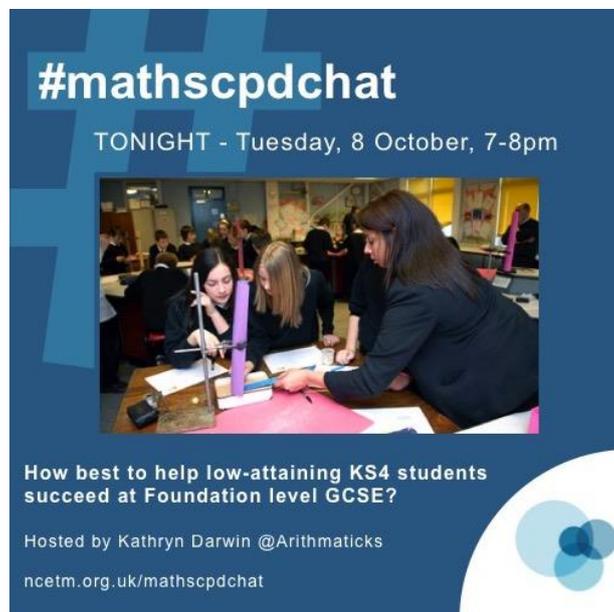


## #mathscpdchat 8 October 2019

### How best to help low-attaining KS4 students succeed at Foundation level GCSE?

Hosted by [Kathryn Darwin](#)

*This is a brief summary of the discussion – to see all the tweets, follow the hashtag #mathscpdchat in Twitter*



Some of the areas where discussion focussed were:

- **knowing ‘where to start’ with students who ‘feel like failures’ and ‘desperately need success’ in Foundation level GCSE maths** ... reduce their fear, find out what they can do, work on building their confidence ... don’t think-of/describe the students as ‘bottoms’, or the whole group as ‘the bottom set’ ... that students’ past ‘scores’ don’t tell you where they will end up;
- **communicating that you have high expectations** of the students, whatever their past (lack of) achievements ... refusing to discuss ‘pass or fail’ ... encouraging students to try, make mistakes and then learn how to fix them;

- **building relationships** ... cultivating a 'team spirit' (with the teacher as a member of the team);
- talking to students about the **maths that they will use in their lives** ... talk about careers related to their strengths ... the value to them of being able to do the maths required to cope well with personal finance;
- **building on students own (mental) strategies** (for calculating), and helping them adapt them into more efficient procedures;
- considering carefully about **how to respond to both correct and incorrect 'answers'** (as evidence of sound, confused, or lack of, thinking) ... for example, replying to an **incorrect response** with a carefully-chosen question that is likely to prompt a 're-think' ... responding to a **correct response** by challenging other students to try to explain why it is correct ... avoiding just saying 'yes, that's right' or 'no, that's wrong';
- identifying '**key skills** that students have not yet acquired ... that it is wise to pay particular attention to, for example, metric units, place value, simplifying expressions (arithmetical or algebraic), solving simple equations, using a calculator, factors/multiples/prime-numbers, multiplicative reasoning;
- reading and learning from **Chief Examiners' Reports** ... focussing on '**common errors**' identified in the reports;
- that **students' mathematical literacy** is key ... 'if they cannot 'decode' the question they've had it' ... for example a mathematically illiterate student would struggle to know how to respond to 'Write 120 as a product of the powers of its prime factors';
- the importance of enabling students to see **how ideas are linked within mathematics** (so that they have 'less to remember') ... helping students remember a few connected ideas/procedures, and use them well ... **overcoming students' perceptions of maths as 'a lot of unconnected rules'**;
- making **good use of manipulatives and alternative-representations-of-the-same-idea** ... overcoming students' perceptions of them as 'babyish' ... for example, when working with negative numbers using both number lines and double-sided counters as learning-aids ... using squared paper to aid thinking about area;
- that 'students' lack of times-tables-knowledge is the biggest thing holding them back' ... **building fluency in using multiplication facts**, for example students learning multiplication facts as 'overnight homeworks' ... **linking knowledge** of multiplication facts to their emerging understanding of proportionality, especially fractions and ratio;
- that each student should have a good **scientific calculator** ... explicitly helping students (teaching them) to use a calculator efficiently;

- students **not knowing how to use '=' correctly** ... students interpreting '=' as 'makes' rather than as 'is equal to' ... so, for example, responding to 'fill-in the missing number in  $3 + 4 = \dots + 1$ ' by writing ' $3 + 4 = 7 + 1$ ';
- that students' lack of understanding of, and lack of ability to use, **place value** is a big issue ... for example they 'struggle to multiply or divide numbers by powers of 10' ... 'Miss, don't I just add on two zeros to times by a hundred?';
- challenging students, without actually solving a problem, to **decide what knowledge/procedure(s) they would need to use in order to solve it** ... for example deciding which of Pythagoras' Theorem, the Sine ratio, the Cosine ratio, and the Tangent ratio, they need to use to solve a given problem ... using 'Goal-Free' problems to help students learn to interpret exam questions;
- that **using a visualiser** can be a very helpful/effective teaching aid... for example, using a visualiser to display students' various attempts-to-solve-a-problem in order to prompt whole-class discussion;
- **establishing 'Daily Maths' as a routine**, even on days when students don't have a maths lesson;
- **students compiling a glossary of 'key facts'** in the backs of their exercise books;
- establishing **'exam-procedures' that are likely to 'calm students' anxieties at the start of an exam'**, such as writing in a space on the exam paper formulas that they have learnt, writing the first few prime numbers, sketching a number line showing negative numbers ... regarding this as 'doing a brain dump' at the start of an exam;
- **knowing when to stop students working on practice questions** ... for example, when they are becoming bored of getting them all right;
- using **past Key Stage 3 SATs mental tests** as a weekly activity ... the teacher reads-out the questions (not bothering with the SAT-test timings) ... students **share (describe) and discuss their (idiosyncratic) methods**;
- entering students for **'Entry Level' (Level 1) exams** in order to boost their confidence (link provided below) ... that the first two papers test fluency of knowledge recall and use of procedures, and that the third paper provides opportunities for students to use reasoning to solve simple problems;
- giving students **homeworks in which you know that they will succeed** with (at least) the first part;
- **tracking students' progress** in order to show other people (for example school senior leaders (SLT)) why you are teaching students what/in-the-way-that you are;
- **coping with criticism (from, for example, parents or SLT) of the content that you are teaching** ... criticism that students are repeating content 'covered' in previous years ... showing the critics that the hardest questions in Foundation level

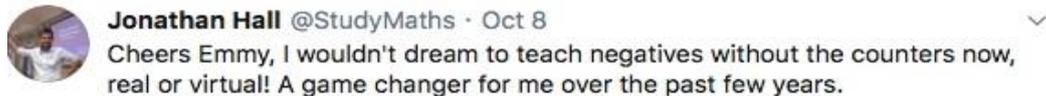
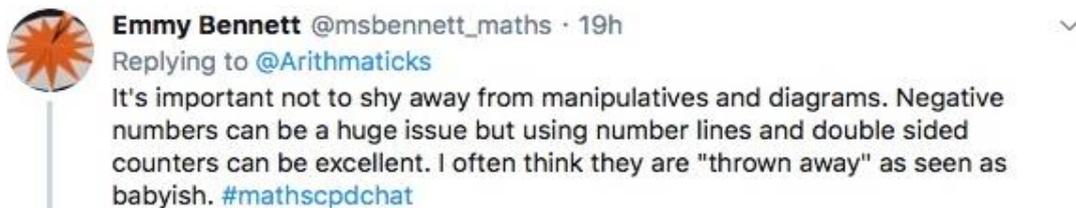
GCSE maths exams require students to have fluency with 'very basic skills' ... refer them to (show them) examiners' reports.

In what follows, click on any screenshot-of-a-tweet to go to that actual tweet on Twitter.

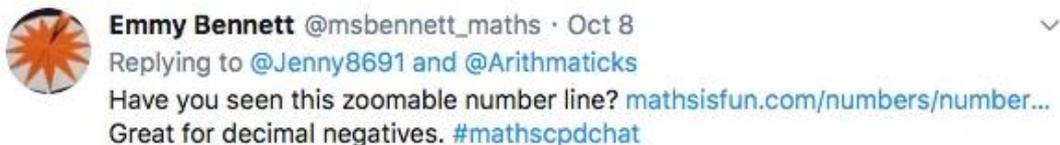
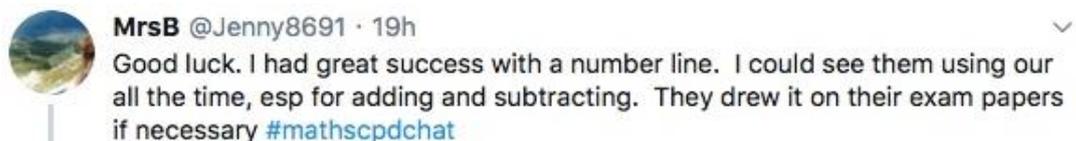
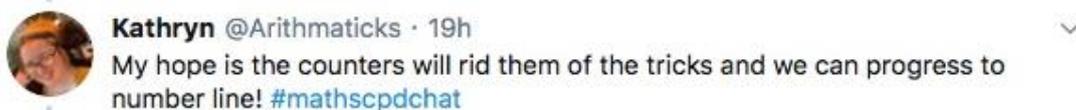
This is part of a 'conversation' of tweets, about using manipulatives and diagrams as an aid when trying to 'fix key skills' that students have not yet acquired. The conversation was generated by this tweet from [Kathryn Darwin](#):



and included these from [Emmy Bennett](#), [Kathryn Darwin](#) and [Jonathan Hall](#):



these from [Kathryn Darwin](#), [MrsB](#), and [Emmy Bennett](#):



and these from [Alison Hopper](#), [Julia Treen](#), and [Mike Thain](#):

-  **Alison Hopper** @AlisonHopperMEI · 19h  
The counters and number line do draw on different understanding of addition and subtraction. [#mathscpdchat](#)
-  **Julia Treen** @FlashJangle · Oct 8  
Replying to [@msbennett\\_maths](#) and [@Arithmaticks](#)  
I've had success going back to squared paper for area too, lots of drawing shapes of a given area then working up to the formulae. [#mathscpdchat](#)
-  **Mike Thain** @ThainMike · Oct 8  
Replying to [@msbennett\\_maths](#) and [@Arithmaticks](#)  
Definitely use manipulatives. Show them that this isn't just about tricks for the exam but actually teaching them maths that they will need. [#mathscpdchat](#)

(to read the discussion-sequence generated by any tweet look at the 'replies' to that tweet)

Among the links shared were:

[Deep Progress in Mathematics](#) by Anne Watson, Els De Geest and Stephanie Prestage, which is the freely downloadable pdf version of a book that describes fully the findings of the *Improving Attainment in Mathematics Project*. That project addressed the teaching of low attaining students. It was shared by [Mary Pardoe](#)

[Deep Progress in Mathematics](#) by Anne Watson, Els De Geest and Stephanie Prestage, which is the real book described above. It was shared by [Mary Pardoe](#)

[Pearson Qualifications: Entry Level Certificate Mathematics \(2017\)](#) which has been designed to enable lower attaining students to develop mathematical skills and understanding that underpin GCSE foundation level maths. It was shared by [Matt Man](#)

[Effective Teachers of Numeracy](#) by Mike Askew, Valerie Rhodes, Margaret Brown, Dylan Wiliam and David Johnson, which is a report of a study carried out for the Teacher Training Agency by the School of Education at King's College, London. It explores the knowledge beliefs and practices of effective teachers of numeracy. It was shared by [Mary Pardoe](#)

[Preparing for GCSE Problem Solving – Developing Reasoning Through Thinking Mathematically](#) which is a book and download from the ATM (Association of Teachers of Mathematics). It contains twenty-five tasks designed to help students master key strategies, and is intended to prepare students for the problem solving questions in GCSE mathematics exam papers. It was shared by [Mary Pardoe](#)

[Problem Solving - examples and solutions: example 21](#) which is an example of a problem of the kind included in Foundation level GCSE exam papers, with a solution of the problem. It is from the *Problem Solving – examples and solutions* pages of the MEI (Mathematics Education Innovation) website. It was shared by [Mary Pardoe](#)

[Self Evaluation Post 16 Level 2: Building on learners' thinking](#) which is an example of a resource suitable for a group of GCSE resit students who have a wide range of prior experience. It includes suggestions of ways to support and challenge students as they work on the resource. It was shared by [Mary Pardoe](#)

[If it's Friday, it must be GCSE re-sit](#) which is an article in the *Charlie's Angles* series on the NCETM website. These are *Thoughts on topical issues of mathematics education from the NCETM's Director, Charlie Stripp*. It was shared by [Mary Pardoe](#)

[Zoomable Number Line](#) which is a useful interactive virtual number line. It was shared by [Emmy Bennett](#)

[Double Sided Counters](#) which is a lovely interactive virtual environment in which the user manipulates double sided counters. It was shared by [Emmy Bennett](#)

[Tools for Maths Teachers](#) which is an extensive collection of varied resources from *MathsBot.com*. It was shared by [Miss Ward-Gow](#)

[Maths Emporium](#) which contains over 15,000 files to do with Edexcel Mathematics and all the qualifications that they offer including past papers, mark schemes, examiner reports and grade boundaries. It was shared by [Maths Emporium](#)

[Start with Confidence posters](#) which are posters that can be freely downloaded from the AccessMaths website. They are 'just aimed at making sure students are fluent in those 'opening page' questions'. It was shared by [p21m](#)

[JustMaths](#) which is an extensive collection of resources intended to support the teaching and learning of mathematics in preparation for GCSE exams. It was shared by [Matt Man](#)

[Numeracy Ninjas](#) which is a free 'numeracy intervention designed to fill gaps in students' basic mental calculation and empower them with skills required to access GCSE maths concepts'. It was shared by [Mike Thain](#)

[Mathsbox](#) which is 'a big box of ready to use resources for busy teachers'. It was shared by [Sharon Malley](#)

[Mindset](#) by Dr Carol S Dweck, in which the author explains her research findings about the effects on human achievement of approaching life's challenges with either a fixed or a growth mindset. It was shared by [Dave Bowman](#)

[Mathematics Enhancement Program Year 9](#) from the CIMT (Centre for Innovation in Mathematics Teaching) which is a collection of free resources. It was shared by [plexmaths](#)

[Working with a bottom set year 11: how I do it](#) which is a blog by [@adamboxer1](#). It was shared by [Craig Wilson](#)