representations and images

Using the examples provided as a guide, develop some multiple representations and images of your own. Possible ideas might be:

- The other three operations
- Fractions
- An unknown or variable

Reflection (brief summarising discussion or activity that leads into the next prompt)
Choose one or more of the following activities:

- Refer to the research quoted on Resource Sheet 9. What do you and your team think of these statements?
- Read the article by Rose Griffiths [http://www.pearsonschoolsandcolleges.co.uk/AssetsLibrary/PDFs/AdditionalhelpinmatharticlefromNASEN.pdf](http://www.pearsonschoolsandcolleges.co.uk/AssetsLibrary/PDFs/AdditionalhelpinmatharticlefromNASEN.pdf)
- Consider as a team: ‘Has our thinking about the provision for lower attainers changed? In what ways?’
- As a team, reflect on the statement: “We believe that all students can make progress in mathematics given access to the appropriate opportunities.”
- Ask your team to collaboratively plan a lesson for a low attaining group using some of the strategies explored during the session with a focus on progression.
Implementing and continuing to learn

Ask members of your team to consider what they might aim to change:

- Tomorrow
- Next Week
- Next Year

You can use Resource Sheet 8 to record this if it is helpful to do so.

Further reading

- See Resource Sheet 9 for a summary of the existing research on Low Attainers.
- Giles G. (1994) Algebra Through Geometry resources DIME
- Rousham, L., (1997), Jumping on an Empty Number Line, Primary Maths and Science Questions, 2, pp. 6-8