The Bell Foundation

Teaching English as an Additional Language (EAL) Learners in Maths

EAL learners who are New to English and have had a good previous education often find it easier to demonstrate their ability in maths than in other subjects. A lot of maths notation may be familiar because it is used in other languages, and some mathematical topics are very visual, e.g. trigonometry, transformation geometry.

However, for the majority of EAL learners there is still a lot of English required to access maths lessons, and an understanding of the key features of mathematical language is essential for success in the subject. Word problems are a particularly challenging area.

EAL learners who have come from other education systems may not have studied the same areas of maths that are taught in the UK. For example, in many countries, statistics and probability are not taught until university level and many places do not teach geometry until secondary school. For example, some primary learners with EAL that are new to the UK, may find shape and space topics difficult at first.

What are the challenges for EAL learners in maths lessons?

EAL learners face a range of challenges in terms of the language requirements of maths lessons; they may have difficulties at word, sentence and text level.

Word level

When tackling word problems, EAL learners are likely to encounter unfamiliar vocabulary items of three different types:

- Subject-specific technical words, e.g. isosceles, integer, cosine, subtraction. All learners will need help with the technical words of maths. Many of them derive from Greek and Latin and have unfamiliar spellings and forms.
- Subject-specialised words, (words that have alternative meaning in everyday language) e.g. negative, odd, take away. EAL learners will probably find the specialist meaning of everyday words even more confusing as they may have already learnt the word in another context. For example, words like ‘power’, ‘mean’ and ‘volume’ have specific meanings in maths but also very different meanings in everyday language or other subject areas. Making the different meanings explicit will help all learners, not just those with EAL (Monaghan, 2016).
- Everyday words, e.g. hot-dog stall, carpet tiles, car hire. EAL learners may be faced with everyday words such as these in maths problems. These may be unfamiliar not only in terms of the language but also the cultural context, e.g. learners may not have come across a hot-dog stall. There are an infinite number of everyday words that might occur in word problems. It is good to give EAL learners the opportunity to encounter the most common and develop strategies to work out how to tackle problems where they do not understand every word.

Sentence level

EAL learners may have problems with difficult or unfamiliar sentence structures in maths texts. For example:

- Tickets cost £38. Ahmed has £120. He buys as many tickets as possible. How many does he buy? How much money does he have left?
- Comparative phrases, such as 'as many as possible', or 'not enough money for' might be a challenge, teachers can help by modelling the language needed for a particular task.
- There are 20 biscuits in a packet. If Sonja buys three packets, then how many biscuits does she have altogether?

Another feature of mathematical English is its logical reasoning chains, which have connectives and pronoun references that may not be understood by EAL learners. Teachers can help by highlighting these. e.g. If… then… how many altogether?

Text level

EAL learners may find the way the text is presented or structured in maths texts difficult.

All tickets for a concert are the same price. Amy and Dan pay £63 altogether for some tickets. Amy pays £24.50 for 7 tickets. How many tickets does Dan buy?

Maths problems are usually written in the present tense and they appear to be a narrative. Learners tend to use the information in the order in which it is presented, which may not be effective. In this example, the first thing you need to do is work out the price of each ticket, so it would be wrong to use the £63 information to do that.

How can I support EAL learners to tackle unfamiliar mathematical language?

Maths teachers will not be able to teach all the words that EAL learners might meet in GCSE maths problems. But they can:

- Make sure they do know the subject-specific technical words and can use them.
- Help EAL learners to develop strategies to tackle problems where they may not be familiar with all the words.
- Practise the most common types of problems frequently, encouraging EAL learners to learn key words and phrases that often come up (altogether, each, the same, as many as possible etc.).
- Encourage bilingual glossaries of key words and phrases, including verbs that are often used (earn, cost, hire etc.).
- Model the language EAL learners need to use.
- Provide opportunities for EAL learners to practise the target language and use it in speech and writing.

It is best practice to give EAL learners plenty of opportunities to move from the concrete to abstract and to provide lots of time to talk about mathematical problems before reading, writing or calculating. Introducing vocabulary-based starter activities for collaborative learning is a good idea. Examples include loop games and definition games.

> *'Collaborative Learning Activities can be used as a tool for improving the access of bilingual learners to mathematical language through the medium of English. If this is achieved it is likely that their attainment in mathematics will increase.'* (Symonds, 2010)

Examples of collaborative activities include:

> *'Words and phrases commonly used in word problems need to be taught systematically. This can be reinforced by asking pupils to write their own word problems.'* (DfES, 2002)

Learners writing their own word problems can be a collaborative activity if done in pairs or small groups; they can then work in pairs to solve each other's problems.

Encourage EAL learners to make their own bilingual glossaries of useful verbs that often appear in word problems. These should help with the general context of what kind of problem it is. Examples include to assume, to buy, to cost, to earn, to hire, to measure, etc.

One idea which supports the steps in working out a problem or following a method is to ask pupils to listen to the instructions first, and then sequence sentences that have been copied onto cards and cut up (see DARTs).

To support reading word problems Maths teachers should model how to read the question aloud with the class, talking through which words are 'mathematical' and important and crossing out irrelevant information. EAL learner may need reassurance that it is okay if they do not know all the content words like carpet tiles, biscuit packets etc. Showing the learners how the structure of the question can be broken down should help them to solve it. E.g. the actual question is always the last bit. In some GCSE exam questions that involve reading and adding information to graphs or charts, answers can be worked out with very little reading of the questions.

How can I make a fair assessment of EAL learners' progress and attainment in maths?

When a child or young person with EAL is new to the school, it is good practice to assess their mathematical/numeracy skills as well as their English and first language skills as this gives a clear idea of the learner's cognitive potential. Primary schools may be able to conduct an informal maths assessment with the support of a bilingual adult or parent. Maths departments in secondary schools usually require a written test to be completed for placement purposes; this is best completed with support and a bilingual dictionary and should include mainly number and algebra questions that do not require understanding of English. It is important to be clear about what you are trying to find out.

Useful links

Collaborative Learning Project

- Wordy maths problems
- Word problems

Nrich - enriching mathematics

- Secondary resources for mathematics
- Hot-dog problem

References

DfES, 2002, Access and engagement in Maths, Crown copyright.

Monaghan, F., 2016, The Language of Mathematics, EAL Journal, Autumn 2016.

Symonds, A., 2010, Mathematical collaborative learning activities: the linguistic benefits for bilingual learners, NALDIC Practice Papers PP5.

The Bell Foundation
Red Cross Lane
Cambridge
CB2 0QU

www.bell-foundation.org.uk