Secondary Magazine Issue 36

National Centre for Excellence in the Teaching of Mathematics

Welcome to Issue 36 of the Secondary Magazine. Summer is here, sort of! We have already had the longest day – isn't it annoying when people tell you that it is starting to get darker earlier in the evening now? Wimbledon fortnight is also upon us, so feel inspired by the tennis and perhaps use the Up2d8 resource in your classroom. Above all, enjoy reading this issue of the Secondary Magazine.

Contents

Secondary Magazine Issue 36

National Centre for Excellence in the Teaching of Mathematics

From the editor

There is something in our culture that makes us want to remember where we were or what we were doing when certain iconic events occurred. At the risk of ageing myself, I remember quite clearly being called in from the garden by my Dad when I was a small child to hear the 'small step for man, giant leap for mankind' words. As I remember, I was fairly unimpressed, (why shouldn't you walk on the moon?) which made my Dad even more excited and amazed.

So where were you when:

- Kennedy was assassinated
- man first walked on the moon
- England won the World Cup
- Elvis Presley died?

And what about a recent event, where were you when Key Stage 3 SATs were abolished?
I was driving home from work when I heard the announcement by Ed Balls on 14 October 2008 and spent some time thinking about the prospect of a five-year curriculum, unmarked by an external test.

I can't remember where I was when the report of the Expert Group on Assessment was published in May 2009. The group was set up to 'provide advice on a range of aspects of assessment' as part of Ed Balls' announcement.

The report defines four purposes of assessment:

- to optimise the effectiveness of pupils' learning and teachers' teaching
- to hold individual schools accountable for their performance
- to provide parents with information about their child's progress; and
- to provide reliable information about national standards over time.

It makes nine recommendations in the areas of:

1. Continued availability of Key Stage 3 tests and promoting Assessment for Learning including the use of Assessing Pupils' Progress.
2. Cross Key Stage moderation of teacher assessment to improve reliability and trust.
3. Improving transition from Key Stage 2 to Key Stage 3.
4. Ensuring that lower attainers at Key Stage 2 catch up at the start of Key Stage 3.
5. Strengthening the quality of teacher assessment.
6. School Report Card.
7. Changing assessment at Key Stage 2.
8. Reporting to parents.
9. National sample testing at Key Stage 3 to monitor standards over time.

It may be necessary to go to the report and read around these recommendations yourself, but isn't it nice to see learning and teaching as a key focus of the first purpose. It is what our job is about – providing experiences which allow high quality learning to take place.

What do you do when a new report is published? If this was a magazine quiz, you may have some options:

a) put your head in the sand and ignore it; if I can't see 'it', 'it' can't see me
b) memorise it and quote large chunks in the staffroom
c) find a middle way.

So how would you score?
Mostly a – would get an accusation of being an ostrich – surely?
Mostly b – would tell you to get out more perhaps?
Mostly c – well, what about this middle way? How do we engage with the findings, consider the opportunities they may create in our classrooms and start to take small steps to accommodate the principles of the report in our working practice?
Have you got an example of this? Why not tell us about it 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.

This Up2d8 resource uses the context of the Wimbledon tennis tournament to answer the questions related to the number of points needed to win or lose tennis matches.

Students are asked the question, What is the least number of points you could gain to win a game of tennis? They are then invited to extend this question to a set, a women's singles match and a men's single match. A second question is posed: What is the maximum number of points you could gain and still lose a game, set or match of tennis? This causes some problems as the answer could be infinite, so students are invited to put in their own restrictions to pose a question which they can then answer.

This 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.

Click here to download the Up2d8 maths resource - in PowerPoint format.

Secondary Magazine Issue 36

National Centre for Excellence in the Teaching of Mathematics

The Interview

Name: Jennifer Piggott

About you: I direct the NRICH Mathematics Project – based in the Faculties of Mathematics and Education at the University of Cambridge. I arrived here after 26 years of teaching in secondary schools, some time in the Advisory Service and in Initial Teacher Training.

The most recent use of mathematics in your job was... Well, I use it all the time – this morning I was doing the accounts! However, part of my job is to do maths and think about how we learn and teach mathematics. Of course, I cannot help but do maths for fun too! Someone sent me a problem last week, and when I should have been doing the accounts this morning I got distracted by the problem – much more interesting!

Some mathematics that amazed you is...
Loads, but on a pure mathematical basis $e^{i\pi} = -1$
Then there was the television programme the other week that showed how they dampen the motion of skyscrapers, in particular the programme was describing a massive ball hanging in the centre of the structure. More impressive was some work some students did at a master class I ran a few weeks ago and very recently, a nice insight someone on the team gave me into the structure of one of the problems on the NRICH site that I had not noticed before.

Why mathematics? Why not?
There are lots of things I am interested in – my first degree was in geology, although I had applied to university to do mathematics. I think mathematics chose me, not the other way around. Having taught it for 26 years, it just made me want to teach it better and learn more. Relatively, I know so little mathematics – I suppose that is quite frustrating. But then there is so much else I do not know – I think I need to keep it all in perspective.

Your favourite/most significant mathematics-related anecdote is… Someone told me about a mathematician who measures the difficulty of a maths problem by the number of hot baths they have before they solve it. I sort of assume that they bathe fairly regularly and that they think particularly well in the bath…

A maths joke that makes you laugh is… Mmm, can't think of one in particular – is that pathetic?
I used to have a poster on my classroom wall – it was a picture of a mountain goat standing all alone on the side of a mountain.
The caption was "I am so far behind I think I am first!"

Something else that makes you laugh is… How stupid I can sometimes be!
I'm Sorry I Haven't a Clue
I also have a number of cuttings of jokes on my wall that particularly amuse me. Because they are quite visual they are hard to explain but I will try one of them.
A rather overweight lady is walking into a bathroom and cowering behind the door is a pair of scales.
There is another one with a man in a bike shop asking the assistant for a bike that is good for pavements! My colleagues are not so amused by this but then they do cycle and we do work in Cambridge!

Your favourite television programme is… Poirot

Your favourite ice-cream flavour is… I am not a great ice-cream fan and strictly speaking, orange sorbet is not an ice cream. The next best thing is vanilla.

Who inspired you? Or perhaps, what?
Different people and things at different times – not necessarily about maths but about learning and inquisitiveness.
I think the first was my primary teacher, Mr Silcock.
The second was my mother – eternally confident I would succeed.
My husband, for teaching me how to study.
The OU for offering the opportunity to study mathematics and really start to get to grips with it (this was after I started to teach maths, which is interesting!)
The NRICH team just because they love doing what they do and are so good at it
And my daughter who is so positive about what I do.

No famous mathematicians there – interesting...

If you weren't doing this job you would… Probably still be a teacher.
If you mean, if I had not become a teacher, then probably something in the petroleum industry, micropaleontology, or possibly in IT.

Secondary Magazine Issue 36

National Centre for Excellence in the Teaching of Mathematics

Focus on...Pythagoras

Every man has been made by God in order to acquire knowledge and contemplate.
Pythagoras of Samos

Pythagoras of Samos (around 580BC – around 500BC) was a Greek mathematician and philosopher who founded the religious movement of Pythagoreanism. There are many myths and stories around the Pythagoreans, but Pythagoras's influence is not in doubt – Bertrand Russell considered Pythagoras' influence on Plato and others so great that he should be rated as the most influential of western philosophers.

Pythagoras was the head of the Pythagoreans, the inner circle of followers were known as *mathematikoi* and they lived permanently with the Society, had no personal possessions and were vegetarians. They were taught by Pythagoras himself and obeyed strict rules. Pythagoras believed:

- that at its deepest level, reality is mathematical in nature
- that philosophy can be used for spiritual purification
- that the soul can rise to union with the divine
- that certain symbols have a mystical significance, and
- that all brothers of the order should observe strict loyalty and secrecy.

There was also an outer circle known as the *akousmatics*, who were allowed to live in their own houses, only coming to the Society during the day. They were also allowed their own possessions and did not have to be vegetarian.

Pythagoras is one of an elite list of around 300 mathematicians to have lunar features named after them – an image of the crater named after Pythagoras taken by the Clementine satellite can be seen here.

Pythagoras is said to have believed the Earth to be spherical.

Because no original writings by Pythagoras survive it is difficult to attribute theorems to him personally (the Babylonians knew of the theorem which we know as Pythagoras' Theorem around 1 000 years earlier, although he may have been the first to prove it), but there are theorems and results that can be attributed to the Pythagoreans including:

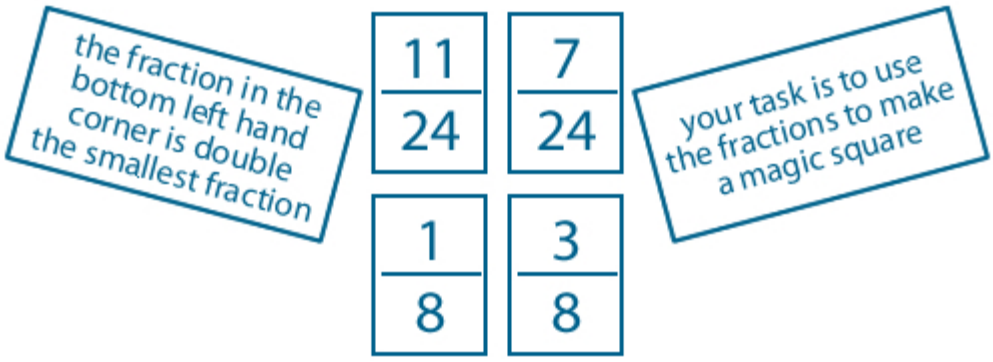
- the sum of the angles of a triangle is equal to two right angles
- constructing figures of a given area and geometrical algebra. Solving, for example, equations such as $a(a - x) = x^2$ geometrically
- the discovery of irrationals
- the discovery of the five regular solids.

Pythagoras is thought to have been the first to make a link between mathematics and music. He is reported to have been a talented musician and, the story goes that one day, while walking past a blacksmith's, he noticed that the blacksmith's hammer and anvil created tones which were relative to the weight of the hammer. There is quite a bit of doubt about the validity of this story, but there is much less doubt that Pythagoras was the first person to identify the acoustic relationships between strings of proportional lengths. He noticed that strings of equal tension of proportional lengths create tones of proportional frequencies when plucked.

An idea for the classroom

We have already mentioned on these pages the excellent set of 'Maths Mysteries' downloadable from the Durham LA website. Many teachers have been inspired to make up similar 'mysteries' and here we offer a Fractions Mystery for you to try in the classroom.
There is no doubt that for some pupils, the topic of fractions is not well understood. Many of our pupils do not make the natural connections a functional mathematician makes to enable them to understand and operate with fractions, so having more opportunities to work with fractions in different contexts may help them make more sense of the topic.

Each pair of pupils needs a copy of the grid and clue cards, and the fractions. Pupils can work together, using the clue cards, to find out where to place the fraction cards on the grid.



Good questions to ask might include:

- Could you suggest a tip for another group?
- Is there only one solution?
- Did you need all the clues?
- Which clues were most useful?
- Which clues were least useful?

Extension activities could be:

- make up a fraction magic square for another group
- make up some different clues for this solution.

A Department for Children, Schools and Families initiative to enhance professional development across mathematics teaching

5 things to do this fortnight

- Like Maths? Like cocktails? Then the NCETM & Life in the North East - Maths Cocktail Party is for you! Held on the 9th July at the Centre for LIFE in Newcastle, LA advisors, Head Teachers and Heads of Mathematics are welcome to come along and meet fellow colleagues involved in maths education. You'll be able to experience some of the new ideas around teaching maths, hear about changes to the exams system and enjoy exchanging ideas with fellow colleagues working in the North East in Maths education. Places are limited so RSVP early to avoid disappointment.

- How do you feel about Functional Maths? You know that the 'hurdle' has been removed, but what now?! The LSN is providing three one-day conferences in Leeds, Coventry and London which aim to provide information and updates on functional skills and the functional skills pilot, and will include workshops introducing the functional skills standards. The first conference is on the 8 July – why not book your place now?

- The 2009 MEI Conference opens on 29 June with a session devoted to current issues and national developments. There will be opportunities to discuss these throughout, including those at GCSE. Much of the conference will be devoted to workshops, three each day, with up to nine options in each. These cover a wide variety of topics, ensuring that there is always something for everyone; there will also be several guest lectures.

- Have you decided to carry on with the SATs this year? So what now? This set of spreadsheets at level 3-5, 4-6, 5-7 and 6-8 from the Recommend a Resource community allows you to carry out a detailed question level analysis of your papers. Why not then add to the discussion about how best to use the data?

- Feel in need of some culture after all the stress of the exams? Why not visit one of the free outdoor screenings of La Traviata relayed live from Covent Garden, on Tuesday 30 June, at 7pm? Screens are set up all over the country from Aberdeen to Plymouth, so here's hoping that the sun is shining!

Secondary Magazine Issue 36

National Centre for Excellence in the Teaching of Mathematics

Diary of a subject leader

Real issues in the life of a fictional Subject Leader

The departure of Year 11 always prompts me to start looking ahead to the new academic year and to review progress over the last 12 months. It's been an interesting year. The implementation of the new programme of study has not run as smoothly as anticipated. My department and I are fully behind the shift towards an increased focus on process skills within lessons, but maintaining consistency across all classes has proved difficult. I have similar concerns regarding the implementation of APP as routine practice across the department. We all value and agree with its aims, yet its consistency and sustainability will inevitably be a challenge. So what will my priorities over the coming months be?

I consciously categorise the priorities into two areas: teaching and learning alongside intervention. Developing pedagogy and the raising of standards within the classroom is an ongoing process. Encouraging my staff to be reflective in their practice while embracing new initiatives is essential if we are to move and develop with recent curriculum and assessment changes. To me, this is the interesting and fulfilling part of being a subject leader, i.e. the bit that requires vision and people skills in order to maximise the attainment of the students. This is where the majority of my job satisfaction lies. The 'sticking plaster' intervention is equally important yet more mechanical in its approach. I acknowledge that squeezing every last drop of potential out of students prior to exams can make a considerable difference to the results of both individuals and the school, however it is without doubt less satisfying.

I used to be somewhat cynical about having to write action plans. I would perceive it as a paper exercise and of little use or importance to the department or myself. I'm still unclear as to when and why I changed my outlook but now I see it a vital tool in planning future developments. It forces me to reflect and prioritise, creating a degree of self-inflicted pressure in maintaining the pledges and intentions set out at the start of the year. Most importantly, it outlines a vision for the department to adhere to through the clarification of our aims. Perhaps it's just the way I am, but I need this kind of structured approach to function. Long live action plans!