

Overcoming barriers to learning in mathematics

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'Within the school curriculum learning mathematics is uniquely challenging in that it is highly organised, sequential and progressive. Simpler elements must be learned successfully before moving on to others. 'It is a subject where one learns the parts; the parts build on each other to make a whole; knowing the whole enables one to reflect with more understanding on the parts, which in turn strengthens the whole. Knowing the whole also enables an understanding of the sequences and interactions of the parts and the way they support each other so that the getting there clarifies the stages of the journey.' (Chinn and Ashcroft, 1998: 4.)

Because of the interrelating nature of the subject children who have learning difficulties in mathematics may sometimes appear to feel even more lost and disempowered than those who encounter problems in other subjects." (Frederickson and Cline, 2009, pp. 387-388)

For pupils learning EAL particular sources of difficulty are likely to include:

- Confusions between trying to achieve mathematical understanding ('knowing both what to do and why') and trying to learn mathematical procedures ('knowing rules and routines without appreciating the reasons for them', e.g. the formula for getting the area of a rectangle - "multiply the length by the breadth").
- Increased anxiety, relating particularly to problems of mis-communication. Barwell (2002) has shown how "real life maths problems" and "word problems" create additional challenges for pupils learning EAL.
- 'Reading' mathematics and understanding the language of mathematics - The vocabulary is challenging. Some words are used only in mathematical English and are therefore unfamiliar until children have been taught them (e.g. hypotenuse, parallelogram), while some other words are used confusingly with different meanings in mathematical English and ordinary English (e.g. mean, product, odd).
- The syntax is challenging. It is not just the vocabulary of mathematics that causes difficulty. The syntax in which mathematical ideas are expressed is often more complex than children are accustomed to in other areas of the curriculum. Examples include the use of the passive voice (as in Each side of the equation is divided by 3) and conditional clauses (as in if...then) (Shuard and Rothery, 1984).

[Making Maths curriculum more accessible: Strategies for children learning EAL](#) and [Some issues concerning EAL in the mathematics classroom](#) provide further explanation of the difficulties that EAL learners may encounter with mathematics.

Burwell et al. (1998, p. 22) advocated that teachers use the following checklist when communicating about mathematics to children whether in written or spoken form. They should make sure that they:

- (a) Use simple sentence structures
- (b) Present no more than one fact per sentence
- (c) Check that any extra information that is given is useful

- (d) Split questions into sections where possible and appropriate
- (e) Make sure that the first part of the question can successfully engage the whole group
- (f) Every question tests the mathematical skills of the child, not their English comprehension.

A cycle of assessment, planning, action and review can help you: to set realistic but challenging targets for pupils with learning difficulties in mathematics, and develop clear ideas about how to work towards them.

It may be useful to have a list of some hypotheses to check when analysing how pupils who are struggling in mathematics approach work that is set in the subject. The checks can be made through testing, through the analysis of errors, through interviewing them about completed work and through observation while they are doing it:

- They do not read the instructions fully before tackling a problem or they do not act on what they read.
- They do not take time to work out what a problem is about before starting work on it.
- They adopt ineffective strategies when attempting a new task or when faced with a task on which they have made errors previously.
- They employ unsystematic problem solving strategies when tackling a task or frequently change their approach without allowing time for one strategy to bear fruit.
- They stick to a single strategy and do not try a different approach when it is unsuccessful.
- They do not seek help appropriately when faced with a difficulty.
- They lose concentration quickly when they find something difficult.
- They work at a very slow pace losing track of what they are doing.
- They race through their work making many careless mistakes without noticing that there are errors.
- They are frequently off task and take avoidance action such as making frequent trips to the toilet or interfering with other children.
- They do not check their work when it is finished.
- When working with others on a joint task, they adopt a passive role, contribute little to any discussion or wait for others to take the initiative and then follow.
- They could make effective use of concrete support materials such as interlocking cubes, a number track or a number line.
- They adopt a defeatist or hostile attitude when working in mathematics.

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References and Further Reading

Barwell, R. (2002). 'Understanding EAL issues in mathematics' in Leung, C. (Ed.) *Language and Additional/Second Language Issues for School Education*. (pp. 69 - 80). Watford : NALDIC.

Burwell, J., D'Sena, P., et al. (1998) 'Accessing GCSE Maths for 'Bilingual' Pupils' in D'Sena, P. and Barrett, F. (Eds.) *Raising Educational Achievement for All. LMU Education Papers No. 3*. (pp. 19 - 23). Leeds : Leeds Metropolitan University.

Chinn, S. J. and J. R. Ashcroft (1998) *Mathematics for Dyslexics: A Teaching Handbook*. London : Whurr Publishing.

Frederickson, N. and Cline, T. (2009) *Special Educational Needs, Inclusion and Diversity: A Textbook* Second Edition Buckingham : Open University Press

Shuard, H. & Rothery, A. (Eds.) (1984) *Children Reading Mathematics*. London : Murray