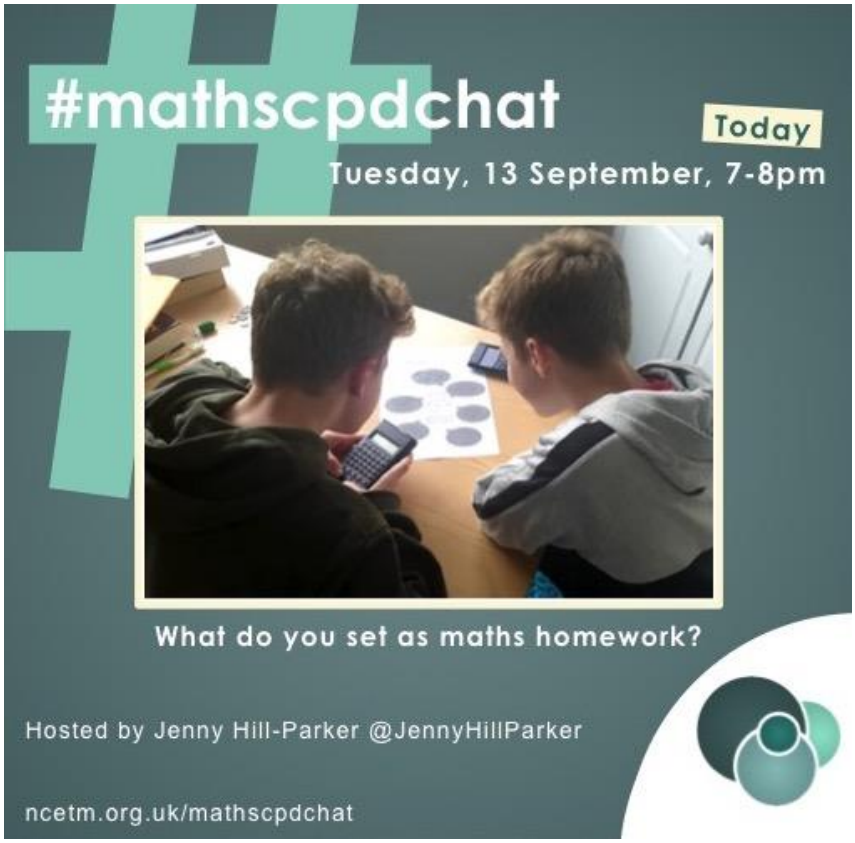
#mathscpdchat 13 September 2022

What do you set as maths homework?

Hosted by Jenny Hill-Parker

*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:

Getting homework done: timely nudges from behavioural psychology which is a blog by Harry Fletcher-Wood. It was shared by Tom Needham

Diminishing Returns which is a task from NRICH. It offers opportunities to think about area, proportion and fractions, while providing an informal introduction to mathematical convergence to tempt the curiosity of 11- to14-year-olds for whom this task is intended. It was shared by RHMaths

NCETM Secondary Archive which is the part of the NCETM website where you will find a PDF archive of all Secondary Magazines. Parts of articles within some of those magazines were shared during the discussion. It was shared by Mary Pardoe

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

The host's opening tweet …

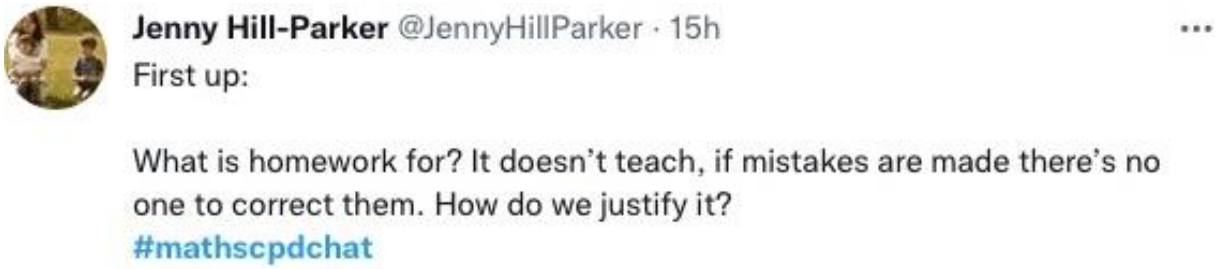
… generated two conversations; this one …

… and this …

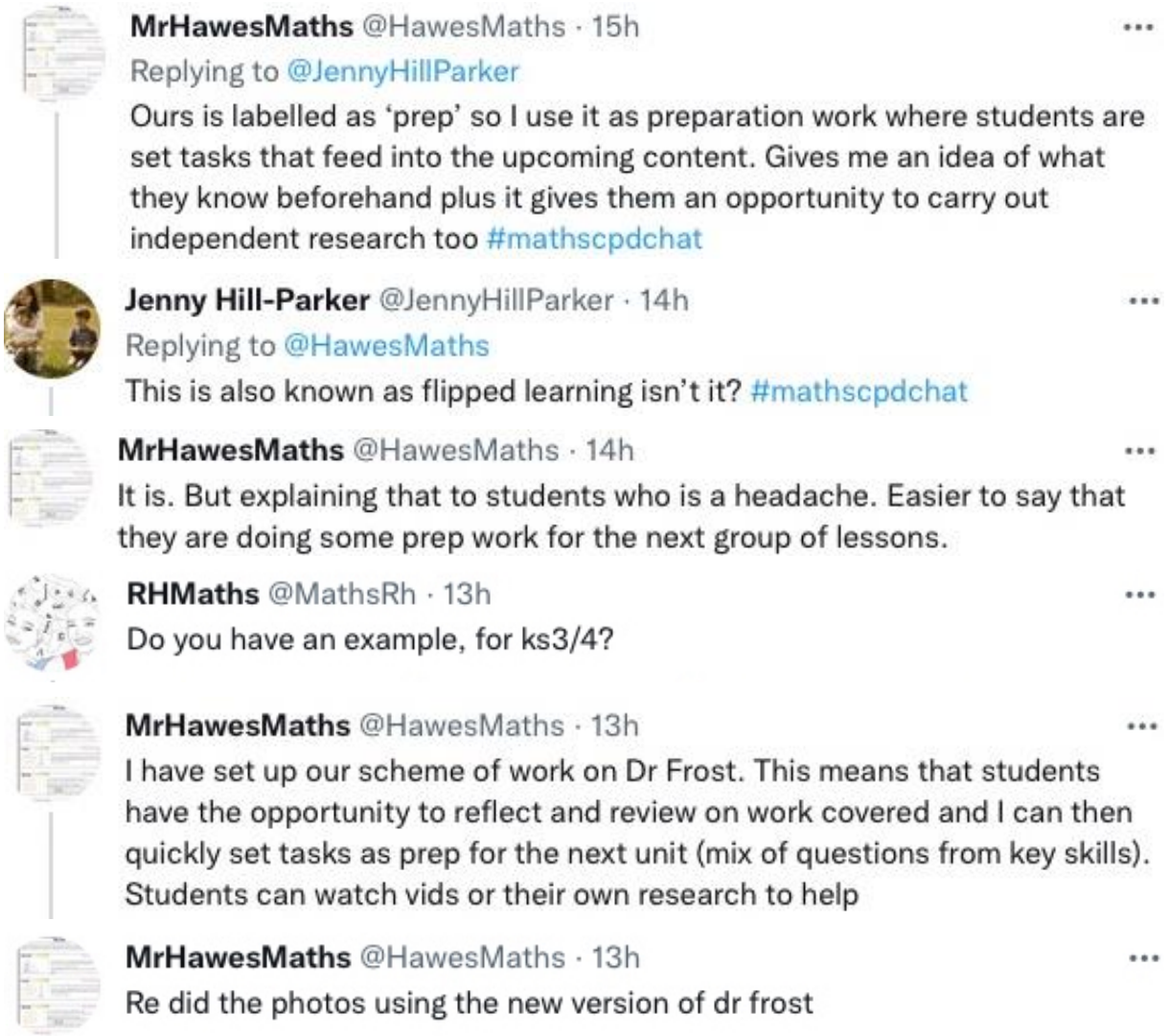
… and two 'real' single replies:

The host's (Jenny's) opening tweet (that prompted the replies shown above) was followed by her first question, which prompted (as in the #mathsCPDchat from 6 September 2022) more replies than any of her other, later, questions. The (linked-to-Twitter) screenshots below show all the replies to the first question, and the discussions that they generated. Those discussions revealed that when teachers set homework, they have various different purposes in mind for it.

In the following part of the summary only (showing all the discussions that were in response to the first question), you can **click on any screenshot-of-a-tweet to go to that actual tweet on Twitter.** This was the first question from Jenny Hill-Parker:



In this conversation, between Mr Hawes, Jenny Hill-Parker and RHMaths the 'purposes of maths homework' discussed included preparation for the next few lessons, and 'exam practice'…



108 **Find a simple percentage of an amount, using non-calculator methods.**

Mastery: 0/100

Set a Task | Generate Worksheet | Have a Go

OR NARROW DOWN		VIDEO	DIFFICULTY	RECENT ACCURACY
E108: Exam Practice: Find a simple percentage of an amount, using non-calculator methods.	Browse		1-4	
K108b: Find the percentage of an amount without a calculator (multiples of 10%).	Example		2	
K108c: Find the percentage of an amount without a calculator (multiples of 5%).	Example		1	

109 **Find a value after a simple percentage change, using non-calculator methods.**

Mastery: 0/100

Set a Task | Generate Worksheet | Have a Go

OR NARROW DOWN		VIDEO	DIFFICULTY	RECENT ACCURACY
E109: Exam Practice: Find a value after a simple percentage change, using non-calculator methods.	Browse		1-4	

UK Curriculum | By Course | Year 8 (KS3)

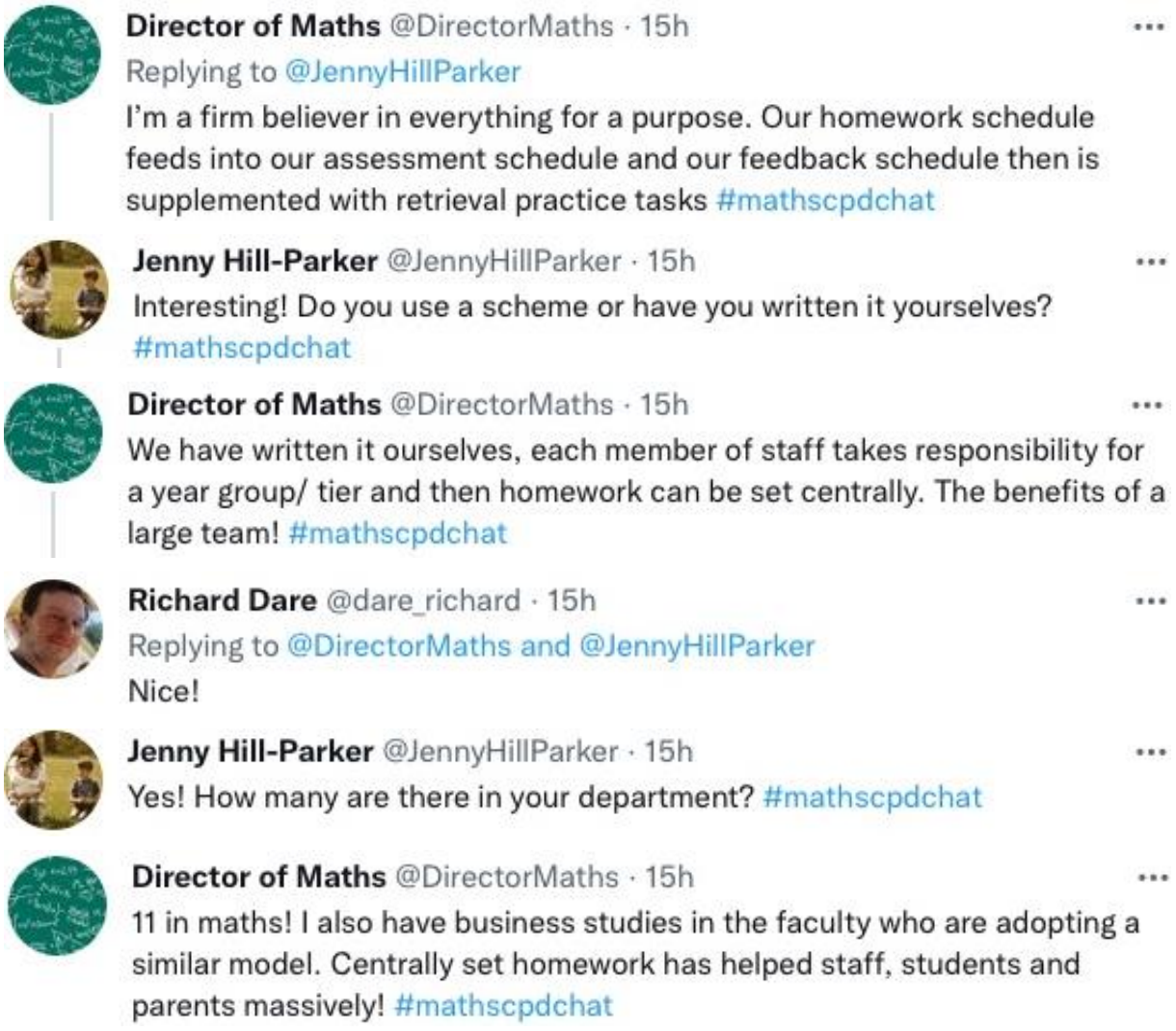
Autumn 1

- 4 operations of decimals and fractions
- Calculator work
- Prime Factors
- Percentages
- Algebra (Simplification)
- Algebra (Equations)

Autumn 2

- Algebra (substitution and formulae)
- Algebra (problem solving)
- Graphs
- Probability

… and in this thread, initiated by Gemma Scott, and including Jenny Hill-Parker and Richard Dare, setting homework centrally from a homework schedule (that is linked with a centrally-planned-by-the-department scheme of work) was discussed …



… and Simon Ball shared with Jenny Hill-Parker thoughts about using homework as an opportunity for students to practise tackling problems outside the classroom:

Simon Ball @ballyzero · 15h
Replying to @JennyHillParker
It's practice, for me. And - hear me out! - practice that's not in a classroom, so students get to do maths in different settings. After all, they almost certainly won't do their exams in a classroom. #mathscpdchat

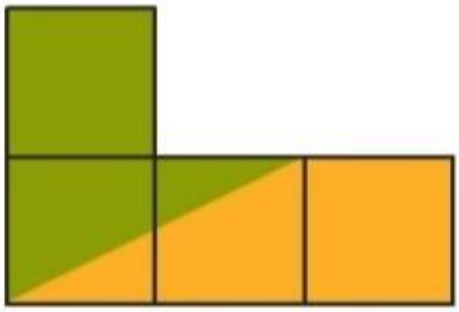
Jenny Hill-Parker @JennyHillParker · 15h
Interesting! As in, the context is key to the success of the task? #mathscpdchat

Simon Ball @ballyzero · 14h
To a great extent, I believe so. Your point about compounding/making uncorrectable errors is important, of course, and a massive problem. #mathscpdchat

This aspect of homework-purpose, mentioned by Mary Pardoe, was appreciated by Richard Dare …

Mary Pardoe @PardoeMary · 15h
Replying to @JennyHillParker
If the homework is a creative follow-on from what students have been doing in the lesson they can bring it to the next lesson to compare with others and discuss. EG they might have been doing this … then have done sketches at home and brought to lesson … #mathscpdchat

Convince me that the area of this tetromino is halved by the cut:



Picture in your mind other ways of dividing the area in half with one cut.

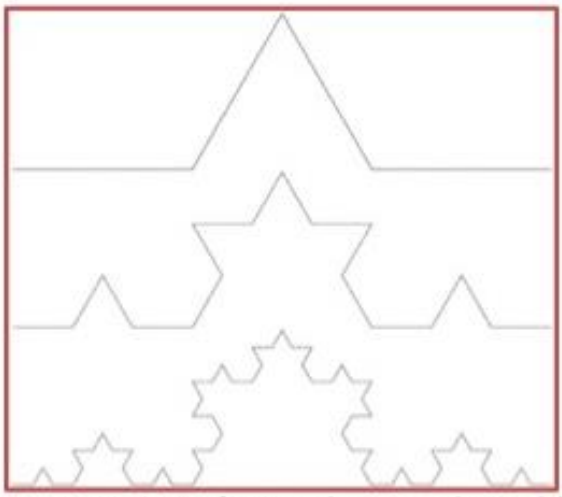
Richard Dare @dare_richard · 15h
Great!

… and Alice Ward-Gow discussed, with Mary Pardoe and Jenny Hill-Parker, how homework can help students develop independence in their learning:

Miss Ward-Gow @mcwardgow · 15h
Replying to @JennyHillParker
Homework is for developing independence #mathscpdchat

Mary Pardoe @PardoeMary · 15h

Yes … and perhaps 'taking responsibility for formulating at least some of the questions' …as Mandelbrot believed … (another homework possibility?) #mathscpdchat



Students can imagine this process continuing forever – they can understand that the number of possible stages of the iterative process is infinite.

Students who understand these simple ideas will probably enjoy creating their own fractal structures.

Benoît Mandelbrot also felt that the fascinating visual appeal of fractal structures motivated students – He believed that students eagerly explore fractal geometry because it keeps alive, or re-awakens, natural, youthful curiosity. He knew that to teach mathematics so that students are curious and eager to contribute demands faith in students' capabilities. While acknowledging that students cannot learn all mathematics by 'reconstructing it from the ground up', Mandelbrot and Frame observed:

"Generally, giving a student an open-ended project and the responsibility for formulating at least some of the questions, and being interested in what the student has to say about these questions, is a wonderful way to extract hard work."

Jenny Hill-Parker @JennyHillParker · 15h

Replying to @mcwardgow

Do we aid the embedding of independence just by setting homework? Or is there more nuance to ou? #mathscpdchat

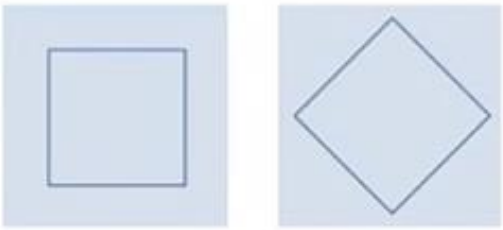
Mary Pardoe @PardoeMary · 15h

Surely not … but homework can provide opps for students to demonstrate independence/confidence-in-own-thinking? An opportunity to discuss-with and learn-from each other when bringing findings to next lesson? EG homework in which students explore this further? … #mathscpdchat

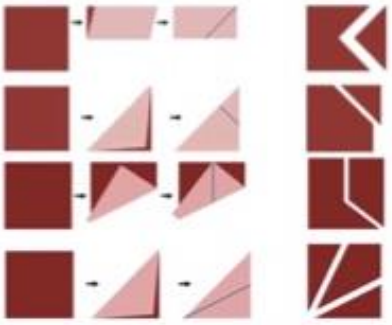
Did you know that it is possible to cut out *any* straight-line drawing on a sheet of paper with a *single straight cut*? You just need to **fold** the paper appropriately several times before you make the cut.

Of course, given a particular straight-line drawing on a particular piece of paper, the problem is to work out how and where to make the folds so that you can cut out the depicted shape with one straight cut. Students will find some such problems much easier to solve than others.

For example, most students will quickly see how they can fold square pieces of paper twice and then cut out, with one straight cut, squares drawn centrally and symmetrically on the pieces of paper.



Some other cuts, and the shapes created:



Miss Ward-Gow @mcwardgow · 20h

Replying to @JennyHillParker

No, we encourage independence whenever possible 👍 independence can develop resilience? #mathscpdchat

Jenny Hill-Parker @JennyHillParker · 19h

Yes! And the meta cognition skills needed to be self reliant. I think homework is brilliant for this. But what if the students just don't do it? #mathscpdchat

Miss Ward-Gow @mcwardgow · 19h

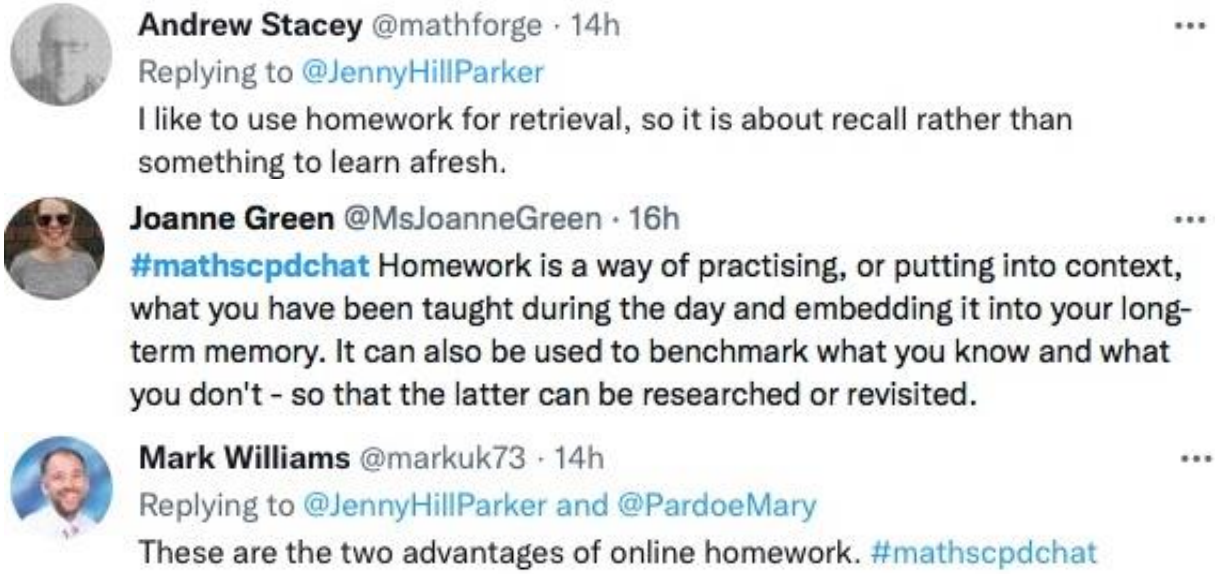
Speak to their tutor or phone home. If the parent/carers are supportive then great, if not look at what else we can do such as homework club 👩‍🦰 any ideas? #mathscpdchat

Jenny Hill-Parker @JennyHillParker · 19h

I think a warm/strict consistent approach can work brilliantly. Most students will respond, I have a colleague who says 'I can't wait to see how you answer q7!!!' The students laugh and love it #mathscpdchat

In the next conversation W E Cookson, Jenny Hill-Parker and Mr Hawes discuss a view about the number of 'maths questions' (of the same kind presumably) that a person needs to attempt in order to 'embed' the relevant 'solving procedure' required to 'get the right answer':

All other responses to the host's first question were 'single' replies from Andrew Stacey, Joanne Green, Mark Williams, Richard Dare and James Maloney:



Richard Dare @dare_richard · 15h

Replying to @JennyHillParker

We had great CPD from @Tom_Needham_ this year. We'll follow HWs with mini quizzes to motivate and check for understanding. #MathsCPDchat

James Maloney @JamesWMaloney · 14h

Replying to @JennyHillParker

Justified if things are corrected soon after. Hopefully HW is seen as part of the learning process and SoW #mathscpdchat

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

Jenny's second question …

Jenny Hill-Parker @JennyHillParker · 16h

Next up;

Should we use homework to test recall of declarative knowledge? Or procedural knowledge too?

#mathscpdchat

… prompted a comment that then generated some description of the practice in one maths department:

Director of Maths @DirectorMaths · 18h

Replying to @JennyHillParker

Personally I'd say both, particularly as the year goes on. I guess the question is what we mean by test and why we are testing. What happens with the outcomes? #mathscpdchat

Jenny Hill-Parker @JennyHillParker · 19h

Replying to @DirectorMaths

What are we testing? and what do you do at your school with the outcomes? #mathscpdchat

Director of Maths @DirectorMaths · 19h

Well in their main homework task every three weeks I'm testing how they are doing against the intended curriculum before their cumulative half term assessment. The outcomes are used to give feedback and feed forward tasks before the assessment with the hope that… #mathscpdchat

Director of Maths @DirectorMaths · 19h

We can remedy it before the assessment. On a cohort level we build weaker Skills into starters etc and then make any dynamic curriculum adaptations like an extra hour on something #mathscpdchat

Director of Maths @DirectorMaths · 18h

I guess my answer is it should encourage and support both declarative and procedural knowledge #mathscpdchat

Also, there was this conversation …

Joanne Green @MsJoanneGreen · 19h

@JennyHillParker **#mathscpdchat** I've never heard of those terms before. What are declarative and procedural knowledge?

Richard Dare @dare_richard · 19h

Replying to @MsJoanneGreen and @JennyHillParker

Declarative memories are things which can be stated. Procedural *may* be tacit. Literally procedures.
#MathsCPDchat

Jenny Hill-Parker @JennyHillParker · 19h

Exactly this. Declarative knowledge is known facts. Like learning the names of them polygons. Procedural knowledge is using a mathematical method correctly. #mathscpdchat

Joanne Green @MsJoanneGreen · 20h

@JennyHillParker **#mathscpdchat** I'd say both. The questions need to contain procedural as it's the core knowledge and terms the pupils need to know. Yes, let them create something from their declarative knowledge. That way, they do learn from homework.

… this single reply …

Richard Dare @dare_richard · 18h

Replying to @JennyHillParker

Ooh! We use it mainly for procedural, but I've been trying to think about setting it for declarative too. I want to see if Carousel will work for this.
#MathsCPDchat

… and these examples:

Mary Pardoe @PardoeMary · 16h

Replying to @JennyHillParker

It can be about both AND also be a bit different AND creative AND give scope for sharing/comparing and learning from each other in next lesson? EG maybe this is what you set for homework … #mathscpdchat

Explain that in a set of nested polygons each 'new' polygon is mathematically similar to the previous polygon, and its vertices are at the mid-points of the sides of the previous polygon. Then challenge students to create, possibly using dynamic geometry software, sets of nested regular polygons such as these:

Each 'step' is the creation of a 'new' polygon that nests in the previous polygon. The output of each step is the input for the next step. So this is another simple example of an iterative process.

Creating accurately each set of nested polygons is a good mathematical challenge in itself. Some students could also explore relationships between the lengths of corresponding sides, and between the areas of corresponding regions in each set of nested polygons. They might try to answer their own questions, such as:

what fraction of each diagram is black?

Jenny Hill-Parker @JennyHillParker · 19h

Replying to @PardoeMary

Ooh I like this! #mathscpdchat

RHMaths @MathsRh · 16h

nrich.maths.org/6700 very similar ideas, an old favourite and makes nice display work too! #mathscpdchat

nrich.maths.org

Diminishing Returns

How much of the square is coloured blue? How will the pattern continue?

RHMaths @MathsRh · 17h

Replying to @PardoeMary and @JennyHillParker

What's your resource bank for such problems @PardoeMary #mathscpdchat

Mary Pardoe @PardoeMary · 16h

All the examples that I tweeted during tonight's #mathscpdchat are from articles that I wrote in the (now archived) NCETM Secondary Magazine. I will find a link tomorrow.

Mary Pardoe @PardoeMary · 6h

ncetm.org.uk/news-features/...

Examples I shared were from issues: 59, 68, 72, 73, 74, 77 and 79 #mathscpdchat

Jenny's third question (which was followed by a comment from her) …

Jenny Hill-Parker @JennyHillParker · 19h

Next up;

Is there a forum where a level students can discuss and get help, this could aid in the disparity of students who can access family help vs those who don't **#mathscpdchat**

Jenny Hill-Parker @JennyHillParker · 19h

Replying to @JennyHillParker

This question was submitted by a newish (v lovely) member of our dept. She remembered some students in her A level class getting help from parents/siblings while she did not, and would have valued a forum where she could have asked questions

… prompted this conversation …

James Maloney @JamesWMaloney · 19h

Replying to @JennyHillParker

I think Teams has helped with this. I'm at a college and it's helped students asked a question before they forget it. Of course, the assistance isn't immediate but many students now don't feel as 'abandoned' to HW.

Jenny Hill-Parker @JennyHillParker · 19h

Replying to @JamesWMaloney

Oh yes of course. So a helpful legacy of the lockdown years was a ready made forum. #mathscpdchat

James Maloney @JamesWMaloney · 19h

Students also make their own WhatsApp groups to discuss amongst themselves. #mathscpdchat

Jenny Hill-Parker @JennyHillParker · 19h

Nice idea #mathscpdchat

… and this …

CantabKitty @CantabKitty · 20h

Student room? Stack exchange? Reddit?

Jenny Hill-Parker @JennyHillParker · 20h

Replying to @CantabKitty

Hi Kitty!

Are they chat forums? #mathscpdchat

CantabKitty @CantabKitty · 20h

Replying to @JennyHillParker

As far as I can tell they are bulletin board style. For chat rooms the young people nowadays are on discord. The issue with all of this is that if it's promoted via school then you open yourself up to all langer of safeguarding issues. If students find the places themselves 🤦‍♀️

Jenny Hill-Parker @JennyHillParker · 20h

Good point. #mathscpdchat

CantabKitty @CantabKitty · 20h

I think (?) studentroom has separate accounts for teachers so the users know if the person replying is a teacher or not. I would steer students to bulletin boards and not live chat because then it is all in public and there is a record. Hard to moderate live chat #mathscpdchat

… and a single reply:

Andrew Stacey @mathforge · 16h

Replying to @JennyHillParker

I'd feel a bit unsure about a forum that was cross-schools, so I'd want something that was just for students in just one school.

One issue is always the ability to type maths ... years ago, I set up a forum for uni students with full maths capability. It wasn't greatly used.

The fourth question from Jenny …

Jenny Hill-Parker @JennyHillParker · 20h

Next question;

Does some homework make the 'Matthew effect' disadvantage gap worse? Is this fair?

#mathscpdchat

… generated this conversation …

Peter Williams @MathsImpact · 19h

Replying to @JennyHillParker

If homework means disadvantages students learn more, then it's a good thing, whether or not it has differing impacts on other students.

If closing the gap means actively avoiding things that promote learning I want no part of it.

#mathscpdchat

Jenny Hill-Parker @JennyHillParker · 19h

Replying to @MathsImpact

No, for sure. As in, you don't close the disadvantage gap by holding others back #mathscpdchat

Peter Williams @MathsImpact · 19h

What you can and should do is ensure that homework is accessible to all students if you're setting it.

Have a non tech option available.

Ensure no extra equipment is needed unless you can also provide it for those who need you to.

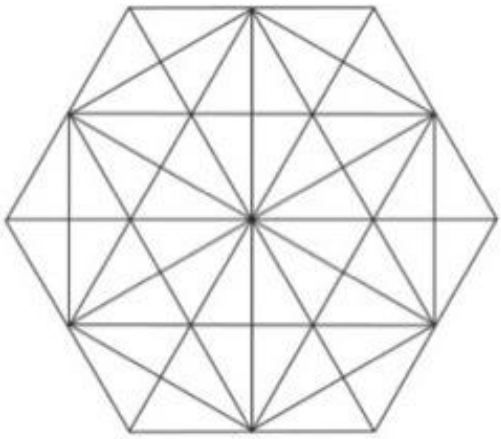
Avoid required parental input.

#mathscpdchat

Mary Pardoe @PardoeMary · 19h

Yes! Possibly all/if-not-most KS3 students could do SOMETHING in response to a (bring-back-and-compare-and-discuss) homework like this? #mathscpdchat

A mathematical game invented during the 1970s by a mathematics teacher, W. Ransome, and described in *Mathematics Teaching, Number 75*, is played on a hexagonal board showing part of a tessellation of 30°, 60°, 90° triangles.



What kinds of special quadrilateral can be found on the board? What kinds can't be found? Why not?

In what ways are different right-angled triangles on the board related to each other?

For example:

The following discussion was also in response to Jenny's fourth question …

Miss Ward-Gow @mcwardgow · 20h
Replying to @JennyHillParker
Potentially - so it's important to identify the barriers and do what we can to remove them #mathscpchat

Jenny Hill-Parker @JennyHillParker · 20h
That's the detail isn't it? What *can we do about it? #mathscpdchat

Richard Dare @dare_richard · 20h
@Tom_Needham_ 's PD was all about behavioural 'nudges'. Making completing HW.
Easy
Attractive
Social &
Timely.
#mathCPDchat

Tom Needham @Tom_Needham_ · 19h
.....using the work of @HFletcherWood from this blog:

improvingteaching.co.uk
Getting homework done: timely nudges from behavioural psychology
Lucia's students respond well in lessons but rarely complete homework or revision. She wants them to act on their good intentions... We can ...

Jenny Hill-Parker @JennyHillParker · 19h
Thanks Tom, I'll have a look! #mathscpdchat

… as was this …

RHMaths @MathsRh · 19h
Replying to @JennyHillParker
Reading up on this! #mathscpdchat

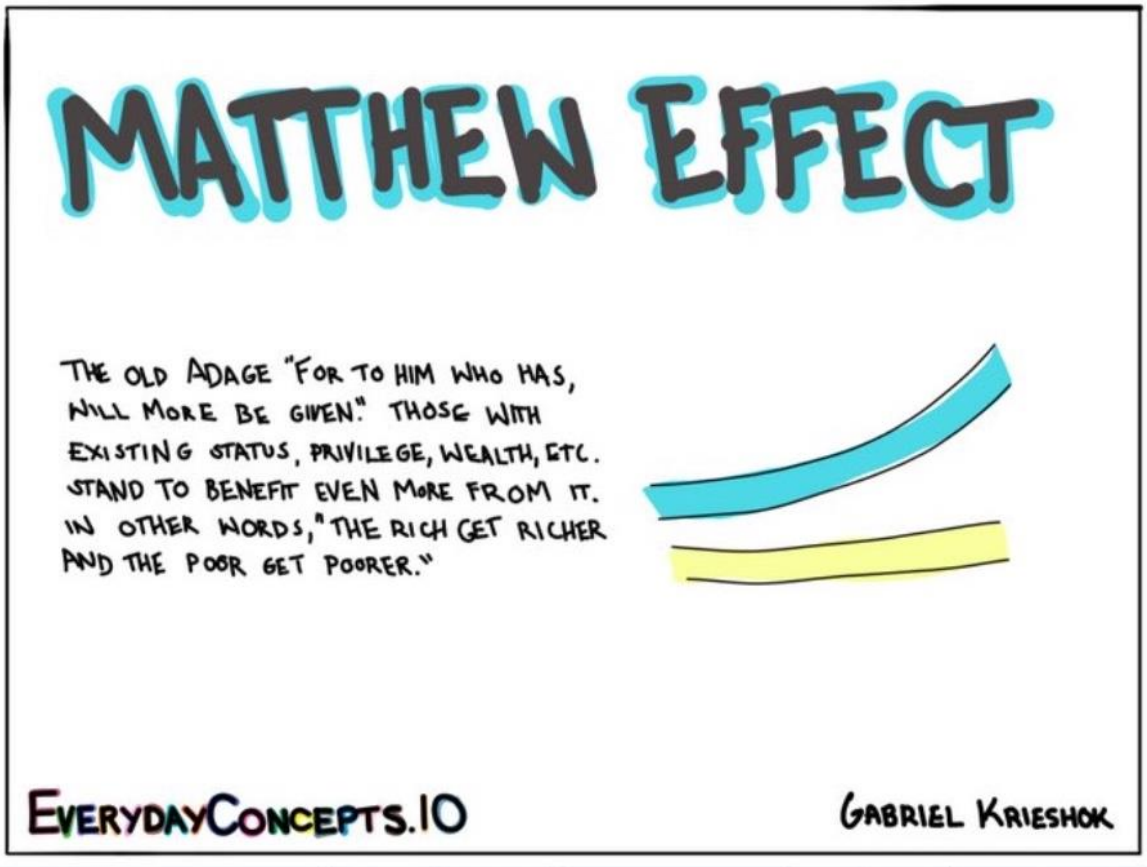
Jenny Hill-Parker @JennyHillParker · 19h
I'd love to hear your thoughts! #mathscpdchat

RHMaths @MathsRh · 19h
#mathscpdchat I see the potential issue but believe in making resources that will improve learning available to everyone. A key in closing the gap is taking the extra effort to check on the efficacy of the task for the disadvantaged. Their number is small in my school though.

… and this:

Joanne Green @MsJoanneGreen · 20h
@JennyHillParker **#mathscpdchat** What's the Matthew effect? Who's Matthew?

Jenny Hill-Parker @JennyHillParker · 20h
Replying to @MsJoanneGreen
It's the mathematical version of this:
#mathscpdchat



Joanne Green @MsJoanneGreen · 21h

#mathscpdchat @JennyHillParker I think the Matthew Effect is a lot of baloney, so: No. Believe in your work and destiny, and you will be rich. What is rich? It's intelligence, creativity, happiness, striving for greater things, being kinder, etc., finance follows.

The other responses to the fourth question were this …

IanNoakes @maths_noakes · 20h

Replying to @JennyHillParker

Pondered over this reply. I've come to the conclusion, no. But if it does, that's not a reason not to set homework.

IanNoakes @maths_noakes · 20h

'Mattthew effect' in this context. Students who don't like homework, don't do homework, increasing the gap. This can be challenged through good culture, high expectations etc., and can be made easier by making more appropriate and accessible tasks

#mathscpdchat

… and this …

W E Cookson @WECmathventures · 21h

Attitude to work , home or in class, may be more significant rather than pupil's home background in creating the advantages MEffect seeks to promote
#mathscpdchat

… and this …

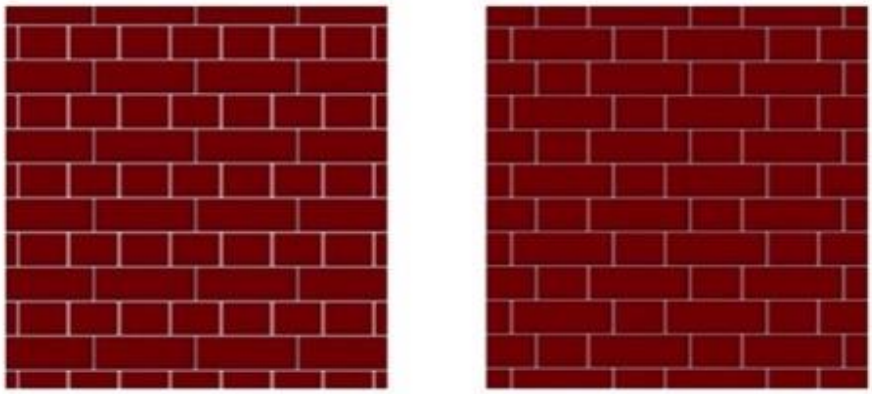
Mary Pardoe @PardoeMary · 20h

Replying to @JennyHillParker

This always needs to be in our thinking. Sometimes can think of a task with which most will not be disadvantaged? EG go for a short walk, and sketch …? #mathscpdchat

Brick bonds
Brickwork patterns formed by *stretchers* and *headers* are called *bonds*.

The commonest bonds are the:



English Bond
by Pbroks13

and

Flemish Bond
by Pbroks13

Students may find in their environment many variations of both the English and the Flemish bonds, and also other bonds. They could be challenged to invent their own bonds, and then try to find actual instances of them.

The following thread was not apparently in response to any particular one of the host's questions, but was generated by a tweet from Joanne Green:

Joanne Green @MsJoanneGreen · 20h

#mathscpdchat @JennyHillParker Some schools give projects to complete per half term. That enables the pupils to combine everything that they are learning - all lessons. They bring their projects in to school, and spend the day looking at each others...

MrHawesMaths @HawesMaths · 20h

Replying to @MsJoanneGreen and @JennyHillParker

I remember doing this as a project once, many moons ago.Used an old trivial pursuit board. Each colour was a strand of maths (number, geometry, algebra, graphs, ratio.etc) used homeworks as a way of creating questions (10qs at a time for each student) then played it #mathscpdchat

Jenny Hill-Parker @JennyHillParker · 20h

Did the students like it? Would you set project based homework like this again? Why/why not? #mathscpdchat

MrHawesMaths @HawesMaths · 20h

It was really fun because students actively created the game. Once a decent bank had been built up. We played it more often, was great as retrieval practice and as 'revision lessons' #mathscpdchat.

Joanne Green @MsJoanneGreen · 21h

@JennyHillParker **#mathscpdchat** The pupils absolutely loved it! It's best done by year group as it's the knowledge they all have. It provides peer support and peer learning too; new friendships are formed too. It also shows which pupils have parental support.

Jenny Hill-Parker @JennyHillParker · 21h

Replying to @MsJoanneGreen

Sounds great when you put it like that! #mathscpdchat

These comments were also not in response to any particular question from the host:

Joanne Green @MsJoanneGreen · 21h

#mathscpdchat @JennyHillParker A lot of schools set software-based questions for homework, such as White Rose Maths. That enables you to track the pupil's progress, as it gets marked online. You can also identify who it's taking longer to complete.

Joanne Green @MsJoanneGreen · 21h

#mathscpdchat @JennyHillParker The software packages work best when they are the same ones that the teacher delivers during the day. That means the pupils have access to all of their work. They can even access it prior to lesson if they want to.

The host's last question …

Jenny Hill-Parker @JennyHillParker · 21h

Last but probably best and most useful;
What are your go to resources for setting homework?
We need resources for
- mixed attainment classes
- times tables practice
- key stage three practice
- exam prep homework

Let's go! **#mathscpdchat**

… prompted the following conversation …

Hannah Smith @HannahLSmithE · 21h

Replying to @JennyHillParker

@DrFrostMaths @up_learn

Jenny Hill-Parker @JennyHillParker · 21h

I know and love the @DrFrostMaths resources but @up_learn is new to me, I'll take a look. Thanks! #mathscpdchat

Hannah Smith @HannahLSmithE · 21h

Up learn for post 16 I've yet to find a platform I like drfrost is good but not quiet complete enough for year 2

Jenny Hill-Parker @JennyHillParker · 21h

I love the skills sheets on @mathsbox1 for weekly homework. And the @ArcMathsApp is great too #mathscpdchat

MrHawesMaths @HawesMaths · 20h

I use them as a weekly review for the first part of a lesson. We then spend the other half working on topics that they found difficult using dr frost.

Jenny Hill-Parker @JennyHillParker · 20h

That sounds like a great system! #mathscpdchat

MrHawesMaths @HawesMaths · 20h

It has been working well. If they get scores around 17-20. I would then encourage them to do a little reflective work and practise questions on topics they have found tough during the past year.

Jenny Hill-Parker @JennyHillParker · 20h

This is a great way of building the desirable difficulty isn't it? #mathscpdchat

MrHawesMaths @HawesMaths · 20h

Indeed

… and this reply …

James Maloney @JamesWMaloney · 21h

Replying to @JennyHillParker

@Integral_Maths which is also there as support even when HW not set specifically.

Jenny Hill-Parker @JennyHillParker · 19h

In what ways do they lend support? Sounds great! #mathscpdchat

… and this …

Helen Stapleton @HStapleton2010 · 21h

Replying to @JennyHillParker and @PardoeMary

Dr Frost will cover all of these @DrFrostMaths drfrostmaths.com

Brooke Hunter @BrookeEHunter · 20h

👏👏

… and this …

Joelle @MinsterMaths · 20h

Replying to @JennyHillParker

We write our own departmentally

… and this:

Sir Raymond ❤️‍🩹 @RMcstravick · 21h

Replying to @JennyHillParker

MissB resources Piximaths Helen Hindle Corbettmaths Dave Taylor to name a few.

Sir Raymond ❤️‍🩹 @RMcstravick · 21h

Mymaths and Mathspad too.

There were also these comments:

Mary Pardoe @PardoeMary · 21h

Replying to @JennyHillParker

Resources can also include interesting ideas that you come-across? EG KS3/4 thinking for ma classes …?

#mathscpdchat

Reification

Reification, in the context of visual images, is the phenomenon in which the mind 'brings into being' something that is not actually present in an image. For example:

- in the Kanizsa Triangle illusion how many triangles do you see?

Kanizsa triangle illusion image by JrPol

- this is an illusory cube:

Illusory cube image by Bernard Ladenthin

Could your students create their own illusory contour figures?

Miss Home @misshomemaths · 20h

Interesting cross-curricular link between art and maths 📐 🖼️ would be a good one for end of term!