INTEGRATING EVIDENCE INTO MATHEMATICS TEACHING

Misconceptions vignettes

Education
Endowment
Foundation

These vignettes seek to represent current practice in schools: not best practice, nor poor practice. They prompt reflective questions for school leaders and teachers regarding their existing practices in supporting the development of mathematics teaching.

Scenario 1:

'Two negatives make a positive'

During a task, a pupil needs to perform the following calculation:

$$(-5) + (-2)$$

The teacher hears the pupil tell their partner that "two negatives make a positive, so the answer must be positive. The answer is 7". The teacher knows he has never used this phrase with the class, but the misconception seems to have emerged nonetheless.

Reflection questions:

- How can we ensure that we are aware of common misconceptions in mathematics, and why they persist?
- How can we adapt our teaching to minimise the chance of such misconceptions emerging?
- What classroom tasks can we use which address these misconceptions?

This is a common misconception, and is an example of a 'rule' that the pupil has developed themselves but which has been extended beyond its usefulness. It is important for teachers of mathematics to be aware of these misconceptions and to address them 'head on' – this could be through the planned use of manipulatives such as Algebra Tiles to support deeper understanding. Language matters too, and teachers should discourage pupils from using phrases such as 'two negatives make a positive' which might cause issues later on.

Scenario 2:

Using examples and non-examples

A class is studying angles on a straight line. Their teacher has introduced the concept using dynamic geometry software, and has provided a number of worked examples to support pupils.

When attempting a series of questions independently, the teacher notices one question in particular which proves problematic. Most pupils incorrectly calculate angle P as 85^{0}, by working out 180 – 65 – 30 rather than 180 – 65. When quizzed, the pupils justify their reasoning by pointing out the fact that the angles all lie on the same straight line.

Reflection questions:

- How might examples have been chosen by the teacher in order to anticipate the misunderstanding seen?
- Do teachers in your school have the opportunity to discuss likely misconceptions prior to teaching, and to consider ways in which these might be addressed?
- How could the language used to describe this concept be changed in future to minimise misconceptions?

The examples we use are crucial, but the use of non-examples which show conditions under which a condition or definition does not hold can be just as important. Use of carefully chosen non-examples alongside examples can help to highlight common misunderstandings such as this one. In addition, the language that we use needs to be consistent and carefully planned – using 'angles at a point on a line' in this case rather than 'angles on a straight line' could help to illustrate which angles to include and exclude in our calculations.