



Welcome to Issue 54 of the Secondary Magazine. Hope you had a good half term. I'm sure you have started the 'count down' for the GCSEs – but have your pupils? As the year starts to hot up for Year 11, I hope this Issue gives you some things to chill out with!

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### **From the editor – Impact and Influence Conferences**

If you were you lucky enough to attend the recent South West NCETM Impact and Influence Conference, you may have considered the connections between rich tasks and rich continuing professional development. This article may help you to make links between mathematical activity and CPD.

### **Up2d8 Maths – South Africa 2010**

The fortnightly Up2d8 Maths resources explore a range of mathematical themes in a topical context. The draw has been made for the 2010 FIFA World Cup South Africa. The first match starts on 11 June 2010. South Africa, as the host nation, is making the preparations to host a major sporting event. Just what are England's chances of winning this year? Does their place in the draw affect their chance of winning – or is it playing better football than any other team that will ensure their success?

### **Focus on...rich tasks**

What is a rich task? Are rich tasks written into your scheme of work? This article may give you some ideas to share with your department.

### **An idea for the classroom – Fibonacci equations**

You may well have seen the idea of using a Fibonacci sequence to generate and solve equations – this time round it is also suggested as a way of forming and solving simultaneous equations. Why not try this in your classroom?

### **5 things to do**

Statistics, sport and summer holidays dominate our list of topical events in this issue. What will you be doing?

### **Diary of a subject leader – Real issues in the life of a fictional Subject Leader**

What are your expectations of your pupils? Do they live down to them? Feedback from a couple of monitoring visits encourages our subject leader to look beyond his current expectations of his pupils and reach for the sky.



## From the editor – Impact and Influence Conferences

Having just returned from the South West Influence and Impact Conference in Exeter, I am thinking about the fabulous sessions I attended and trying to make some sense of them in relation to what I do professionally. For me, the thing that keeps coming back to haunt me is the excellent session given by Dr Jennifer Piggott, Director of [NRICH](#). This session is having an ‘influence and impact’ on me. Jenny’s theme for the session was to make links between rich tasks and rich CPD.

But first – some maths! Jenny directed our attention towards the NRICH problem [Magic Potting Shed](#). Working around tables, some participants immediately started to try out some numbers to see how Mr McGregor could make sure there were enough plants in his magic potting shed to plant out three gardens – you’ll have to go and look at the problem yourself. Other colleagues constructed algebraic expressions from which they were then able to form an equation to gain further insight into the solution. It didn’t take us long to discover a solution (in fact, there is a family of solutions to this problem), but we were no nearer to finding out why that solution worked. What was it about the structure of the problem that determined the solution?

Having become engrossed in a rich mathematical task (although it was hard to stop ‘doing the maths’) we were then in a position to consider its features.

Quoting from Jenny’s PowerPoint slides, a rich task was defined as one that:

- challenges learners to think for themselves and make decisions
- allows for learners to pose their own questions
- allows for different methods and different responses (different starting points, different middles and different ends)
- encourages originality, invention and imaginative application of knowledge
- involves learners in testing, proving, explaining, reflecting and interpreting
- offers opportunities to identify elegant or efficient solutions
- encourages collaboration, communication and discussion
- develops critical thinkers
- develops confidence
- creates learners who can apply their knowledge beyond the original context.

Within these definitions, Magic Potting Shed definitely pushed these buttons for me. But what about rich CPD?

There was some initial discussion about the word ‘learner’ – should we replace that with the word ‘teacher’ or are all teachers learners? Are we all learners in our ongoing journey of developing our own classroom practice?

So if I am learning to develop my classroom practice, I want to be involved in deciding what to develop, I want to be able to do this in a range of different ways and I need other people to work with to refine my ideas. I hope that this will make me a critical thinking, confident practitioner who can take forward my new knowledge and apply it in different situations. There is some more thinking for me to do about this yet – but it is a good place to start. Thank you Jenny for such an engaging experience.

Do you think there are some links between rich tasks and rich CPD? Why not tell us about them here?



## Up2d8 Maths

The fortnightly Up2d8 Maths resources explore a range of mathematical themes in a topical context. The resource is not intended to be a set of instructions but rather a framework which you can personalise to fit your classroom and your learners.

The draw has been made for the 2010 FIFA World Cup South Africa. The first match starts on 11 June 2010. South Africa, as the host nation, is making the preparations to host a major sporting event. Just what are England's chances of winning this year? Does their place in the draw affect their chance of winning – or is it playing better football than any other team that will ensure their success? Football fans the length and breadth of the land will be starting to give us their opinion on England's chances – but what do we think from a mathematical point of view?

This activity uses the 2010 World Cup as a context for discussing probabilities. The PowerPoint slides include the misconception held by many students that the chance of winning a football match is  $\frac{1}{3}$  because there are three possible outcomes, and goes on to encourage pupils to consider other statements related to probability.

The resource is not year group specific and so will need to be read through and possibly adapted before use. The way in which you choose to use the resource will enable your learners to access some of the Key Processes from the Key Stage 3 Programme of Study.

[Download this Up2d8 Maths resource](#) - in PowerPoint format

[Download this Up2d8 Maths resource](#) - in PDF format

## Focus on...rich tasks

- What are the features of a rich task? The Mathemopedia entry [Rich Tasks](#) says, "I would describe a rich task as having a range of characteristics, offering different opportunities to meet the different needs of learners at different times. What is also apparent to me is that much of what it takes to make a rich task 'rich' is the environment in which it is presented – which includes the support and questioning that is used by the teacher and the roles that learners are encouraged to adopt. That is, an environment in which learners are not passive recipients of knowledge, accepting what is given, but independent, assertive constructors of their own understanding who challenge and reflect. On its own a rich task is not rich. It is only what is made of it that allows it to fulfil its potential."
- The [NRICH website](#) is one of the online sources offering a wide range of rich tasks, or rich contexts, for students to explore. What happens in the [Magic Potting Shed](#)? Can you create your own [100 square](#)? You can [search the site](#) by topic.
- Do you agree with the following assertion?  
"Textbooks often assume that we should begin topics by solving simple questions and then gradually move towards more complex questions. While this may appear natural, we find that learners tend to solve simple questions by intuitive methods that do not generalise to more complex problems. When the teacher insists that they use more 'generalisable' methods, learners do not understand why they should do so when intuitive methods work so well. Simple tasks do not motivate a need to learn.  
Rich tasks also allow all learners to find something challenging and at an appropriate level to work on."  

*[Improving Learning in Mathematics: challenges and strategies](#)  
Malcolm Swan*
- An [always, sometimes, never, question](#) can be the start of a rich task. [Read the story](#) of how one teacher tried to use this type of activity to encourage their class to "develop their reasoning and analysing alongside developing understanding of content". Maybe have a go with your own class too. Do you and they agree that  $10 \div 3 = 4$ ? Why not add your favourite always, sometimes, never question to [this discussion](#).
- A mystery activity has many of the features of a rich task. They certainly
  - are accessible and extendable
  - allow learners to make decisions
  - involve learners in testing, proving, explaining, reflecting and interpreting
  - promote discussion and communication.

We pointed out the *Durham Maths Mysteries* back in [Issue 21](#) of this magazine. What's your favourite mystery?

- Using a multiple representation can be a rich way to help challenge students to construct their own links between areas of mathematics. This example is taken from [Improving Learning in Mathematics](#):

### Interpreting division notation

If I share 5 pizzas among 4 people, how much pizza will each get?

$$5 \overline{)4}$$

$$0.8$$

$$4 \div 5$$

$$1.25$$

$$\frac{5}{4}$$

$$5 \div 4$$

$$4 \overline{)5}$$

$$\frac{4}{5}$$

If I share 4 pizzas among 5 people, how much pizza will each get?

- There are many, many sources of rich tasks on the internet. Have you found Jonny Griffiths' [RISPs site](#)? [How have you used](#) our very own Up2d8 Maths resources? Which is your favourite [Bowland case study](#)?

1	$1+n$	$2+n$	$3+2n$
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## An idea for the classroom – forming and solving equations

Isn't it nice when you suddenly rediscover an old resource and find that it is just as good as it was when you used it before? And isn't it even nicer when you think of something new to do with it that makes it even better?

I've used [the worksheet](#) on Fibonacci equations several times as it gives pupils a reason to form and solve equations. It works like this. I introduce pupils to the idea of a Fibonacci series and they get used to filling in the missing values in a table:

3	4					
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becomes

3	4	7	11	18	29	47
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Then pupils can be set the challenge of completing this:

1			5
---	--	--	---

...which they can usually puzzle out. But when you get to:

1						29
---	--	--	--	--	--	----

...it becomes obvious that some sort of strategy is necessary. Depending on the ability of the group, the idea of using an equation can be reached and pupils can fill in the missing row:

1	$1+n$	$2+n$	$3+2n$	$5+3n$	$8+5n$	$13+8n$
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...to reach the equation  $13 + 8n = 29$  which gives a solution of  $n = 2$ . Pupils can then test out this solution by substituting it in the expression for  $1 + n$  and checking that you do get to 29 by the end of the row.

The remainder of the worksheet gives some different contexts in which to apply this idea, including some negative number and non-integer solutions so that pupils get some practice in these difficult areas.

The improvement to the resource this time round was giving pupils this to figure out:

3	4					
---	---	--	--	--	--	--

Of course, this could be worked out by using trial and error but, without spoiling your fun too much, a more elegant solution can be found by setting up a pair of simultaneous equations.

If the first two cells are  $a$  and  $b$  then the equations would be  
 $a + 2b = 15$  and  $5a + 8b = 61$ .

Again, having obtained a solution, pupils can substitute their values in the boxes to check that they 'work'. There are some more negative number solutions here too.  
If you use this resource in your classroom, do tell us how you used it.



## 5 things to do this fortnight

- Maths can tell us unexpected things about sporting movement and performance. [A Gresham College lecture](#) taking place at the Museum of London on 9 March will look at some of the things that we can learn about running, jumping, throwing, swimming and systems of point-scoring by using simple maths and mechanics. Whether you are a coach, a competitor, or just a spectator, maths can enrich your sporting experience!
- How should school practice within mathematics teacher education be organised? An event hosted by Oxford University on 14 April will examine two different ways of organizing school practice by studying Sweden and Finland. The event will illuminate the huge differences in ways that school practice serves as a resource in the discourse of the two countries and will shed light on organisational aspects of school practice which have been hypothesised as being of great importance for successful mathematics teacher education. The event starts at 5 o'clock and you can get more details by e-mailing [Matthew Inglis](#).
- Would you like to improve your statistics content knowledge? Maybe you've used the NCETM [Self-evaluation Tools](#) and have identified that stats is an area to work on, or maybe you're about to teach A-Level stats for the first time, or perhaps you just fancy a challenge. Starting on 27 March, [Making statistics work in the classroom](#) is a distance-learning course from the Royal Statistical Society Centre for Statistical Education (RSSCSE). It encourages self-learning in the development of statistical topics within standard secondary courses and enables teachers to develop a broader base of understanding that will enable them to teach the subject with more confidence and increased effectiveness. A problem-solving approach is used throughout. More details are available from the [RSSCSE website](#).
- What will you be doing after the GCSEs this summer? The Goldsmiths' Company is offering a free summer course for teachers of mathematics and science. The mathematics course will look at the maths behind activities as diverse as cryptography, drug testing, internet applications and the study of chaos. Course activities will include a mix of lectures and hands-on workshop sessions, with an introduction to mathematical computation using the Maple package. A visit to the National Codes Centre at Bletchley Park will take place mid week. Though aimed primarily at those teaching advanced level mathematics, this course will be of interest to teachers of all science-related subjects who have studied mathematics to A-level standard. You can find [details of last year's course](#) and [book your place for this year](#) on the Goldsmiths' Company website.
- How's your training going for the [Sport Relief Mile](#)? Sport Relief runs from Friday 19 to Sunday 21 March. The aim is for the whole of the UK to come together to get active, raise cash and change lives. Details of suggested fundraising activities specifically for secondary schools are on the [Sport Relief website](#).





## Diary of a subject leader

### Real issues in the life of a fictional Subject Leader

I had a really busy couple of weeks – a monitoring visit from the Local Authority Mathematics Advisor to check our progress against our Action Plan, and then a visit from the Local Authority Behaviour and Attendance Consultant. Obviously it would not be correct to discuss the detail here, but it has got me thinking about inspections and to be honest, the point of them, but there is also a sting in the tale!

The Maths Advisor's visit was all about students progressing and engaging. And very often the majority of students do both – not quite as much of it as I would like, but then that's life! It is always tempting to 'put on a show' on such occasions. However, we have been monitored so closely that I don't think we can put on a show. You just see what we try to do every single day. The day was great. Students engaged – and those on our student interview panel revealed that they understood maths was about logic and thinking and not just numeracy, although they thought that mattered too!

The feedback for that visit was really up-lifting. My team of four (plus SMT link) felt as though the great effort we had put in was being noticed – and not because the advisor had said so, but because our students had said so. What was really good about their comments is that they were completely unsolicited. The advisor had them playing a little strategy game that involved a degree of computation, and then asked if it was maths? And why was it maths? They all knew that it was maths, and not because of the computation. A little bit more probing and students were talking about all the activities that take the time, that we feel should engage them, and that we feel make the difference.

It was just great – roll on Thursday. In agreement with the Behaviour Consultant we agreed that one of our team would shadow observations and discussion with students, debrief at lunch and take it from there. As we went to lunch, I chatted with the shadow. Her delight and enthusiasm for what she had seen and heard throughout the morning was infectious. Well, infectious to all but the consultant... need I say more? I left the meeting feeling tired, drained, and despondent. Not because of the day, but I just felt that the last 18 months counted for nothing. Then I began to feel angry and frustrated – we all did.

Now I have time to get over that emotional response, I just feel as though we all just found what we were looking for. (Perhaps I should tell Bono?) The Maths Advisor knows what we are trying to achieve and looks for that, and largely sees that. The Behaviour Consultant came because in our latest Ofsted, albeit two years ago, behaviour in maths was unsatisfactory, and across the school, satisfactory. So what did he see? To be fair he saw "satisfactory with some good". However, no real comment as to whether the activity was really extending and enriching mathematical learning, just comments about behaviour that we felt were shallow compared to our push to develop thinking. And, an implicit assumption that he would not understand the thinking stuff because it was 'maths' and maths is 'hard'.

What can I take away from all this...? Firstly, when being inspected, make it really clear to those inspecting what you are looking for. Secondly, and for me far more importantly, perhaps you see what you are looking for – and that is a double-edged sword. How often do my students meet my expectations of them? Could I see something else in some of them if I looked for it? And then my Year 10 top set that should be better, yet in the culture of my school don't work hard and are reticent to engage – do I see their culture in them, and not mine? If I looked for that excellence would I begin to find it?