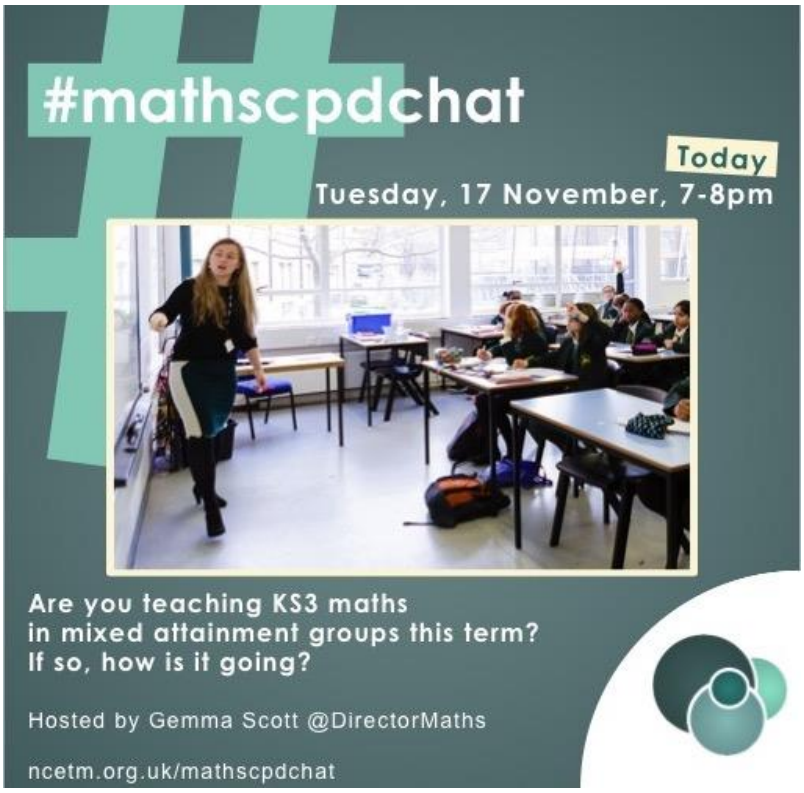
#mathscpdchat 17 November 2020

Are you teaching KS3 maths in mixed attainment groups this term? If so, how is it going?
Hosted by Gemma Scott

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 focused were:

the extent and nature of contributors' experience with mixed-attainment maths teaching and learning:

- at least one contributor who has been teaching Y8/9 students in mixed-attainment groups only since September this year is **'finding it tough'** … for example, finding that it is hard to 'teach students to add fractions when some are brilliant and others show very little understanding' … **looking for successful strategies** when 'we aren't teaching 'from scratch'' … teaching 'the basics' to all, and then differentiating by providing different tasks … students themselves selecting the tasks on which they will work;

- other teachers have been **teaching Y7/8 students in mixed-attainment groups for several years** … **'using 'open middle' style questions a lot**' … finding that by working on **'open middle' tasks/problems** students and teachers are helped to 'see how to deepen understanding rather than accelerating through content' … there was a discussion about the nature of some particular examples of tasks that teachers regard as 'open middle' tasks … whether working on these tasks actually results in any new learning, or whether some are just puzzles that can only be solved using specific knowledge and understanding … a few examples were then provided of tasks that actually do give students with varying levels of prior attainment opportunities to reason, acquire new appropriate and varying learning, and practise what they are learning (link provided below) … taking time 'to get students confident with this style of question' … presenting just one task of this kind, allowing students to work on it in pairs and groups, followed by whole-class feedback and discussion … having to cope with practical constraints resulting from the present Covid circumstances, such as not being allowed to alter 'the form seating plan' … spending time planning collaboratively (as a department team) how teachers might use this kind of task;
- some teachers are struggling to know, when they are faced with an all-attainment class, how best to teach **'topics that have a wide range of pre-requisite skills'** (such as operations with fractions) … one teacher had been working on **addition/subtraction of fractions with students in a mixed-attainment Y7 class** … the teacher managed the teaching and learning so that the highest attainers were learning to add/subtract algebraic fractions while others deepened their understanding of addition/subtraction of numerical fractions (where the operations required simple or more complex mathematical actions appropriately for each student's present depth of understanding);
- that using (carefully) **manipulatives (such as Cuisenaire® rods), and a variety of representations (such as bar models or number lines)** can significantly support the learning of all KS3/4 students whether they are working in mixed attainment groups or are setted;
- some teachers are **having to teach KS3 mixed-attainment classes in 80-minute lessons** … it was suggested that those teachers and their students might benefit from the teachers' breaking-up, in their mental planning, such lessons into two 40-minute lessons;
- some teachers' KS3 pupils are presently learning maths in all-attainment groups only because such grouping is intended to address pupils' needs arising from home-learning during the first Covid lockdown … and some of these teachers **had their maths lessons 'centrally' planned for them** during the first part of this term … many teachers are finding that **trying to teach centrally-planned/resourced lessons is hard** and not to their liking … that effective maths teaching requires the teacher to respond to students

individually in order to 'take them one step further' … effective teachers plan and choose the learning and the tasks 'with the particular students in mind' … and use students' understandings and questions to 'run as far as you can' along the 'path of progress' … that pre-prepared slides are not effective resources because 'students' questions/understandings can never be predicted – if you predict you are likely to be holding them back' … but at least one teacher believes that **central planning can result in effective teaching/learning if time is made available for the whole team to collaborate** (for example, 'discussing in detail the hows and whys' and sharing/discussing possible teaching approaches and strategies) … that teachers who are teaching students in the same year group can be paired-up to co-plan … that, after planning collaboratively, teachers can 'go off and teach a lesson, and come back together to discuss how their lessons went';

- at least one teacher feels that where a curriculum for KS3-maths-learning-in-all-attainment-groups has been 'built on the essentials' it is **important that 'the enrichment is there for students who already have the knowledge, but in a way that is not just acceleration'**;
- many teachers are **looking for ways to support the 'weakest' students in all-attainment groups while also supporting the highest attainers** … that students can 'keep asking me for explanation', and **each time they ask I'm 'looking to getting them to do a little more in the next question'** … using an **online chat facility**, such as *GoGuardian* (link provided below), even during in-school teaching, in order to **interact one-to-one with a studen**t … students using **mini-whiteboards** to communicate what they want to ask … some teachers are (once every two weeks, for example) **splitting all-attainment classes into two sub-groups for one lesson** in which the students in one sub-group are challenged to use and apply what they have been learning, while the students in the other sub-group experience more teaching aimed at helping them acquire the knowledge/skills/understandings that students in the 'more advanced' sub-group are using and applying;
- some **primary teachers mentioned that they have seen 'positive real differences in pupil attainment' after moving from 'ability tables'** in the past to working with the whole class as an all-attainment group … observing effective mixed attainment maths teaching in a primary school convinced at least one secondary teacher to 'take the plunge' into mixed-attainment maths teaching in KS3;
- one teacher saw 'a lovely comparison of results of identical Y7 Christmas tests from setted and mixed cohorts' … the results were similar except that there was **'no tail of underachievement' in the mixed-attainment cohort**;
- some teachers agreed with the belief expressed on the *Mixed Attainment Maths* website that '**labelling children and setting them according to their ability places limits on**

learning' … teachers discussed the question as to whether, when pupils are allocated to sets in Y7 and follow a scheme of learning written specifically for their set, it is ever subsequently thought to be in a pupil's interest to move the pupil from one set to another;

- some contributors to the chat had **launched into mixed attainment maths teaching several years ago as a result of seeing it done effectively in Japanese schools** … one such teacher advised 'newcomers' to mixed-attainment teaching to think of what would be taught to a top set, and how to break that down for everyone … even if some students do not attain full and deep understanding within a topic, or acquire all the skills needed to apply procedures with understanding, the small steps that they DO MAKE can be celebrated … that no topic is ever really 'finished' … the teacher advised 'newcomers' to think about possible misconceptions and barriers to learning, and which manipulatives and representations are likely to aid learning … establish acceptance by students that 'mistakes are normal' … arrange for pupils to use mini-whiteboards at all times, and focus at the same time on mini-whiteboard responses to challenges from several different students;
- some teachers are observing that **'the lower prior attainers' in KS3 are benefitting (achieving more than 'equivalent' students who in previous years were taught in 'lower' sets) from learning in all-attainment groups** … that this may be because **the teachers' expectations of them have changed** … that the lowest attaining students 'with a lot of patience and explaining requiring more careful teaching can achieve much higher than I expected';
- some teachers are finding that, while they can plan the learning of the 'middle 80%' of the students in KS3 mixed-attainment groups, it is **much harder to plan how to teach the very lowest and highest attainers** … they are wondering if the very lowest attainers might be supported better in a separate group where the teaching can be 'tailored for them with a real focus on number bonds, place value etc., and securing that understanding' … that struggling Y7 students who seem to be 'not yet KS3 ready' would benefit 'from an in depth exploration' of such key topics … some teachers have **'noticed a number skills dip in Y8/9 this year'** … some teachers are arranging the teaching of all-attainment Y7 groups so that the last lesson each week is devoted to 'basic numeracy and filling in the gaps for the other lessons' in that week (that is, in that lesson students work on tasks that are selected in the light of how students have responded in the other lessons) … this term's Y7 teaching has revealed-to/highlighted-for at least one teacher those **pupils who 'struggle with basic addition/subtraction, which I don't recall seeing previously**';

what teachers think makes effective mixed attainment teaching:

- teachers **being willing to 'give it a go' with a positive attitude** … not 'being told that it's not possible to achieve';

- some teachers enjoy using **'low-threshold/high-ceiling' tasks,** but '**struggle to do taught part of a lesson well as it feels too fast for some and too slow for others**' … for example, one teacher has in a Y8 mixed-attainment class two students who are 'working beyond GCSE' and four students 'who struggle with even the four-times-table' … some teachers use 'worksheets which get increasingly difficult (and they choose where they start) – answers provided' … some have **students of similar attainment sitting near to each other** 'so that mini-discussions can happen naturally without bothering everyone' … others have '**less knowledgeable students being taught by more knowledgeable**' … the teacher purposefully 'holds off' from 'providing help' when a student requests it, and asks instead 'who (which student(s)) do you think can help answer that?';
- some teachers believe that it is important to **set a challenge that is accessible to every student in a mixed-attainment class**, and to **establish 'a supportive climate in which students learn from each other'** … establishing a 'safe culture where everyone accepts that everyone contributes to the learning of the whole group' … that this is not easy … but the following advice was offered to newcomers to mixed-attainment-teaching: for a start … '**don't value speed, focus on process, give every contribution equal attention, always ask 'Can you explain that?' in response to right answers**' … that in high sets (when students are setted for maths) valuing speedy work can result in students achieving only a superficial grasp of mathematical ideas … that usually in mixed-attainment classes students 'have more time to think and understand';
- 'setting out all the necessary info, allowing for students to ask many questions, then **setting each student off on their own path**';
- some teachers **want 'a variety of practice questions'** … 'so they can all practise and make progress';
- at least one teacher with mixed attainment classes prefers to use teaching approaches that depend on **'differentiation' (different students working on different tasks)** rather than approaches that rely on **'scaffolding' (all students working on the same task, but being supported to different extents and in different ways)**;
- that teachers need to spend the time with each pupil that is required to **get to know as much as possible of what is their prior maths knowledge and understanding** … that secondary teachers **need good subject knowledge, knowledge about resources, and how to make effective use of manipulatives and other learning aids** … that this 'comes with experience and trial and error, finding out what works where';

what KS3 teachers would like to do in their mixed-attainment teaching that they cannot do now owing to the pandemic:

- some teachers would like the whole department **to have the time to develop together some low-threshold/high-ceiling tasks** … that 'sharing ideas is critical' … that in the present circumstances many teachers are not meeting each other at all in school;
- at least one teacher would like students to be able to **use the 'whiteboards at the back of the classroom'** … having to maintain safe distancing is presently preventing this;
- some teachers would like to be able to **re-organise the classroom seating arrangements** to enable one-to-one conversations in close proximity;

whether teachers would like the way in which their students are presently grouped for maths to change or to stay as it is:

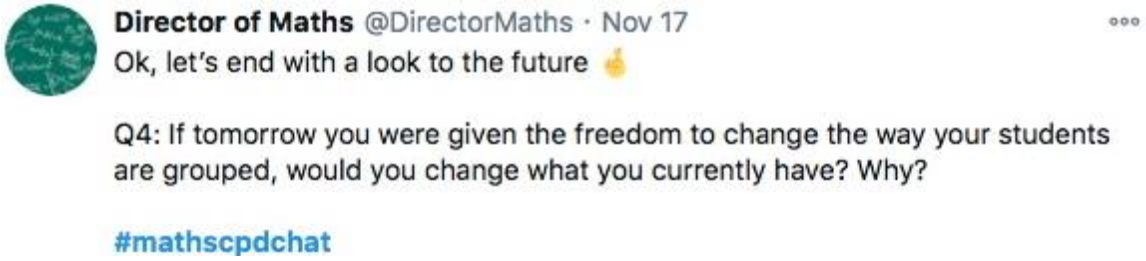
- some teachers would **prefer to go back to setting as soon as possible** … while others now believe that **students can make 'just as much progress' in mixed attainment groups as in sets** if the teacher 'has the right mindset (no glass ceiling for any pupil)';
- some teachers are finding that their **students are engaging well while working in mixed attainment group**s, even though it is **hard work for the teachers themselves**;
- that **the class size for mixed-attainment teaching is critical** … at least one teacher would want mixed attainment teaching to be in classes of no more than 24 students … that 24 students can be taught effectively, 26 is manageable, and with more than 26 the teacher is likely to struggle;
- some teachers who before this term had no experience of mixed-attainment maths teaching **would like to be able to 'have a go at it in a school where it is already fully-established, is well-resourced, and during non-Covid times**' … that during these challenging times they would prefer students to be in sets;
- although some teachers still prefer sets, their present experience of mixed-attainment teaching has made them reflect on **how vitally important it is that teachers have high expectations of all students** … of what they can achieve mathematically, of their behaviour, and of the kind of classroom culture that can be maintained;
- some teachers are **enjoying the challenge of teaching maths to students in all attainment groups** … it is motivating them to plan very carefully for the maths learning of all students;
- some teachers are liking mixed attainment teaching **'because it gives the 'bottom-set' students more opportunity'**;
- some teachers repeated during the chat that they would '**go for mixed attainment in KS3 and KS4, but only if the teachers were all on board**' … because the mindset of the teacher is the most important influence on whether or not teaching maths to students in mixed-attainment groups is successful;
- that effective **mixed-attainment maths teaching and learning requires a pedagogy different to that which may be effective when students are setted** … that **differentiating by outcome**, rather than by task, 'lends itself more readily to mixed-

attainment teaching and learning' … 'when we had investigations we taught the whole class because differentiation was by outcome' … that 'this is not just a discussion about grouping' … it is also about how teachers are prepared to teach;

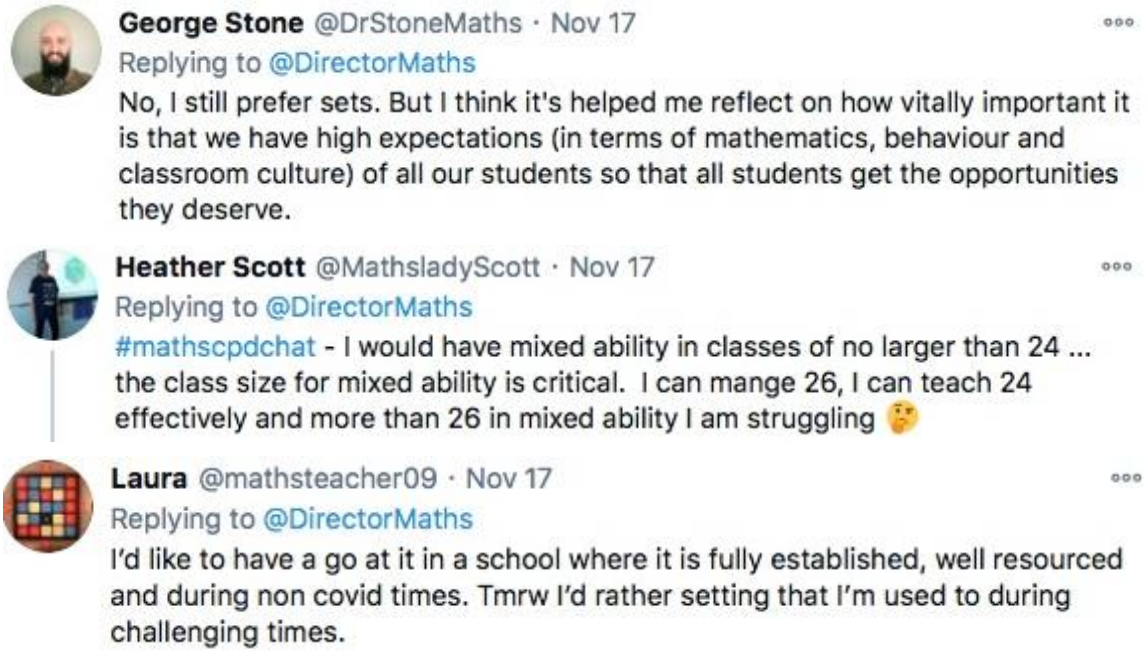
- that in more than 30 years of teaching maths in secondary schools, at least one teacher has found that **what matters most is whether teachers work in a school where they are happy with the grouping**;
- that **successful implementation of mixed attainment maths teaching in a school is a process and not an event**.

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

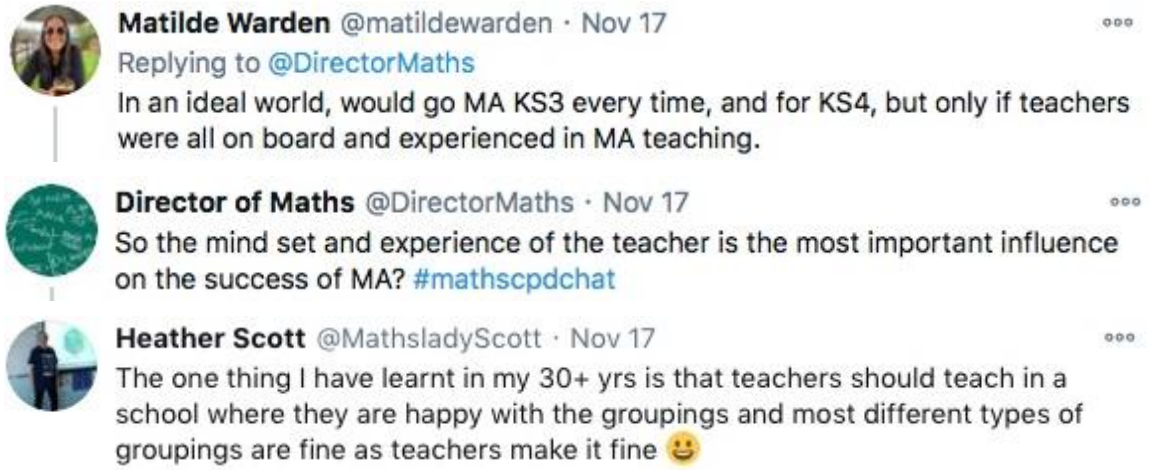
This is a part of a conversation about how the recent mixed attainment maths teaching experiences of some teachers have influenced their views about the way students are grouped for maths in secondary schools. The conversation was generated by this tweet from Gemma Scott:



and included these from George Stone, Heather Scott and Laura:



and these from Matilde Warden, Gemma Scott and Heather Scott:



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

Among the links shared were:

Teacher Collaboration Supports Mixed-Attainment Classes which is an NCETM classroom-resource article that provides some reasons why the practice of placing students in 'ability' sets may be called into question. It includes detailed descriptions of how and why some secondary schools moved to mixed-attainment maths teaching and learning. It was shared by Gwen Tresidder

An Effective Model for Collaborative Planning in Maths which is an NCETM feature article. The authors describe how at a Wandsworth secondary school, collaborative-planning sessions have led to improved lesson quality, reduced planning time, and better staff retention. It was shared by Gwen Tresidder

Mixed Attainment Maths Lessons which is part of the Mixed Attainment Maths website. It provides many resources designed specifically to be used in mixed-attainment maths teaching with detailed guidance about how they might be used effectively. It was shared by Mary Pardoe

Planning for Teaching GCSE Mathematics with Mixed Attainment Groups which is a book from the Association of Teachers of Mathematics (ATM) by Mike Ollerton and Sam Hoggard which brings together tasks designed to support learning and planning for teaching GCSE mathematics with all-attainment groups. It was shared by Mary Pardoe

How Many? which a delightful book by Charles Snape and Heather Scott created to support learning about number in an engaging way. It was shared by Heather Scott

GoGuardian: Enable Teacher Chat which provides instructions for setting up and carrying out online teacher-student conversations. It was shared by Heather Scott