Case Study: TfW in secondary maths classrooms – Vardean School, Brighton

My journey into Talk for Writing and how it applies to maths

At the end of 2010, Brighton and Hove set up a Talk for Writing pilot to be attended by a range of teachers and advisers across the curriculum. A few months after the first session, I was stunned and delighted to receive the following from Zeb Friedman, Maths Adviser, Brighton and Hove, and AST maths teacher Varndean School, from the Brighton Talk for Writing pilot.

I was persuaded into going to the session on Talk for Writing in Brighton and Hove, and really although I am always interested in what is happening in other subjects, I was not convinced that there would be anything in it for me or for mathematics beyond 'lets write an essay about the history of maths'. I was starting to feel like my students did when I insisted that they write the working out in their work 'just because'! However, there was something about the Talk for Writing project that struck a chord with me. This was comparing maths to written communication in a direct and explicit way. I had a chat with our science AST and she helped me to see some really important links. Over the last couple of months my thinking has gone something like this:

Maths in secondary schools is facing a huge challenge. How do we as teachers help our students to think about maths more functionally? How can we help them to be better problem solvers when we are being asked to take away scaffolding in the way we assess their work? How can we get them to be more independent in their thinking about maths?

When I thought about this in relation to writing what I realised was that in maths we had been so assessment driven that we were getting students to do questions like 'here is a sentence, what is the missing word?'.

Suddenly we had moved to 'Write a mathematical essay where you will be judged - on the quality of your written communication'. This was a daunting leap.

Not only were students struggling with this but so were we. Assessment-led teaching had created a generation of de-skilled practitioners in maths. I'm not suggesting that all maths teachers are rubbish, just that for many of us our attention was elsewhere. I had spent several months either with my head in the sand or in a state of paralysis when ever these issues of functionality came up. When I did feel brave enough to look up it felt like an epiphany in the hall listening to Julia Strong explaining about Talk for Writing. This was the answer and as I began to work with aspects of this approach I started to feel as of this was the magic wand I had been looking for to move my students and me onwards to the land of written mathematical communication.

The strategy that makes so much sense to me is 'boxing up'. I started talking to my students about maths being a story, an essay. In English lessons they were taught to structure and plan essays, it was not enough to just string words together in a muddle. We talked about mathematical stories and what paragraphs looked like in maths. We started with Pythagoras' Theorem and Trigonometry, because it is a fairly concrete bit of mathematics which has an obvious structure. I modelled for them how I would do this then I asked them to do the same. I was insistent about the structure and they really had to follow my steps. So far this is pretty predictable and I was not entirely comfortable as it did not allow them their own approach or any creative methods they might come up with. I am not a 'chalk and talk' or 'follow my method without understanding' type of teacher. However, I persevered.

Students began to produce work like the example below after one lesson of boxing up. Some still needed a bit of convincing. I got them to find the mistake in two pieces of work, one where the work was boxed up and one which was muddled 'old style'. I also made use of the visualiser and got the class to be critical of each other's work. They were all pretty convinced after two lessons.

We looked at our next topic in relation to boxing up and we boxed that up too. Gradually we moved towards a common understanding of the structure behind all mathematics questions and problems:

- What information do I have? What is the question being asked?
- What mathematics do I need to use to do this?
- What calculations/working out do I need?
- Answer – and does it make sense. Have I answered the question?

This structure is not new to me or to the students but there has been a shift in their work because I now have a way of being very explicit about this structure and its underlying influence on most (all?) maths problems.

Then something which had been bothering me was solved. Students could follow the structure of a mathematical story or essay and understand how to put together the paragraphs but within that structure they had freedom and creativity about the mathematics they used to solve the problem. They were not churning out cloned pieces of work after a while and they were starting to develop individual style and approaches to their work that I was afraid might be lost in the process.

Looking through pupils books I am for the first time struggling to find examples of sloppy working out.

As Zeb has so graphically explained, the reason why the boxing-up approach is so useful in maths is because the more you can explain a process, the more you understand it, and the more you understand, the more you will retain the information and be able to build on your understanding. This fortunately fits perfectly with the maths Quality Written Communication requirements.

Before: Previously a typical simple maths addition question would have looked like this

289+257 = (1 mark)

After: But now it has been turned into a problem like this:

- You have an electricity bill where the readings are 289 and 567 units.
- 1 unit of electricity costs 16 pence.
- How much will you be charged for this bill?

[4 marks]

The story behind boxing up

Sometimes, in our attempts to help, we make things too complex, and perhaps APP is a good example of this. It is often the most simple of things that are the most effective. There are six key non-fiction text types. In some ways each has a different structure and it is possible to construct skeletons reflecting the different shape of all the text types and their varied hybrids. But looked at from another angle, all writing, whatever it is, has the same simple structure:

- A beginning
- A middle
- An end

It was this realisation that made Pie Corbett move away from the text skeletons that had developed from the literacy hour to suggesting that you could box up any text using a very basic grid, it's just that there would be different ingredients for the toolkits for different types of writing.

If you boxed up any typical explanation text for say science, history or English, it would basically look like this:

Boxed-up grid for explanation text

Beginning:

- Introduce what is being explained
- Include a hook to interest your reader.

Middle:

- Put key points in logical order, possibly in several paragraphs
- Link points clearly so reader can see how one thing leads to another
- Include detail where necessary to make explanation clear.

End:

- Conclude your explanation rounding it off logically in a memorable way.

The idea of boxing up is that you use it to understand the structure of any type of text and use the same ingredients to help you structure a similar text. If you apply this approach to any maths problem, when you analyse the questions, the basic structure of what you have to do is always the same.

Boxing up maths problems

Beginning: Plan it

- What is the question asking me?
- What information do I already have?

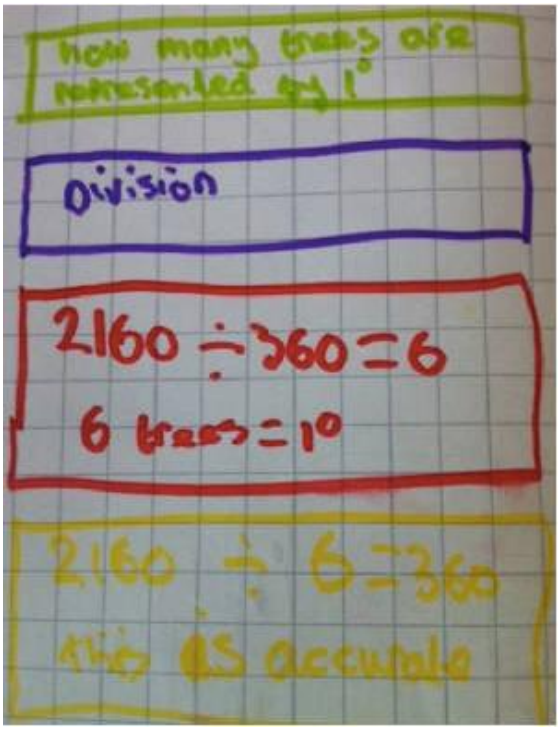
Middle: Do it

- What maths will I be using?
- What calculations/ working out do I need to do?

End: Check it

- How can I check that my answer is correct?

In effect this is the basic maths explanation toolkit.



So let's use see how it works in practice. Below is a typical maths problem:

The Gas bill problem

Mr Black is looking for the cheapest provider of gas in order to cut his bills. He has received the following quotes from two companies.

Gascom:

Standing charge per month: £1.00
Cost per kWh: £2.99

Ugas:

Standing charge per month: £3.78
Cost per kWh: £2.38

Mr Black estimates that he will use 4000 kWh in the next 3 months. From which company would his gas bill be cheaper and by how much?

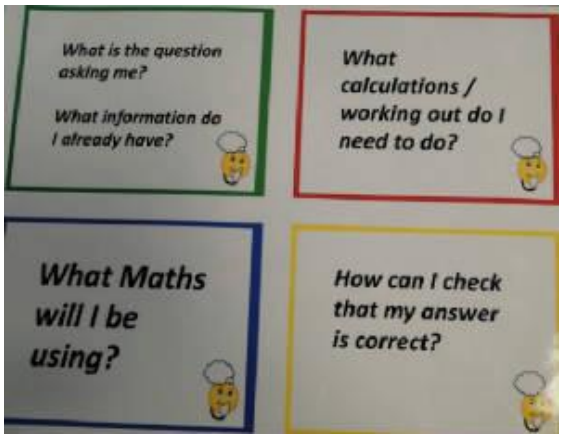
Below is what the boxed up answer might look like:

Plan it: • What is the question asking me? • What information do I already have? Do it: • What maths will I be using? • What calculations/ working out do I need to do? Check it	Which company is cheaper for 3 months' gas and by how much? Estimated use; Monthly standing charges; cost per kWh X + – Gascom: 3 months costs £1x 3 3.00Gas costs £2.99 x 4000 11,960.0011,963.00 Ugas: 3 months costs £3.78 x 3 11.34Gas costs £2.38 x 4000 9520.009531.34 Difference 11,963 - 9,531.342431.66. Ugas is cheaper by £2,443.00. Check answered question. Check used correct prices. Check calculations

Initially, it's best to get the students to tackle these in pairs so they have to explain what they are doing. If they regularly have to do this in this manner, they will move from imitation of the structure to innovation to independent application. They will then automatically be able to apply this method to any maths problem on their own using the template in the head that provides a structure for their thinking but allows them to choose the method that best suits them in solving the problem.

A visualiser, or any equipment that enables you to immediately put up on screen examples of good work, is useful here as you can select the clearest examples of good answers from the students and put them up on screen to discuss what makes them good. The students can then have a look at their work and revise it in the light of this discussion. This will help them recognise the steps they need to take to improve their learning.

In Portslade Aldridge Community Academy in Brighton and Hove every maths table has the key boxed-up questions permanently on the tables and these questions form the frame for all discussion in maths. When students are introduced to the approach, coloured pens are available on the tables so they use a different colour for each stage (using the same colour scheme as the handout) to underline the importance of the stages.



When the students tackle the problems, they do so in pairs, moving swiftly from one problem to another and building confidence in their ability to analyse the question, work out what maths is required, do the maths and check their answers.

To spread the approach across the school, maths teachers Helen Hindle and Emma McCrea trained one Year 11 class in the approach and then that class trained the other Year 11s and all the other maths teachers. Then the teachers used the approach with all

the other years in the school. The children started to produce work looking like the illustration. Where the approach is now becoming embedded, students no longer need to work in pairs or refer to the boxed-up stages as they have internalised the approach and apply it automatically.

Try it, it works!

To find out more about Talk for Writing in secondary schools or to book training, email julia.strong@talk4writing.com.