#mathscpdchat 3 May 2022

How do you show pupils that ALL their responses and contributions in maths lessons are valued?

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:

Questions and Prompts for Mathematical Thinking which is an ATM publication written by Anne Watson and John Mason. The authors have put together 'a collection of cogent and challenging questions which are designed to tease out structures and concepts at the heart of mathematics'. It was shared by Tazreen Kassim-Lowe

Teachers' responses to children's mistakes in kindergarten mathematics classrooms which is a dissertation by Qian Li submitted towards achieving the degree of Doctor of Philosophy at Purdue University in India. It was shared by Tazreen Kassim-Lowe

Conjecturing Atmosphere which is a blogpost by John Mason for Oxford Education from 2015. The author begins with the statement: 'Mathematical thinking can only take place in what I call a conjecturing atmosphere.' He describes the characteristics of a conjecturing atmosphere, one aim of which is to reduce the pressure on 'being correct' in order to facilitate deeper appreciation and comprehension. It was shared by Mary Pardoe

Effective Questioning and Responding in the Mathematics Classroom which is an article by John Mason, Open University & University of Oxford, 2010. The author addresses the following questions: How do questions arise in the maths classroom? How can we use them effectively? How can we stimulate students to ask their own questions? The conjectures that are presented are intended to be tested in readers' (teachers') own experience. It was shared by Mary Pardoe

Project Mathematics Update: Expressing Generality which is a PDF document containing a series of activities involving the seeing of generalities in various contexts. It was prepared by John Mason in 1988 for the Project Mathematics Update course team at the Open University's Centre for Mathematics Education. It was shared by Mary Pardoe

A full illustrated summary of the discussions in this #mathsCPDchat follows.

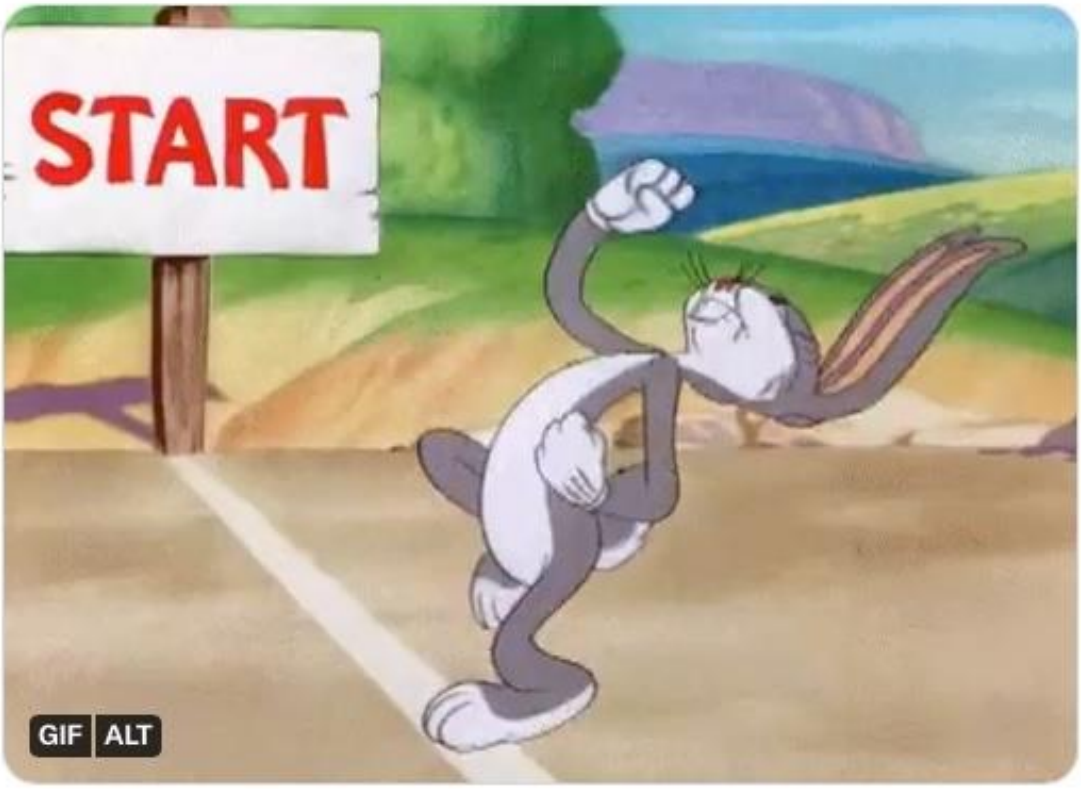
The host's welcome tweet …

Tazreen Tershanah @tershanah · 13h

#mathscpdchat A warm welcome to everyone. 😀

Thank you for taking the time to discuss this topic: 'How do you show pupils that ALL their responses and contributions in maths lessons are valued?'.

Please ensure that you use the hashtag #mathscpdchat in every response.



… generated a short discussion about anonymity:

Mr Payne @Tom_does_maths · 13h

Replying to @tershanah

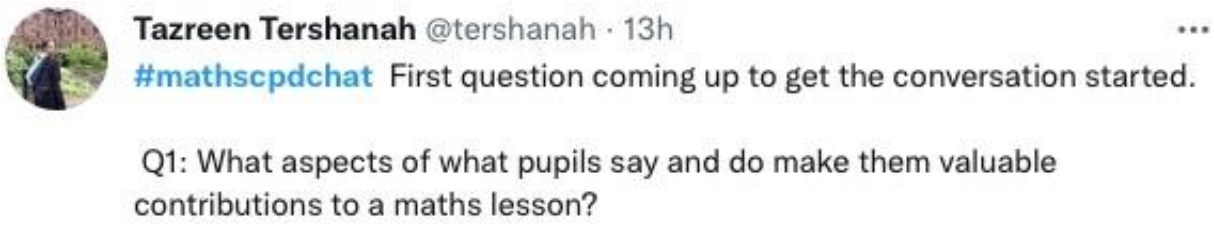
Something like @Socrative is great for this. Keep things anonymous and when you're going through answers you can usually spot all the common mistakes in their responses. I like to say I'm happy to see the mistakes as they are helpful to learn from.

Tazreen Tershanah @tershanah · 13h

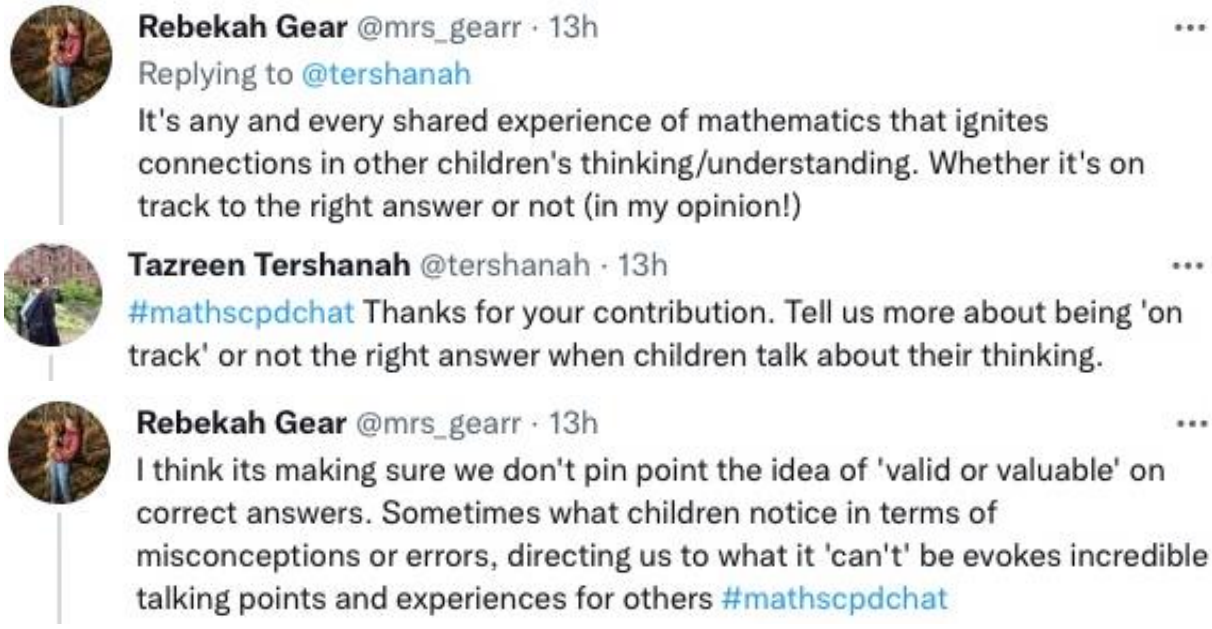
Please remember to use the #mathscpdchat. Thanks for your contribution. Interesting. So written contributions as well as verbal contributions. How important is anonymity when discussing written contributions?

The (linked-to-Twitter) screenshots below show the conversations and replies which were generated by Tazreen's first and second questions. Discussion generated by the first question, was about the aspects of pupils' activity and general behaviour in maths lessons that teachers regard as valuable. Contributors also mentioned interaction between pupils, and establishing an atmosphere in which that interaction is likely to be valuable because it supports learning. Discussion resulting from Q2 was about responding to pupils' 'mistakes'. Click on any of the screenshots-of-a-tweet to go to that actual tweet on Twitter.

The following conversations and replies were in response to the first question from the host Tazreen Kassim-Lowe:



This conversation was between Rebekah Gear, Tazreen Kassim-Lowe and Mary Pardoe:



Another reply to Rebekah Gear's first tweet above prompted an interchange between Mary Pardoe and Tazreen Kassim-Lowe:

In a conjecturing atmosphere, when a question is asked, those who are confident listen carefully and quietly check their thinking, while those who are unsure take the opportunity to formulate their own conjecture. If need be, those who are confident that they know might ask questions designed to point in a useful direction.

The aim is to reduce the pressure on 'being correct' and rather to emphasise the deeper appreciation and comprehension which can then be the basis for reconstructing the idea in the future when needed. A conjecturing atmosphere requires trust: learners trusting the teacher that they can make progress on the tasks and questions posed to them, because effort is worthwhile; teachers trusting learners to make an effort because they will be rewarded by a more comprehensive appreciation of the topic, and be better equipped in the future than if they simply rehearse procedures over and over. A conjecturing atmosphere based on trust grows over time. It does not just suddenly happen. It depends on senior management trusting that teachers' ways of working will produce deeper and more effective learning over time, rather than demanding immediate short-term success.

Action: When a learner offers a response to a question, try to catch yourself before you declare whether it is right or wrong; praise it as a conjecture, and invite others to consider whether they agree with it, or whether they would like to suggest a modification or a counter-example. In this way you can be responsible for the process of thinking, while the learners work together to decide correctness.

From *Conjecturing Atmosphere*
John Mason 2015

Tazreen Tershanah @tershanah · 13h

Thanks, Mary. I love the idea of catching a response before declaring if it is right or wrong. #mathscpdchat

Mr Hawes's answer to Tazreen Kassim-Lowe's Q1 prompted this interchange:

MrHawesMaths @HawesMaths · 13h

Replying to @tershanah and @martynyeouk

I would have to say anything. Even if they don't actually verbally contribute. Just being on task and producing good work and progress in contributing. I even highlight their work as exemplars. #mathscpdchat

Tazreen Tershanah @tershanah · 13h

#mathscpdchat Thank you. We have spoken in the feed about verbal responses and written responses but you have just highlighted that occupying the maths classroom with good learning behaviours is in itself a contribution to the lesson! ❤️

This reply to Tazreen Kassim-Lowe's Q1 was from Gemma Scott:

Director of Maths @DirectorMaths · 13h

Replying to @tershanah

I have to say everything! Even the behaviour they show or the wit they bring. You learn better from people you respect and that comes from relationships. Poor behaviour is often rooted in something else #mathscpdchat

The second question from the host, Tazreen Kassim-Lowe …

Tazreen Tershanah @tershanah · 14h

#mathscpdchat Since we are discussing great mistakes, here is another question for you:

Q2: How do you respond to incorrect responses?

… generated this discussion between Martyn Yeo, Dr Anna and Tazreen Kassim-Lowe:

Martyn (He/Him) @martynyeouk · 14h

Replying to @tershanah

Have used other pupils to help@them spot the mistakes by saying why they disagree...
#mathscpdchat

Tazreen Tershanah @tershanah · 14h

#mathscpdchat Thank you, Martyn. How do you create that climate? Where children can disagree respectfully with each other?

Martyn (He/Him) @martynyeouk · 14h

Replying to @tershanah

Have to show its okay to agree and disagree even when the answer is correct
#mathscpdchat

Tazreen Tershanah @tershanah · 14h

#mathscpdchat What a challenging an stimulating climate! Does it matter how they agree or disagree?

Dr Anna @Dr_anna_maths · 14h

#mathscpdchat Sometimes the method of disagreeing needs to be taught explicitly. I have some suggested sentence starters for class discussion including 'I disagree with...' and things like 'Building on what ... said...'

Tazreen Kassim-Lowe's question in the conversation above …

Tazreen Tershanah @tershanah · 14h

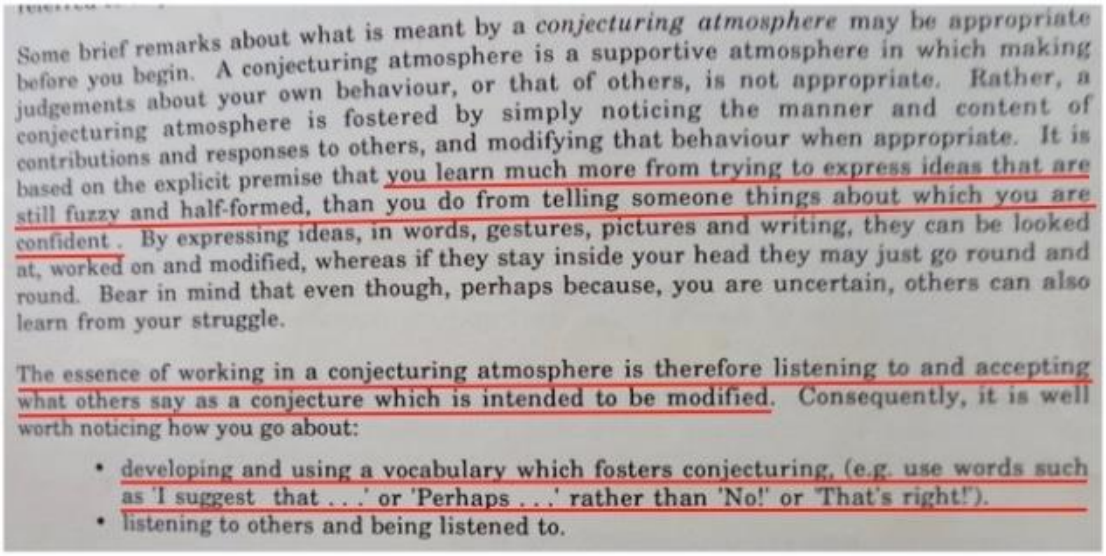
#mathscpdchat Thank you, Martyn. How do you create that climate? Where children can disagree respectfully with each other?

… generated two more comments … from Mary Pardoe, and Tazreen Kassim-Lowe:

Mary Pardoe @PardoeMary · 14h

Replying to @tershanah and @martynyeouk

Butting in ... I think it takes some time. The paragraphs that had the greatest impact ever on my maths teaching I believe were these in the late 1980s.
(An online version is still available as a PDF here: open.edu/openlearncreat)
#mathscpdchat



Some brief remarks about what is meant by a *conjecturing atmosphere* may be appropriate before you begin. A conjecturing atmosphere is a supportive atmosphere in which making judgements about your own behaviour, or that of others, is not appropriate. Rather, a conjecturing atmosphere is fostered by simply noticing the manner and content of contributions and responses to others, and modifying that behaviour when appropriate. It is based on the explicit premise that you learn much more from trying to express ideas that are still fuzzy and half-formed, than you do from telling someone things about which you are confident. By expressing ideas, in words, gestures, pictures and writing, they can be looked at, worked on and modified, whereas if they stay inside your head they may just go round and round. Bear in mind that even though, perhaps because, you are uncertain, others can also learn from your struggle.

The essence of working in a conjecturing atmosphere is therefore listening to and accepting what others say as a conjecture which is intended to be modified. Consequently, it is well worth noticing how you go about:

- developing and using a vocabulary which fosters conjecturing, (e.g. use words such as 'I suggest that . . .' or 'Perhaps . . .' rather than 'No!' or 'That's right!').
- listening to others and being listened to.

From *Project Mathematics Update: Expressing Generality*
John Mason 1988

Tazreen Tershanah @tershanah · 14h

#mathscpdchat Fascinating. Important to erm and ahh and show the struggle! It is what makes learning possible.

Tazreen Kassim-Lowe's Q2 …

Tazreen Tershanah @tershanah · 14h

#mathscpdchat Since we are discussing great mistakes, here is another question for you:

Q2: How do you respond to incorrect responses?

… also generated this discussion between Lucy, Susan Whitehouse and Tazreen Kassim-Lowe …

Lucy @honeypisquared · 14h

Replying to @tershanah

Ha! My daughter has taught me a great deal about this. I am so often surprised by what happens if if *don't* interrupt what I think is the wrong track...#mathscpdchat

Susan Whitehouse @Whitehughes · 13h

Totally agree. It's not always easy to tell an incorrect response from a response that is just different to what you were expecting #mathscpdchat

Tazreen Tershanah @tershanah · 14h

Replying to @honeypisquared

#mathscpdchat What is the difference between interruption, interception and disruption of incorrect responses?

Lucy @honeypisquared · 13h

I think this is the wrong question. I think the question is 'wrong for who?' Or maybe 'wrong for what?'

… this short discussion between Mr Hawes's and Tazreen Kassim-Lowe …

MrHawesMaths @HawesMaths · 14h

Replying to @tershanah

Pause. Pause. Allow opportunity to go again and ask the class to think where the mistake was if they can. Await new response. If still incorrect invite another class member to talk to that original student about the correct response. #mathscpdchat

Tazreen Tershanah @tershanah · 14h

#mathscpdchat 'Pause, Pause'. So important to allow processing time. How do you create a climate where children can comment on each other's responses?

MrHawesMaths @HawesMaths · 14h

Just building the culture of when I say, have another think, that is the cue for others to consider their answer and be ready to be called upon. #mathscpdchat

… and this interchange between Gemma Scott and Tazreen Kassim-Lowe:

Director of Maths @DirectorMaths · 13h
Replying to @tershanah
Unpick! That and try and manage my reaction! #mathscpdchat

Tazreen Tershanah @tershanah · 13h
#mathscpdchat hammer.purdue.edu/articles/thesi
emotional reactions: the valence of teachers' affective reactions to students' mistakes (i.e., positive, negative, or neutral). Excellent point! Maths is emotional. 😂

hammer.purdue.edu
Teachers' responses to children's mistakes in kind...
Making mistakes is an inevitable part of mathematics learning and an essential aspect of ...

Q2 also generated a conversation about being 'too nice to say no' between Dr Anna and Tazreen Kassim-Lowe …

Dr Anna @Dr_anna_maths · 13h
Replying to @tershanah
Sometimes I have observed trainees being 'too nice to say no' and leaving pupils thinking their answer was okay when it was solidly incorrect. Balance of kindness and clarity is needed #mathscpdchat

Tazreen Tershanah @tershanah · 13h
#Mathscpdchat Thanks, Anna. Kindness and Clarity indeed. Is it ever ok to say 'No'?

Dr Anna @Dr_anna_maths · 13h
#mathscpdchat Sometimes I think we have to otherwise a misconception can take root. Often the pupil can spot their own mistake when asked to show how they got to their answer

Tazreen Tershanah @tershanah · 13h
#mathscpdchat No would be followed by some unpicking, some reconceptualisation and possibly new learning. Is it a skill to turn no in to new learning?

… and Q2 prompted single replies from Karen Brockway, Anna Kerr and Priya Shah …

KarenB @brockway_karen · 13h

Replying to @tershanah

I usually say "I'm so glad you said that" because it's generally a common misconception I'm hoping will come out of the woodwork so I can explicitly clarify. #mathscpdchat

A Kerr @annamkerr · 13h

Replying to @tershanah

Explain your thinking ….. and they usually unlock their own misunderstandings #mathscpdchat

Priya Shah @mathsdives · 13h

Replying to @tershanah

If their facial expression suggests they are uncertain of their answer then I state, you look unsure about your answer, what seems to be puzzling you? And the rest unfolds as you dive deeper into the discussion.#mathscpdchat

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

Tazreen's third question …

Tazreen Tershanah @tershanah · 15h

#mathscpdchat RESPECT! A powerful tool.
This brings us on to something that a lot of you have already spoken about:
Q3: How do you create an environment where pupils value and respect EACH OTHER'S responses?

> **Director of Maths** @DirectorMaths · 15h
>
> Replying to @tershanah
>
> I have to say everything! Even the behaviour they show or the wit they bring. You learn better from people you respect and that comes from relationships. Poor behaviour is often rooted in something else #mathscpdchat

… prompted some contributors to discuss 'backwards fading':

Director of Maths @DirectorMaths · 15h

Replying to @tershanah

Something we have tried recently is reducing the value in "getting the answer" and adding value to the method and the explanation. Backwards fading has been useful here #mathscpdchat

A Kerr @annamkerr · 15h

Can you explain backwards facing please? #mathscpdchat

Tazreen Tershanah @tershanah · 15h

Replying to @DirectorMaths

#mathscpdchat Process over product. Tell us more about backwards fading, if you can. :-)

Director of Maths @DirectorMaths · 15h

In essence I give them the final answer. Their task is to put the method/ working out in. Depending on the topic/ where we are in the learning journey I might also give them some of the latter steps to start off with #mathscpdchat

A Kerr @annamkerr · 15h

Replying to @DirectorMaths and @tershanah

Love that. I have never tried it as explicitly as that. #mathscpdchat

Tazreen Tershanah @tershanah · 15h

#mathscpdchat Backwards fading to promote whole class discussion:

BeckyGeorge @1982beckyboo · 14h

I do this too. It also helps as they know instantly if their working is correct before moving on rather than ploughing on through a task. It is good for those who insist that everything is done 'in their head' and won't accept me and the examiners cannot read in their head!

BeckyGeorge @1982beckyboo · 14h

So many of my lads in particular who just will not show working out end up losing marks so I always say maths is like a story. The question is chapter one, the answer is the final chapter and the working out is all of the other chapters. They wouldn't expect to buy a book with...

BeckyGeorge @1982beckyboo · 14h

Only the first and end chapters printed and all of the pages in between are blank and the reason given is oh well, the rest is in the authors head!

Issues arising from thinking about students 'working together as a class' were discussed:

A Kerr @annamkerr · 15h

Replying to @tershanah

Create opportunities to work together as a class, where the teacher gets it wrong, everyone contributes somehow. It can be hard to make that happen. You also need to model being respectful #mathscpdchat

Tazreen Tershanah @tershanah · 15h

#mathscpdchat What tools do you use to model being respectful @annamkerr ?

A Kerr @annamkerr · 15h

Making sure quiet students are heard, listening attentively to them and asking permission to summarise, reminding students to be quiet and listen, never making fun of wrong answers, including every student where appropriate, thanking them for contributing... #mathscpdchat

Tazreen Tershanah @tershanah · 14h

#mathscpdchat Asking permission to summarise is interesting. Teachers tend to revoice children's responses but it is important not to loose the authenticity of the child's thinking.

A Kerr @annamkerr · 14h

#mathscpdchat Exactly! The vocab used can tell us a lot about a child thinking - Higher/bigger etc. I teach a couple of deaf children and they often can't hear other students so I have to repeat.

There was also this reply to Q3:

Mr S Maths @MrSMaths11 · 11h

Replying to @tershanah

Absolute zero tolerance for any laughter etc. at another's response. Also award a housepoint if someone spots me make a mistake on the board - helps to normalise that making mistakes is part of learning maths!

To the host's fourth question (tweeted very close to the end of the chat) …

Tazreen Tershanah @tershanah · 15h

#mathscpdchat What a great mix of research, practical ideas and opinions. Most likely our final question before we wrap up at 8pm:

Q4: What do you praise and how do you praise it?

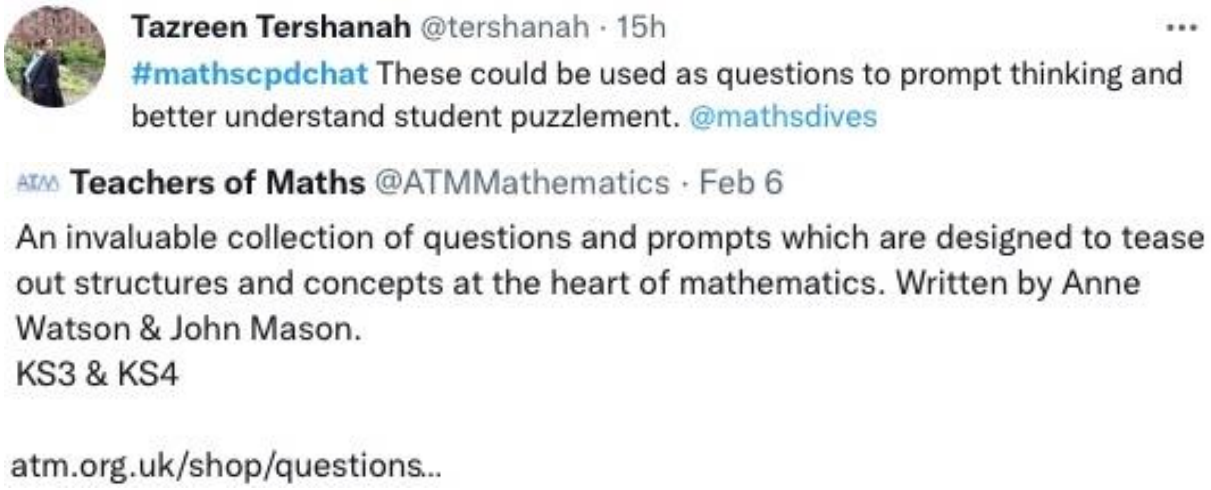
… there was this reply:

A Kerr @annamkerr · 15h

Replying to @tershanah

I praise effort, working hard, speaking out even if they are wrong, helping someone and for asking questions. Or anything that class needs working on I.e. not shouting out. Usually with a 'well done for.....' so they know what they did well. #mathscpdchat

At the end of the chat the host suggested a useful resource by retweeting a tweet from [Teachers of Maths (ATM)](#):



4 GENERAL QUESTIONS AND PROMPTS

By considering activities in list B, grouped under six collective headings for convenience, we developed several general questions and prompts which can be used by teachers. Some of these arose from recalling our own practice or from watching other teachers, and some came from Dyrszlag. Others arose from considering how we might use these activities in particular mathematical contexts, or from discussions with others.

Exemplifying Specialising	Completing Deleting Correcting	Comparing Sorting Organising	Changing Varying Reversing Altering	Generalising Conjecturing	Explaining Justifying Verifying Convincing Refuting

List B grouped

Under each heading we generated appropriate generic questions.

Exemplifying, Specialising	Completing, Deleting, Correcting	Comparing, Sorting, Organising
Give me one or more examples of ... Describe, Demonstrate, Tell, Show, Choose, Draw, Find, Locate, an example of ... Is ... an example of ...? What makes ...an example? Find a counter-example of ... Are there any special examples of ...?	What must be {added / removed / altered} in order to {allow / ensure / contradict} ...? What can be {added / removed / altered} without affecting ... ? Tell me what is wrong with ... What needs to be changed so that ...?	What is the same and different about ...? Sort or organise the following according to ... Is it or is it not ...?

Changing, Varying, Reversing, Altering	Generalising, Conjecturing	Explaining, Justifying, Verifying, Convincing, Refuting
Alter an aspect of something to see effect. What if ...? If this is the answer to a similar question, what was the question? Do .. in two (or more) ways. What is quickest, easiest, ...? Change ... in response to imposed constraints.	Of what is this a special case? What happens in general? Is it always, sometimes, never ...? Describe all possible ... as succinctly as you can. What can change and what has to stay the same so that ... is still true?	Explain why ..., Give a reason ... (using or not using ...) How can we be sure that ...? Tell me what is wrong with ... Is it ever false that ...? (always true that...?) ... How is ... used in ...? Explain role or use of ... Convince me that ...

General Questions & Prompts

We then applied these general questions to List A, grouped under eight collective headings, to produce a grid. A full page copy of this grid can be found on the last page of the booklet.

… to which there was this reply:

Mary Pardoe @PardoeMary · 15h

Replying to @tershanah and @mathsdives

And this is a useful and excellent article …

mcs.open.ac.uk/jhm3/Selected%...

#mathscpdchat

Effective Questioning and Responding in the Mathematics Classroom[1]

John Mason

Open University & University of Oxford

2010

0. Introduction

Asking learners (especially children) questions is so strongly embedded in our culture that most adults do it when in the company of children, and most children do it when playing 'school'. Furthermore, in these types of interactions, the questioner usually knows the answer, and most children quickly work out that this is the case. Questions in school are seen as some sort of testing process, through which learners supposedly learn, and this carries over into adult-child interactions. An extreme form is the *cloze* technique of pausing and expecting students to fill in the missing word. Many classroom interactions are some variant on "guess what is in my mind". By contrast, adults are more likely to ask each other genuine information-seeking, genuinely enquiring. How do questions arise in the classroom? How can we use them effectively? How can we stimulate learners to ask their own questions? These issues are addressed through a number of conjectures which cannot be proved as universal, but which can be tested in your own experience.

This was the host's final tweet:

Tazreen Tershanah @tershanah · 15h

#mathscpdchat My first time hosting was an enjoyable one. Thank you to contributors.

> **Tazreen Tershanah** @tershanah · 15h
>
> #mathscpdchat Is it past 8pm.
>
> That is all folks!
>
> I must express my gratitude for such quality contributions today centred around caring practice and pupil learning.
>
> Thank you.