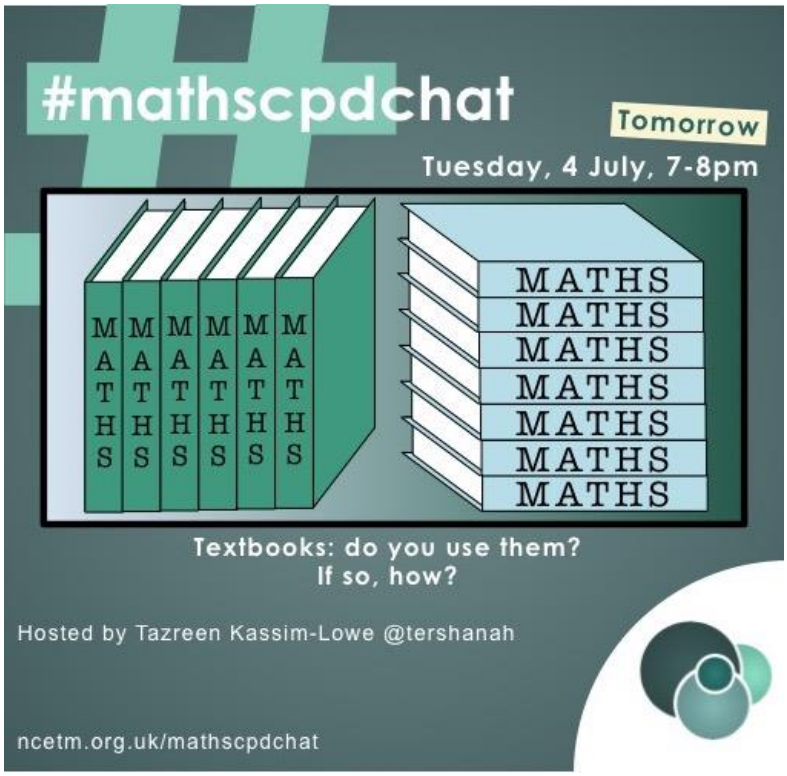
#mathscpdchat 4 July 2023

Textbooks: do you use them? If so, how?

Hosted by Tazreen Kassim-Lowe

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



The links shared during this discussion were:

Does the choice of maths textbook make a difference? which is a research report (2021) by Henning Sievert, Ann-Katrin van den Ham, and Aiso Heinze. By focusing on some key maths topics, these researchers looked at how different textbook treatments were related to student outcomes. It was shared by Tazreen Kassim-Lowe

Teaching for mastery and textbook tensions which is an article by Rebekah Gear in an issue, Mathematics Teaching 280, of the ATM's journal. The author explores challenges faced when introducing textbooks, and approaches that could be considered to make this successful. It was shared by Tazreen Kassim-Lowe

Designing lessons for dialogic learning which is an article by Geoff Wake and Matt Woodford in an issue, Mathematics Teaching 285, of the ATM's journal. The authors offer their insights into the approaches they took when designing lessons based around a commitment to dialogic learning. It was shared by Tazreen Kassim-Lowe

Teaching Mathematics for Social Justice which is a book from the ATM by Pete Wright. This full colour book is aimed at teachers of mathematics who are interested in addressing issues of social justice in their classrooms. It was shared by Tazreen Kassim-Lowe

School Mathematics Textbooks which is a very recent blog by Tad Watanabe in which he describes and discusses some ways in which Japanese teachers use textbooks. It was shared by Tazreen Kassim-Lowe

It Stands to Reason which is an article in the archived NCETM Secondary Magazine, Issue 131. It explores the use of less-same-more grids, with examples. It was shared by Mary Pardoe

An illustrated summary of the discussions in this #mathsCPDchat follows.

The host tweeted this notice that the chat was soon to begin …

Tazreen Tershanah @tershanah · 15h

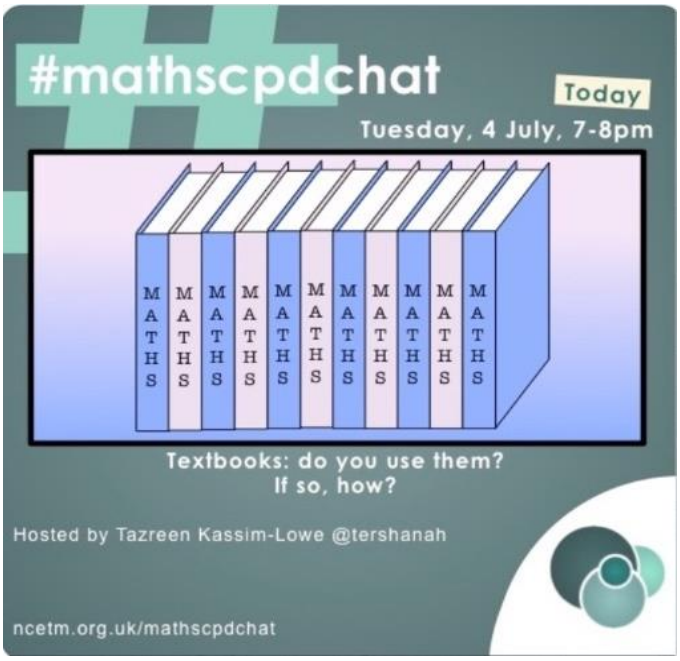
It is nearly that time for #mathscpdchat . 5 minutes to go. Grab yourself a drink. Looking forward to mediating our discussion around effective use of textbooks.

… followed shortly afterwards by two 'welcome' messages …

Tazreen Tershanah @tershanah · 15h

Good evening. Thanks for joining tonight. All phases welcome.

Don't forget to use the hashtag: #mathscpdchat



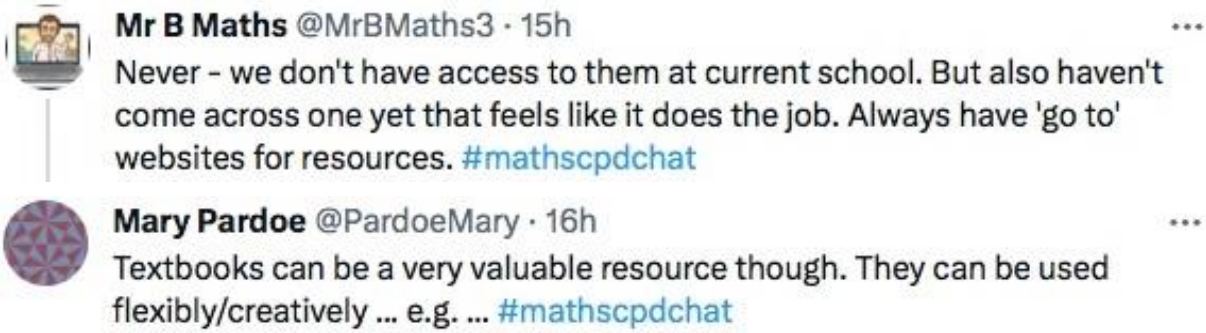
Tazreen Tershanah @tershanah · 15h

It's 7pm. Thanks for joining this #mathscpdchat: Textbooks: Do you use them? If so, how?

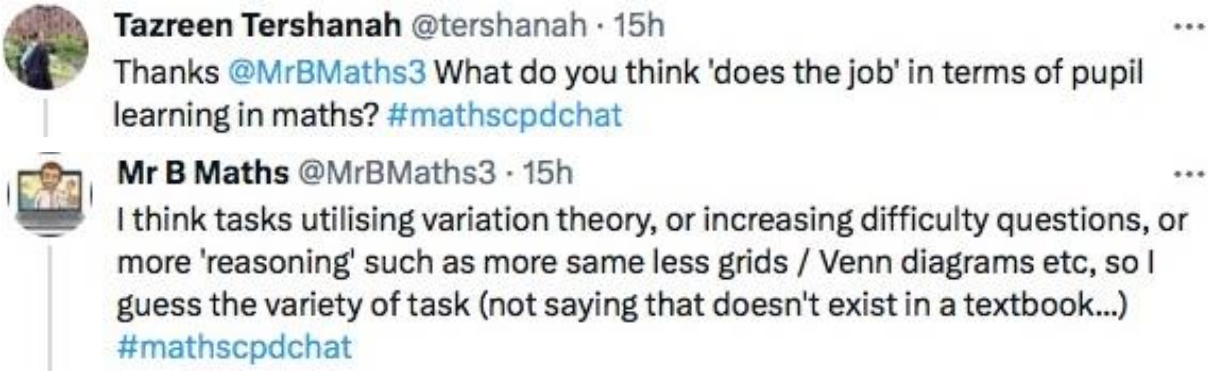
I will do my best to respond to posts and comments thoughtfully.

… and then her first question:

This question generated most of the discussion of the mathsCPDchat, in the form of long threads (conversations), shorter discussions, and 'single replies'. Twenty comments created the following conversation, which was generated by a teacher who presently goes to websites for resources:



Whether or not a list of questions generates learning depends on how learners interact with the questions. It can be a vehicle for learning if learners have been encouraged to think about what they are learning by tackling the questions.
For example they can be encouraged to ask:
What is the same about all these questions?
How are the questions different?
What do I need to know and understand to answer each question?
Can I make up my own question?
Can I answer my own question?
What have I learnt by answering these questions?

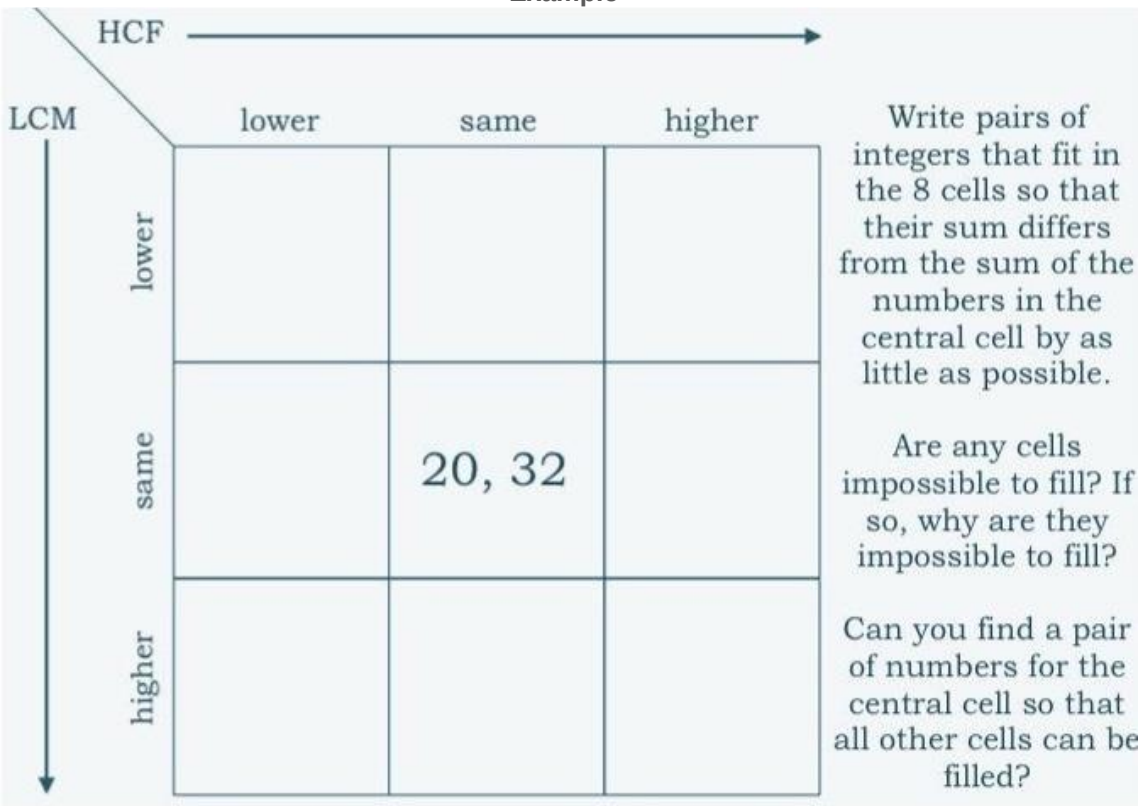


Mary Pardoe @PardoeMary · 4m

There is an article about more/same/less grids in the archived Sec Mag 131, here: ncetm.org.uk/media/tqwi5men. #mathscpdchat Scroll down to 'It Stands to Reason'.

What kinds of task can we give pupils that will challenge even the highest achievers and the most "rapid graspers" (to use the Ofsted term), and that will develop their reasoning skills while involving only 'age-appropriate' (i.e. not accelerated or pulled forward) mathematical knowledge and concepts? In this article we look at a particular two-way-grid-of-cells that can be used to stimulate pupils' deep thought about any pair of related quantifiable concepts which can be applied to the same mathematical object – and the objects and concepts need not stray outside the expected content for the given pupils' age / year group.

Example



Tazreen Tershanah @tershanah · 15h

Thanks. #mathscpdchat More reasoning is always a good thing in my book. These tasks might exist in textbooks but I suppose it is about using your critical/professional judgement to assess the appropriateness of these tasks?

Mr B Maths @MrBMaths3 · 15h

Yes Completely. I guess like anything it is selecting the appropriate task for that class / lesson. Probably why it will never be a one size fits all #mathscpdchat

Mary Pardoe @PardoeMary · 14h

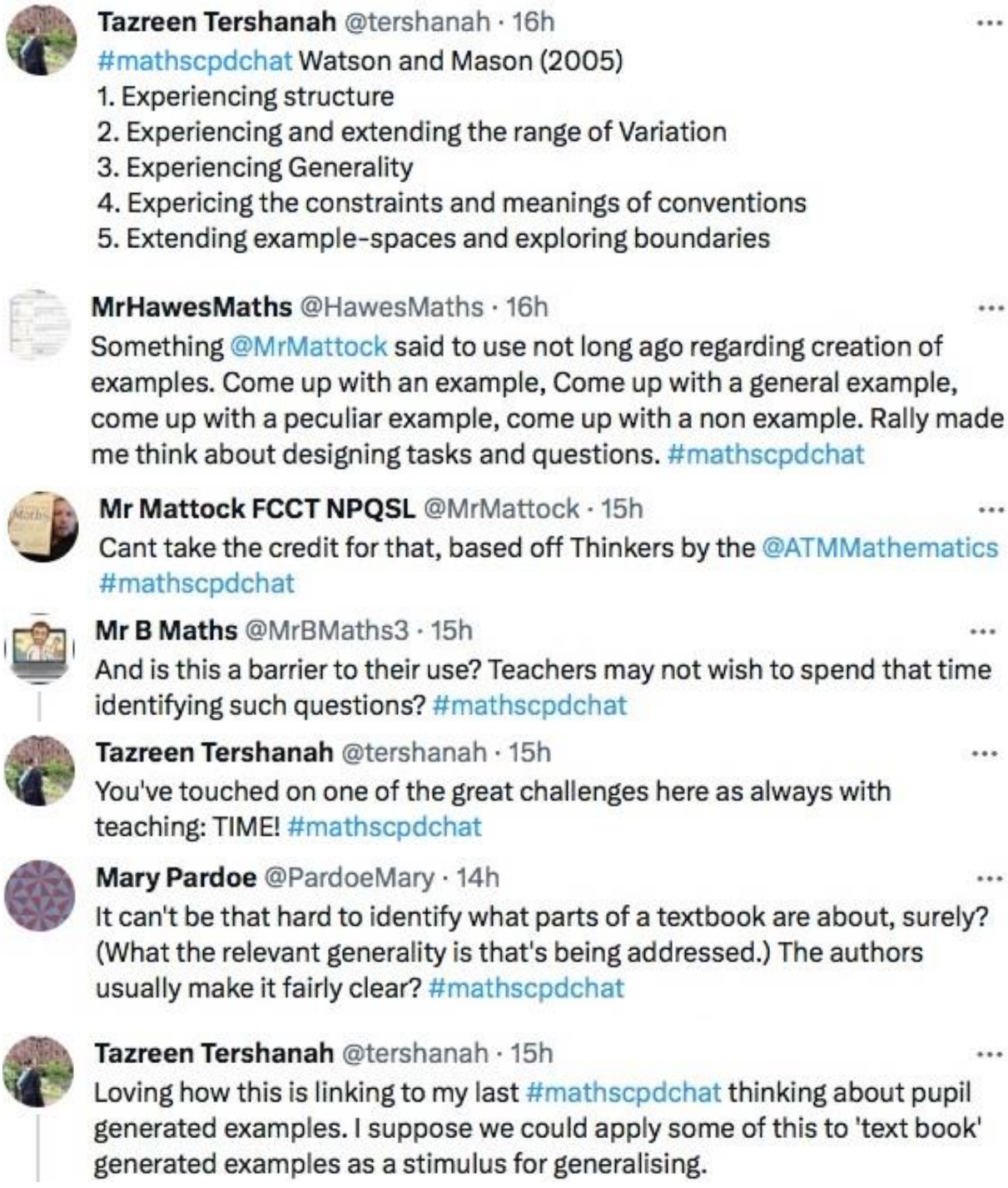
Yes. Finding the appropriate part of a textbook to use to provide opportunities for a particular class to appreciate a particular generality that you want to focus on ... #mathscpdchat

A strategy for supporting learners in being able to see the general in the particular is to provide a multiplicity of examples, and invite them to make up their own examples. Then you can invite groups of learners to consider what is the same and what is different about the various examples. By articulating what they have noticed, and trying to express it to each other, they are more likely collectively to get a true sense of the underlying generality.

'The teacher's job is to organise and provide the sorts of experiences which enable pupils to construct and develop their own understanding of mathematics.'

Research Sources

Watson, A. & Mason, J. (2005). Mathematics as a Constructive Activity: learners generating examples. Mahwah: Erlbaum.



Mr B Maths @MrBMaths3 · 15h

And perhaps looking at are they 'standard' examples or 'peculiar' examples. Looked at this in a recent maths hub workgroup session... Can't remember the source! #mathscpdchat

Mary Pardoe @PardoeMary · 15h

Absolutely! #mathscpdchat

To clarify their thoughts, mathematicians often consider unusual or extreme examples. Learners in mathematics lessons can be encouraged to do the same.

When a teacher invites learners to construct examples of a mathematical concept, the learners have an opportunity to be as creative as they wish. Asking them to think of more examples, one after another, often stimulates creativity as, seeing less obvious variations that others produce, the learners realise that they also might create more exciting examples.

For example, a class was using a text book in which a 'locus' was defined as 'all the points satisfying particular conditions'. As an example, the perpendicular bisector of the line AB was shown as the locus that is set of all points on the page that are the same distance from a point A as from a point B.

When the teacher invited learners to think of other examples of loci, and give the conditions determining them, the learners' examples were, at first, cautious examples suggested by the example in the text book, such as all the points on the page that are:

- nearer to A than to B
- two centimetres from A
- one centimetre from the bottom of the page.

When eventually, one learner thought of 'all the points that are a million miles from the tip of my pencil', and convinced everyone that the locus was the surface of a gigantic sphere, other learners also became much more adventurous, giving examples of loci that were:

- planes ('all the points that are the same distance from the centre of the moon as from the centre of the earth'),
- parts of three-dimensional space ('all the points that are closer to this finger tip than to that finger tip'),
- curved surfaces other than surfaces of spheres ('all the points that are four centimetres from this piece of string').

By thinking of more unusual examples the learners enriched the space of examples to which they had access.

Tazreen Tershanah @tershanah · 15h

Thanks @PardoeMary As always, you have got me thinking about examples in text books and perhaps representations which are so unusual that we may not have thought about a certain concept in that way and requires some collaborative unpicking. #mathscpdchat

Various other ways of using textbooks were discussed in the following conversation:

MrHawesMaths @HawesMaths · 17h

I sometimes use them as part of retrieval practice. Or for strengthening and deepening tasks. Depends on how good the books are. I am a fan of the @cgpbooks for maths at ks3 at the moment #mathscpdchat

Holmsey @YorkFarmGirl · 17h

I like these for my tutor pupils for drill and skill when they need it I use the gcse ones too for similar reasons.

Tazreen Tershanah @tershanah · 17h

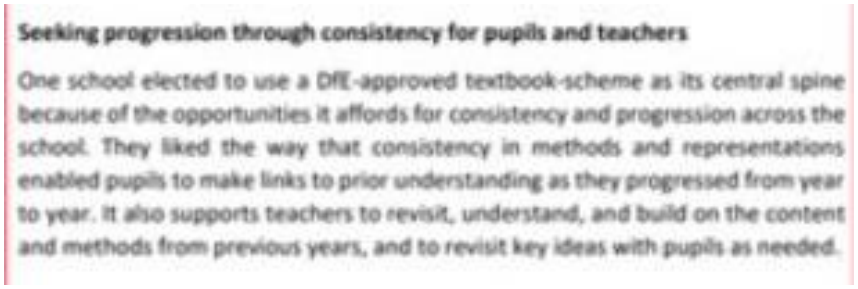
#mathscpdchat Thanks @YorkFarmGirl Sounds like it is that is served the purpose of repetition.

Holmsey @YorkFarmGirl · 16h

I've had a few of my secondary school pupils say they feel rushed and haven't time to nail the foundations and spend a lot of time working on this building up that base confidence.

Tazreen Tershanah @tershanah · 16h

Thank you. Don't forget to the use the #mathscpdchat hashtag. The recent study on resources (primary) have found that a lot of leaders value the consistency the textbooks bring and the reassurance it provides pupils.


Seeking progression through consistency for pupils and teachers

One school elected to use a DfE-approved textbook-scheme as its central spine because of the opportunities it affords for consistency and progression across the school. They liked the way that consistency in methods and representations enabled pupils to make links to prior understanding as they progressed from year to year. It also supports teachers to revisit, understand, and build on the content and methods from previous years, and to revisit key ideas with pupils as needed.

Tazreen Tershanah @tershanah · 17h

Thanks @HawesMaths So, for 'working out' mathematical muscles! #mathscpdchat

Tazreen Tershanah @tershanah · 18h

#Mathscpdchat I think there is the element here of decoding the way that questions are sometimes presented and getting to grips with the format and of questions and what thinking is expected from them (is that right @HawesMaths ?)

MrHawesMaths @HawesMaths · 17h

Sure if it fits what I am doing with the class. Some textbooks do not provide enough questions and can progress too quickly. I prefer a textbook with more 'drill and kill' (lots of qs)to work through and spend time on developing A02/3 skills with specific resources. #mathscpdchat

Mary Pardoe @PardoeMary · 17h

I'm certain that you, when selecting 'drill' consider the degree and kind of variation in what your students are faced with ... i.e. ... #mathscpdchat

When you provide learners with examples, it is important that there is variation in all the features that can be varied, so that they learn what it is possible to change. They also have to learn what is the 'range of permissible change' of all features that can be changed. For example the orientation of a shape can be changed and it still be an image of a particular object after a rotation, but not all orientations are possible.

It is important that the teacher is aware of what can be varied in examples, and the corresponding ranges of permissible change, because learners are often unaware of some features that can be changed, and the whole ranges of permissible change. For example, some learners think only of quadrilaterals as convex, or bases of triangles as parallel to the bottom of the page.

You might look at examples in the textbook you use, and try to decide whether there is sufficient variation in the examples to draw the learner's attention to the features that can be varied, and the ranges over which they can be varied.

Research Sources

Watson, A. & Mason, J. (2005). Mathematics as a Constructive Activity: learners generating examples. Mahwah: Erlbaum.
Watson, A. & Mason, J. (2006) Seeing an Exercise as a Single Mathematical Object: Using Variation to Structure Sense-Making. Mathematical Thinking and Learning. 8(2) p91-111.

Tazreen Tershanah @tershanah · 21h

Thanks for this. #mathscpdchat This is Something @mideco_2883 touched upon earlier that the 'order' of questions need to be adapted in order to promote mathematical thinking and pattern spotting.

MrHawesMaths @HawesMaths · 17h

Of course. Otherwise why complete a task that doesn't tackle the possible variations that help to make links and prep for any formative/summative assessments so there are no 'gaps' ☝ #mathscpdchat

Tazreen Tershanah @tershanah · 17h

#mathscpdchat That's it. Ultimately you (the teacher) know the children best and act as the 'glue' to support mathematical linkages.

Tazreen Tershanah @tershanah · 17h

#mathscpdchat Here is a useful summary of a study which asked whether choice of maths text book makes a difference (for those who answered sometimes or always).

researchingeducation.com
Does the choice of maths textbook make a difference? - Researching ...
Taking some key topics, we looked at the relationship between different textbook treatments and student outcomes The mathemati...

MrHawesMaths @HawesMaths · 17h

Interesting read. I'm not sure I would want my department at primary level working through textbooks. Seems very formulaic.

Tazreen Tershanah @tershanah · 17h

#mathscpdchat Then another good read (already mentioned tonight) would be @mrs_gearr 's MT article on how she used a textbook as a starting point for collaborative planning as opposed to a formulaic approach to teaching.

A way in which a textbook may be 'a godsend' was described in the next conversation:

Educator Supe @ShakinthatChalk · 18h

You could try asking if (good) text books were available would staff use them as per your poll options.

I have text books I use occasionally. In one school I used them predominantly as they were pretty good.

Tazreen Tershanah @tershanah · 18h

Thank you! Please don't forget to use the #mathscpdchat hashtag. What counts as a pretty good #mathematics textbook?

Educator Supe @ShakinthatChalk · 18h

Too long for a tweet. In short, the teacher is able to use it.

#mathscpdchat

Tazreen Tershanah @tershanah · 18h

#mathscpdchat user friendly!

Carl Smith 🇺🇦🦄 @blazercarl · 18h

They are a Godsend on supply.

Tazreen Tershanah @tershanah · 18h

Don't forget the #Mathscpdchat hashtag. Interesting. What about them is helpful for a supply teacher?

Carl Smith 🇺🇦🦄 @blazercarl · 18h

When the work left is not suitable (too hard/easy/quick you can always set them a task on the topic being covered from a text book (I am science).

Tazreen Tershanah @tershanah · 18h

#mathscpdchat I suppose they are something else at hand to support a teacher in supporting or deepening pupil understanding.

In this short interchange the focus was on the different kinds of curriculum resource available:

Yvonne Osborne @MrsOsborneMATHS · 15h

I voted "sometimes" #mathscpdchat. Our department is following the White Rose SoL and use the Teaching Slides and Worksheets. Not a textbook but I think doing the same job as one.

Tazreen Tershanah @tershanah · 15h

#mathscpdchat Really glad you mentioned this @MrsOsborneMATHS. A recent study on additional resources differentiated between textbooks and other resources in the following ways:

For ease, we refer to curriculum resources, and their various forms and uses, thus:

Curriculum resources	A general term for all mathematics curriculum resources, including mathematics schemes, linked to curriculum delivery (see above). These include, for example, textbooks, workbooks, worksheets, teacher materials, whole class teaching materials (e.g. PowerPoints), interactive materials, and Apps.
Textbooks	Physical textbooks.
(Mathematics) scheme	A set of sequenced curriculum resources from one publisher/provider written to cover the full mathematics curriculum across the whole primary phase without the need for supplementation.
Textbook-scheme	A mathematics scheme which includes physical textbooks.
Online-scheme	A mathematics scheme which is available predominantly online and specifically does not include physical textbooks.
Central spine	The main mathematics curriculum resource (which is usually, but not always, a scheme) adopted by a school. This may be used as the sole curriculum resource, or it may be supplemented with additional curriculum resources (including other schemes in whole or part).
Curation	To pull together a range of curriculum resources – or parts thereof – from different publishers/providers (potentially including parts of schemes).
Supplementation	To add other curriculum resources – or parts thereof – to the curriculum resources (including mathematics schemes) being used.
Adaptation	To change the curriculum resources being used (including mathematics schemes) in some way. This can include supplementation.

Marks. R., Barclay. N., and Barnes. A., (2023) The prevalence and use of textbooks and curriculum resources in primary maths, Nuffield Foundation, p7

Also in response to Tazreen's first main question …

Tazreen Tershanah @tershanah · 4 Jul

Question 1. Do you use text books? (see poll below) Always, sometimes, never.

… ways in which textbooks are used in A level and GCSE-resit teaching were mentioned:

Simon Ball @ballyzero · 18h

Textbooks are built into our A-Level scheme of learning. We do a few example questions of our own, and then set a few textbook questions. We don't use them in GCSE Maths resit until after the November results. #mathscpdchat

Tazreen Tershanah @tershanah · 19h

Thanks @ballyzero #Mathscpdchat Can you tell us more about why you don't use them in GCSE Maths Resit until after November. The #mathsforlife project is a great read if you haven't already some across it: atm.org.uk/write/MediaUpl..

Simon Ball @ballyzero · 18h

We use our own, more targeted resources in the lead-up to the November resit... and the same in the half-term after, actually! We use a textbook to prepare for the summer entry as something different, essentially! #mathscpdchat

Tazreen Tershanah @tershanah · 18h

#mathscpdchat Thanks for clarifying!

There were also these comments …

MrsH @floralmaths · 18h

Lots of good worded questions, answers in the back and no wasted photocopying.

Rachel Renshaw @RachelRenshaw3 · 16h

This is why I like out excellent GCsE textbooks. They also have exam questions at the end of each chapter

… and the following 'single' replies:

Nicola 🏴🏊🍽️🐶 @nkl_17 · 15h

Only sometimes for cover for KS3 & 4. Use them more for kS5.

Tommaths in Museums AMIMA @TeaKayB · 16h

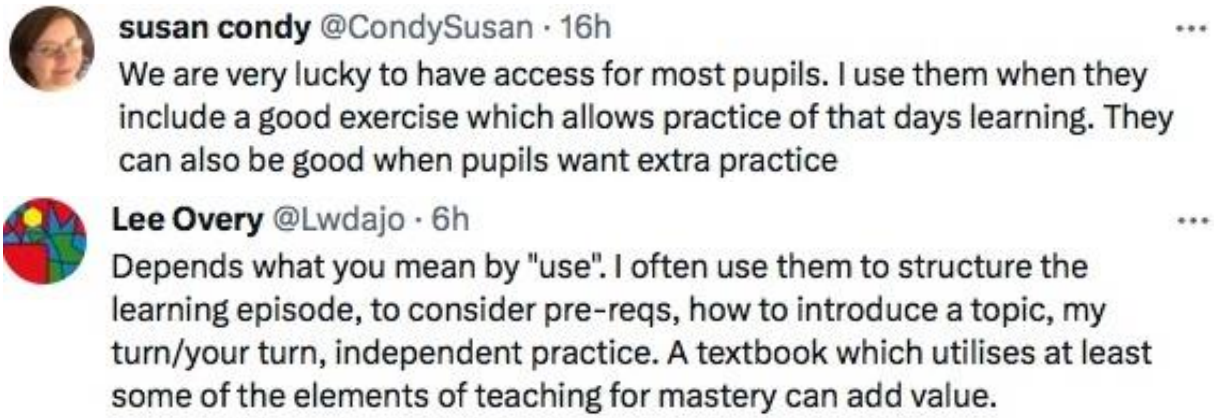
I voted "never" because I'm in a different classroom for every lesson and with no guarantee that there will be a set of the ones I need in any given room, and I'm not carrying them around every time.

Anthony Shaw @ShawMaths · 18h

I can't afford to buy any! #mathscpdchat

Laura Deamer @LauraDeamer · 9h

We have one class set, we use them sometimes. They have some great questions for practice and we use them for cover lessons.



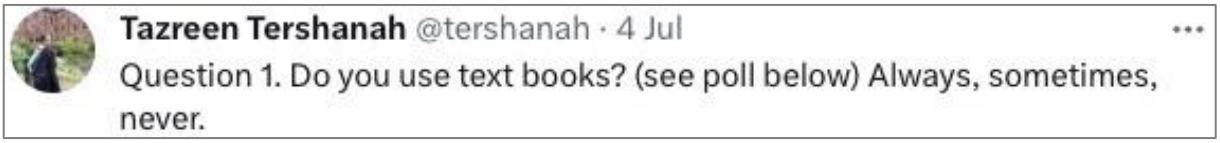
susan condy @CondySusan · 16h

We are very lucky to have access for most pupils. I use them when they include a good exercise which allows practice of that days learning. They can also be good when pupils want extra practice

Lee Overy @Lwdajo · 6h

Depends what you mean by "use". I often use them to structure the learning episode, to consider pre-reqs, how to introduce a topic, my turn/your turn, independent practice. A textbook which utilises at least some of the elements of teaching for mastery can add value.

Some time after Tazreen had tweeted her poll, with which she had asked …



Tazreen Tershanah @tershanah · 4 Jul

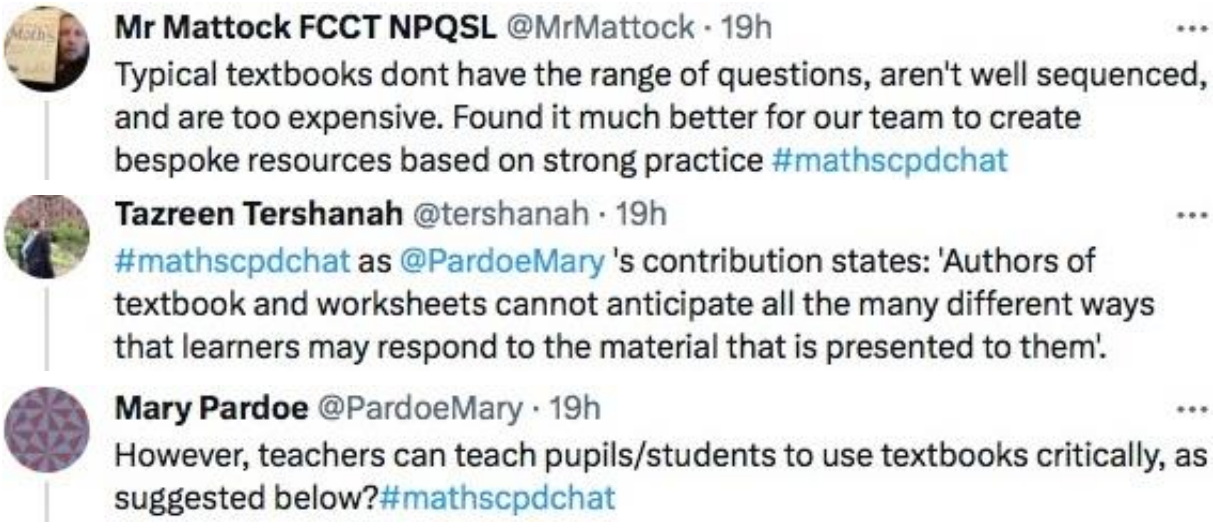
Question 1. Do you use text books? (see poll below) Always, sometimes, never.

… she moved the focus of discussion on from WHAT teachers do in relation to textbooks to reasons WHY they do it (by tweeting the following question):

Tazreen Tershanah @tershanah · 19h

#mathscpdchat Thank you to those who have voted so far. Would love to know why you always/sometimes/never use text books in mathematics?

This prompted some thought-provoking replies. In the next conversation teachers expressed approval of teaching strategies that encourage/enable pupils/students to use material in textbooks, such as exercises, critically:



Mr Mattock FCCT NPQSL @MrMattock · 19h

Typical textbooks dont have the range of questions, aren't well sequenced, and are too expensive. Found it much better for our team to create bespoke resources based on strong practice #mathscpdchat

Tazreen Tershanah @tershanah · 19h

#mathscpdchat as @PardoeMary 's contribution states: 'Authors of textbook and worksheets cannot anticipate all the many different ways that learners may respond to the material that is presented to them'.

Mary Pardoe @PardoeMary · 19h

However, teachers can teach pupils/students to use textbooks critically, as suggested below?#mathscpdchat

Exercises in text books should always be used critically by learners to help them understand some mathematics. Exercises are vehicles for learning; they are not the learning itself. Whether something is learned from an exercise depends on how the learner interacts with the questions. Learners can learn to approach exercises critically, asking themselves, for example:

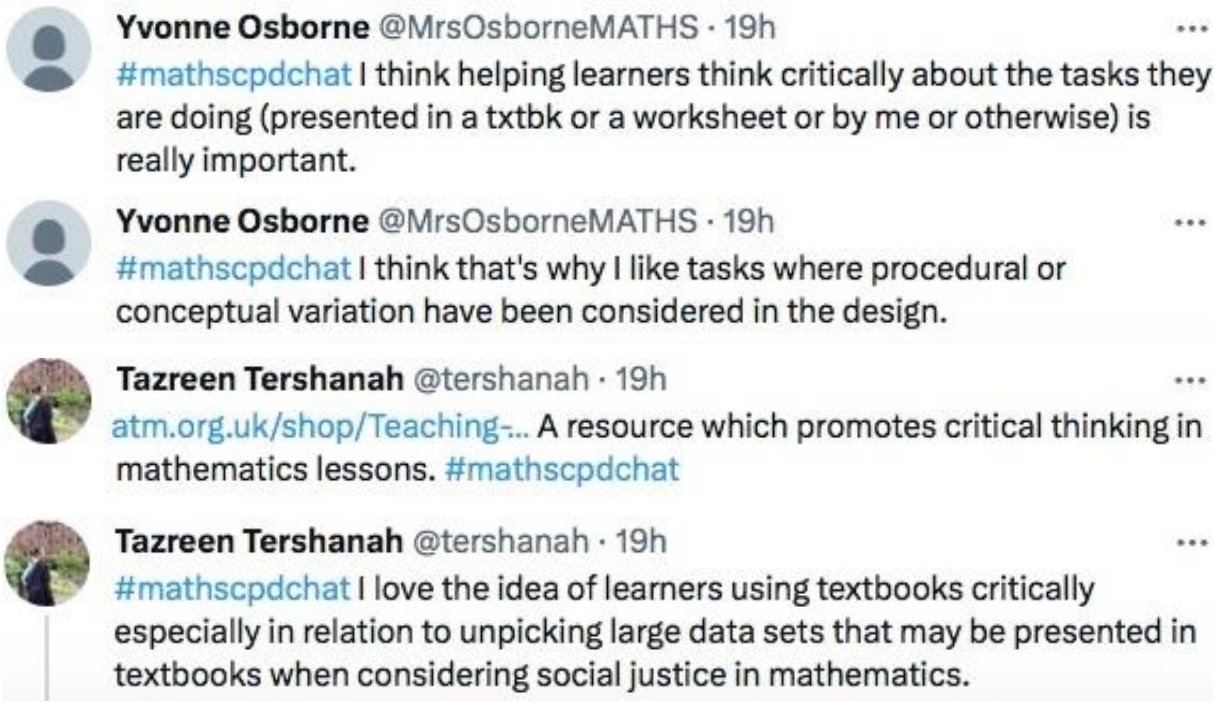
- what am I learning from these examples?
- how many of these questions do I need to try to answer before I understand the idea involved in them?
- are some of these problems harder than others, and, if so, in what way are they harder?
- can I pose my own problem, and then find a solution to my problem?
- can I write my own explanation of how to solve this kind of problem, or answer this sort of question?

Do your learners usually enjoy their homework? If you don't know the answer to this question, you could ask them, perhaps letting learners respond anonymously. If the answer is predominantly 'No', the next step is to try to find out what the learners themselves think are the aspects of homework tasks that they do not enjoy.

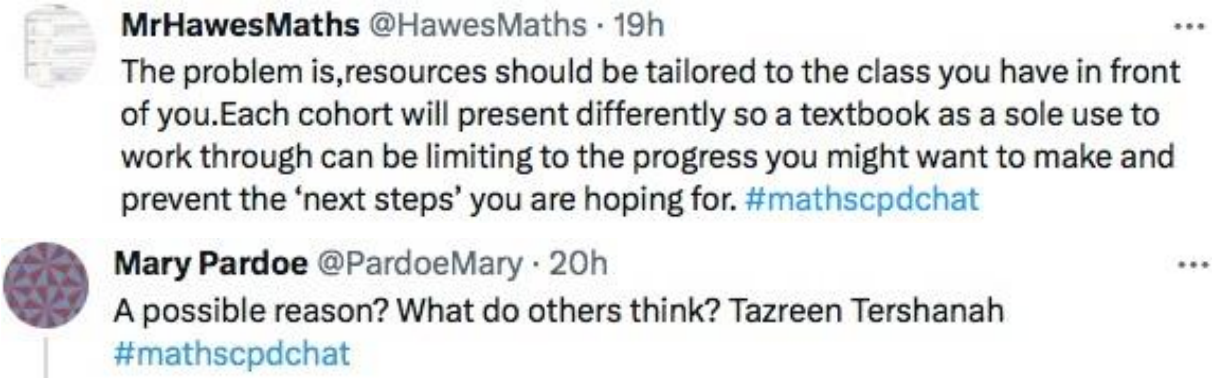
The Standards Site has a number of case studies describing how teachers have developed successful approaches to homework. Go to http://www.standards.dfes.gov.uk/homework/?version=1

Sources

Malcolm Swan, *Improving learning in mathematics: challenges and strategies*, University of Nottingham, Departme for Education and Skills Standards Unit, 2005



Thoughts about different (and idiosyncratic) ways individual pupils respond to material in textbooks led on to observations and conjectures about roles that textbooks can play in teachers' own learning:

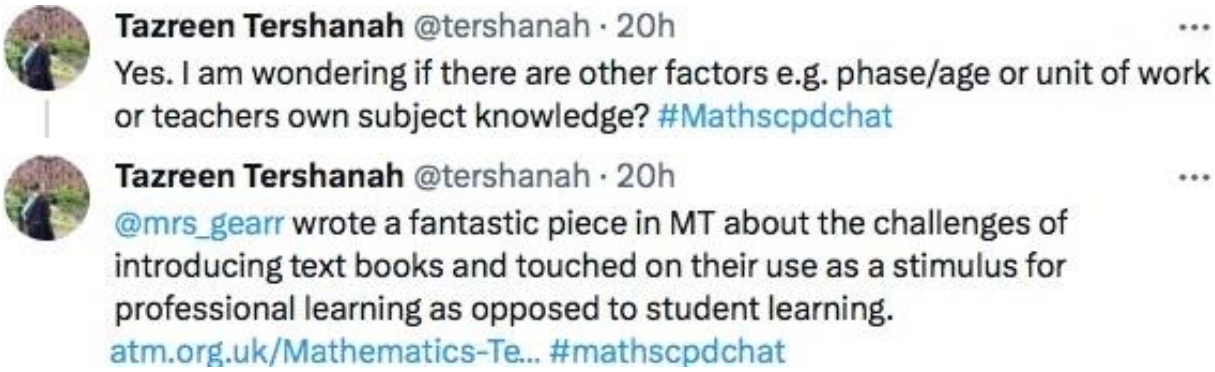


If you follow textbooks or worksheets closely there is a danger that your learners will regard mathematics as consisting of a pre-existing body of knowledge that they cannot influence in any way. Authors of textbooks and worksheets cannot anticipate all the many different ways that learners may respond to the material that is presented to them. Therefore the best way to use textbooks and worksheets is as sources of starting points for tasks and activities to which learners really contribute their own ideas.

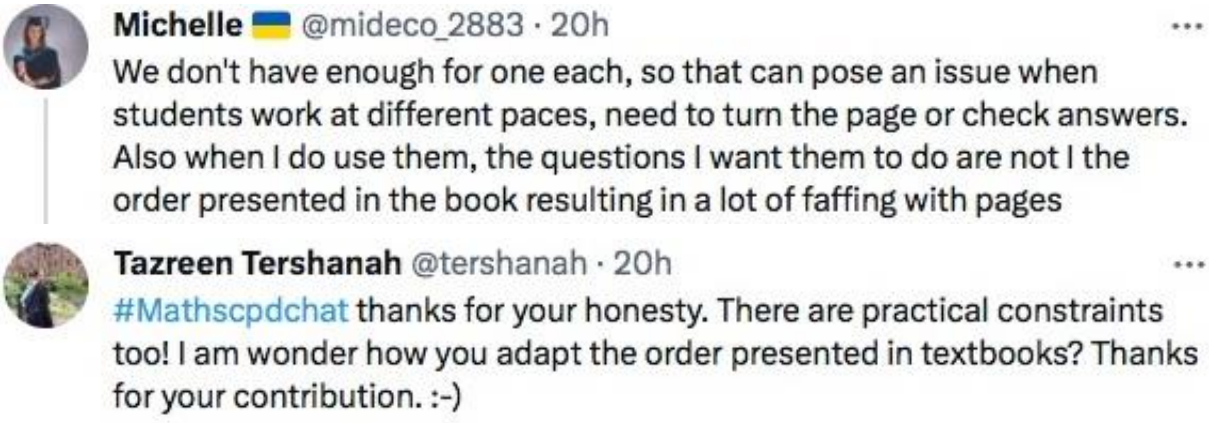
As a teacher you will have an idea of the intended learning for a lesson or a sequence of lessons. The challenge is to know when it is sensible to divert from what you planned, knowing (or having a hunch) that the diversion will be profitable, even if it takes a little longer to get to your planned destination.

Underlying this skill is your own subject knowledge. The deeper your own subject knowledge is, the more likely it is that you will be able to spot those interesting diversions, using the ideas and responses of your learners in productive ways.

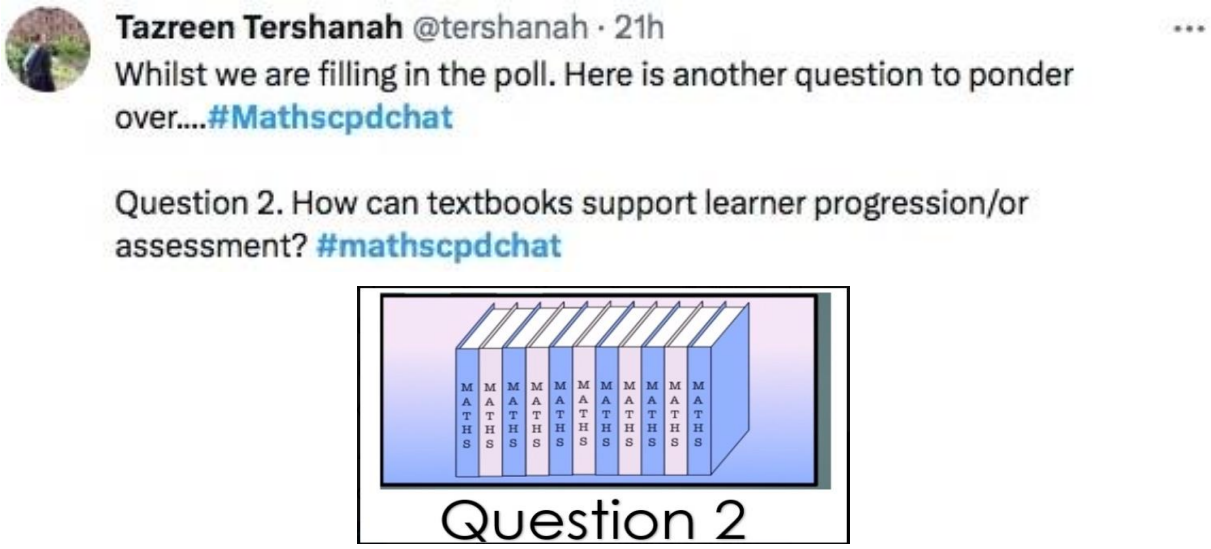
Do you take the time to 'play around' with the mathematics you are going to be teaching? The more you are able to do this, the more prepared you will be to prompt your learners to make the best use of their ideas.



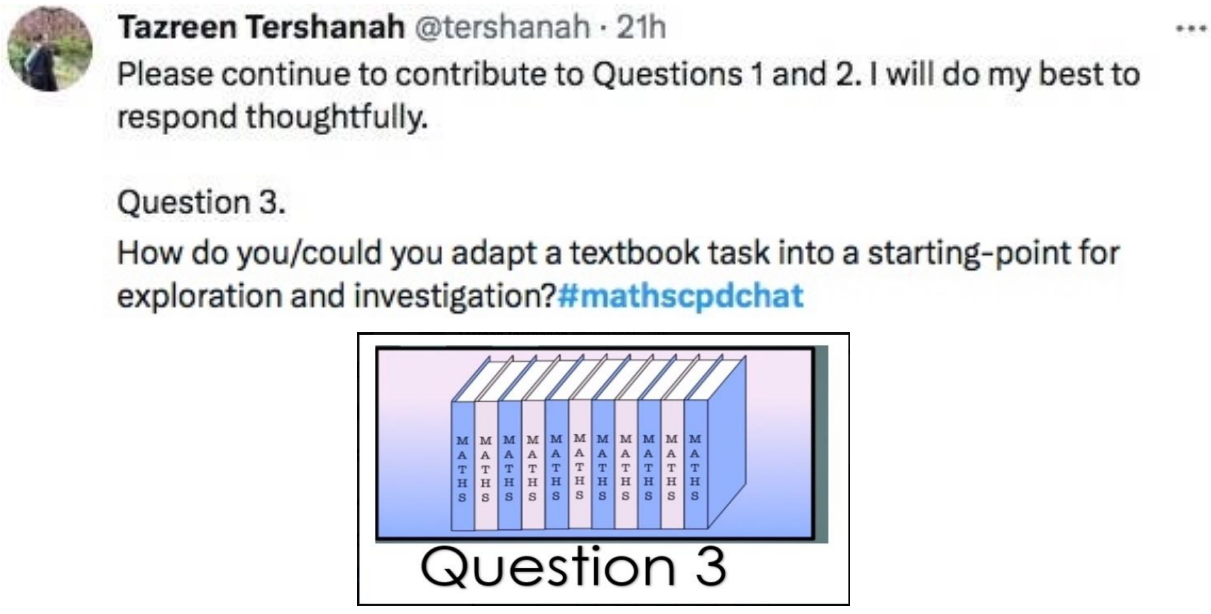
Practical factors were also among the reasons teachers gave for their responses to the poll …



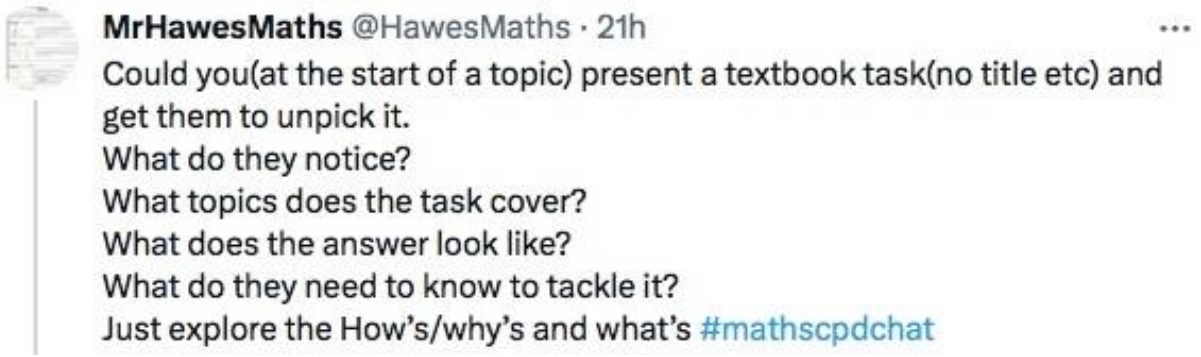
While the host's poll and first question were continuing to prompt replies that generated discussion, as shown above, Tazreen's second main question …



… was left 'hanging'. But to her next question …



… there were some new responses:



Tazreen Tershanah @tershanah · 21h

#mathscpdchat Noticing Noticing Noticing. There are so many things that can be used as a stimulus for noticing which I think is the first step in reasoning. Related to you ideas was @PardoeMary 's recent tweet:

Mary Pardoe @PardoeMary · 9m

Replying to @MrBMaths3 and @tershanah

Textbooks can be a very valuable resource though. They can be used flexibly/creatively ... e.g. ... **#mathscpdchat**

Whether or not a list of questions generates learning depends on how learners interact with the questions. It can be a vehicle for learning if learners have been encouraged to think about what they are learning by tackling the questions. For example they can be encouraged to ask:
What is the same about all these questions?
How are the questions different?
What do I need to know and understand to answer each question?
Can I make up my own question?
Can I answer my own question?
What have I learnt by answering these questions?

MrHawesMaths @HawesMaths · 21h

💪 feeling like an echo or a 🦜 here 😁#mathscpdchat

Tazreen Tershanah @tershanah · 21h

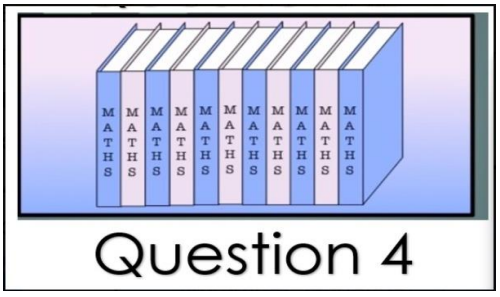
😁#mathscpdchat No worries at all. It's great to see that our own professional knowledge has some parallels with research (even if we did not realise!).

Tazreen's final question …

Tazreen Tershanah @tershanah · Jul 4

Continue to ponder Questions 1,2 and 3. The final question is an important one. So I would like to give you lots of 'thinking time'.

Question 4.
How could text books be used as stimulus for teacher professional development opportunities? **#Mathscpdchat**



… remains, as does her Question 2, to prompt future thought, discussion, and perhaps action.

A tweet that was not a reply to any of the host's questions …

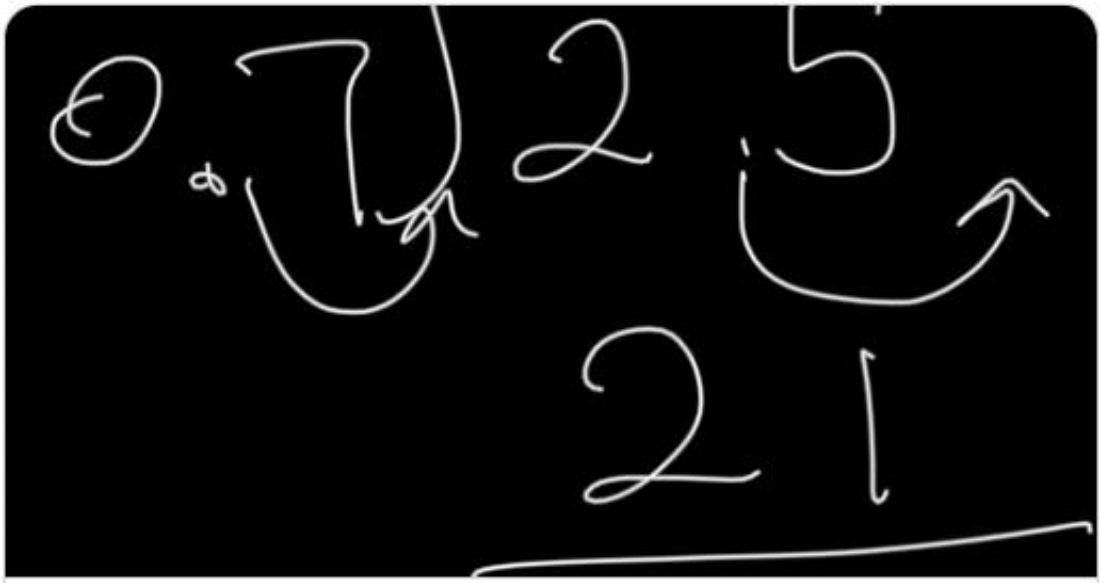
Joanne Green @MsJoanneGreen · Jul 4

#mathscpdchat @tershanah @NCETM I like it when there are Sources, like history books have as you can ask questions about those. And then compare them. I do that with my maths books. But, unfortunately, it's not done like that usually in maths books. There is no 'Source A', etc.

… nevertheless prompted Tazreen to share the link to a significant blog:

Tazreen Tershanah @tershanah · Jul 4

#mathscpdchat Thank you. You've got me thinking about how normalised textbook use might be across other subjects and cultures. Great blog here from @watanabeKSU about supporting professional learning and textbooks in Japan.



tadwatanabe.wordpress.com
School Mathematics Textbooks
Recently, there was a Twitter conversation about mathematics textbooks. The beginning of the conversation really had nothing to do...

The following observation and question (with a comment-in-response) was also not a reply to a main question:

Yvonne Osborne @MrsOsborneMATHS · 20h

#mathscpdchat it seems we have focused on the exercises in textbooks. Does anyone use the examples/explanations that often start a unit of work?

Lee Overy @Lwdajo · 8h

... And these examples lead the student into the independent practice. Also the pre requisites, the structure of how a topic is introduced, the hook. Good textbooks have these. #mathscpdchat

This was the host's final message at the end of the hour allocated to this #mathsCPDchat:

Tazreen Tershanah @tershanah · Jul 4

Feel free to continue the professional discussion.

Thank you so much for joining me for this **#mathscpdchat**. Today we have discussed
1. If we use textbooks
2. The effective use of text books, the challenges and our adaptations
3. The impact on pupil/teacher learning
@NCETM