

Improving mathematics learning in Stoke/at Stoke College

Martin Newton and colleagues

The scene was set for this session by Stoke College's Principal, Kevin Smith, who explained that Stoke-on-Trent was a very low attaining area and a sizeable majority of the students enrolling at the college had poor maths and English skills. The college has been working hard to put these subjects at the heart of all they do, using both the word and symbol of the heart to emphasise their approach. They have encouraging posters around the college referring to both subjects and the recurring theme is "It's all about ME", ME being Maths and English.

Martin then told us about some of the ways in which the college is trying to improve things. He told us about:

- partnerships with the local authority and local business sponsorship;
- active involvement with the local NCETM Maths Hub;
- a British Council critical thinking and problem solving project;
- the early adoption of Level 3 Core Maths.

The college don't claim to have all the answers but they are definitely making some progress.

Next his colleague, Natacha told us about the benefits of:

- having a great team who genuinely work together and support each other;
- sharing research, development and findings, sometimes in small teams, e.g. digital technologies (Klickers, Geogebra, Desmos, QR codes, Cahoot, Post-it software etc.);
- a whole college approach;
- a Growth Mind set and the work of Jo Boaler (Stamford University).

Finally another Martin told us about:

- taking all GCSE students off timetable for two full days of maths revision before both Papers 1 & 2, with whole college support; many of the students were very positive about this;
- getting involved with the NCETM Reasoning Pilot;
- having a Real Maths Fest as part of their outreach to local schools. All the vocational subjects had stalls showing the maths used in their subject in real and realistic contexts e.g. sugar content in foods, a current high profile topic which had a real impact.

The next part of the session involved doing some maths - "the Alan Sugar" problem (see details below) - both traditionally and using the Singapore Bar method. Martin Newton explained that back in the 70s when Singapore was low in the PISA rankings, visits were made to more successful countries. Ideas were brought home and used to devise a new maths curriculum.

The Singapore Bar method is a part of the Realistic Maths approaches used in the Netherlands for many years, then and now a high performing European nation. Manchester Metropolitan University maths education department has been involved with similar research for many years, developing and adapting some key topics for use in the Post 16 resit GCSE context (see Heather Aspinwall session report for more details).

We then had a 'play' with multilink and other physical resources doing ratio problems, investigating the benefits for many learners in developing the deeper understanding necessary prior to representing the solutions on paper. Initially these will be their own shortcuts and symbols but they will lead to more abstract representations over time. We discussed the widespread use of more practical approaches in primary schools and the abrupt change to totally abstract teaching in the secondary sector which contributes to so many learners not liking maths from then on.

An interesting and thought provoking session with time to try things out and discuss the teaching approaches with colleagues.

“Alan Sugar” Problem – outline

Alan puts some brown sugar on a dish. The total weight of sugar and dish is 110g
 Brenda puts three times the quantity of brown sugar on an identical dish and the total weight is 290g.
 What is the weight of the dish?

Pictorially,



$$\text{Dish} + \text{1 unit of sugar} = 110\text{g}$$



$$\text{Dish} + \text{3 units of sugar} = 290\text{g}$$

Cross out or cancel the dish from each ‘equation’ and also 1 amount of sugar from each. The student then see that



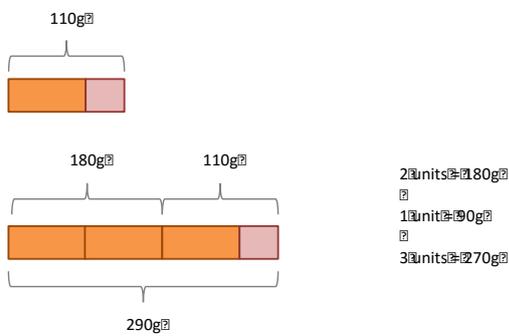
$$\text{2 units of sugar} = 180\text{g}$$

and so  = 90g

and so the dish weighs 20g.

Using the bar model...

Singapore Bar Model



You can see a teacher working with the Bar Model to solve this problem here (<https://www.youtube.com/watch?v=Em2yERb3Kfs>).