Primary Magazine

Issue 35

National Centre for Excellence in the Teaching of Mathematics

Welcome to the 35th issue of the Primary Magazine. Our 'A little bit of history' article focuses on the history of toys, we look at the art of Paul Klee and focus on dinosaurs. Our CPD opportunity considers effective group work and our ICT article explores the use of spreadsheets for probability and data handling in mathematics. *It's in the News!* features the Olympics.

Contents

Editor's extras

In this issue, we highlight some recent additions to the NCETM ITE Resources microsite. We also have some useful websites to share and some information about Florence Nightingale that you might find interesting.

It's in the News!

We feature the first in a two-part series about the Olympics 2012. It's impossible to get away from the fact that it is getting closer! It regularly features in the news for one reason or another. Recently, the tickets went on sale and the torch relay route was announced. This topic clearly lends itself beautifully to mathematics, so in this issue there are some activities to explore around such themes as the ticket sales, London Velodrome, the torch relay route.

The Art of Mathematics

We look at the art of Paul Klee, a Swiss artist born on 18 December 1879 into a family of musicians. Despite learning the violin from an early age, he chose to develop his artistic rather than musical skills.

Focus on…

In this issue, we focus on working with dinosaurs. Children seem naturally interested in dinosaurs; in their sheer size and magnitude, their tongue-twister names and in the almost mystical nature of their long-ago existence. Make the most of this and let our dinosaur facts inspire you and help bring mathematics alive for your children.

A little bit of history

We are going cross curricular once again and looking at some of the ways that you can link mathematics into a topic on toys. If you are studying the history of toys, you might like to try out some of the ideas.

Maths to share – CPD for your school

How we group children for mathematics lessons has been a great debate amongst teachers for many years. In this issue of Maths to Share we consider mixed ability group work within the classroom. You will need to give copies of Effective Classroom Organisation in Primary Schools: Mathematics (Updated) by Whitburn, J., Institute of Economic and Social Research, UK Oxford Review of Education, Vol. 27, No. 3, 2001, pp.411-428 for the teachers to read before the session.

ICT in the classroom

We consider the use of spreadsheets for probability and data handling. This article lends itself really well to KS2, but many of the ideas can easily be adapted for KS1. In the next issue, we change the emphasis to KS1 that can be adapted for KS2.

Editor's extras

If you are an ITE student, or know of someone who is, you might find one of the recent additions to the portal helpful to explore or pass on. Reflective Activities for ITE students is a set of reflective activities designed to challenge and support students as they begin their teaching career. It contains three sets of activities. Ideally they are designed to be explored with a group – maybe with a friend on your course, a mentor or a colleague during your school experience.

The activities comprise:

- a set of reflective activities exploring issues that a student might face during their course
- a set of three articles looking at three of the big ideas in mathematics with some ideas to try in the classroom
- a set of videos of NQTs' reflections after half a term in their first post.

There is also a complementary set of materials for ITE tutors, which are also well worth exploring.

In April there was a TV programme in which Marcus du Sautoy talked about Florence Nightingale's 'Rose' diagram relating to the deaths in hospital during the Crimean War. It seems that she might have been quite a mathematician! If you are doing any work on data handling and want a challenging activity to explore, you could have a look at her diagram and the related graphs with your children.

Did you know that in 1840, Florence Nightingale begged her parents "to let her study mathematics instead of doing worsted work and practising quadrilles." Her mother "did not approve, home duties were not to be neglected for mathematics."

If you want to know more, read the article Mathematical Education in the Life of Florence Nightingale.

Last term we completed an NCETM primary-focussed project which explored ways to best support mathematics specialist teachers (MaST) in their future work in schools. The final report has now been published, and it makes an interesting read. We worked with six local authorities around the country who, in September 2008, were invited to take part in the MaST fast track programme. Since September 2010 they have been involved in a very successful project with the NCETM. Nicki, the LA mathematics consultant for the London Borough of Wandsworth, has written a brief article on her view of this project from a consultant's perspective: it's worth a read!

And finally...

Have you seen *The Guardian*'s primary school teaching resources? Jon Swain has written a short series entitled 'Maths all around us'. You might find these interesting:

- supermarkets
- the street

- cars
- trees.

And for a bit of fun, check out this 3D interactive noughts and crosses game - can you beat the computer?!

Magazine authors: *Louise Burnett, Caroline Clissold, Emma Low, Cherri Moseley*

It's in the News!

Next year (2012), as we all know, we are hosting the Olympics. The event itself is in the news fairly regularly – with announcements of the first cities chosen for the torch journey around the UK, the completion of the Velodrome in London (the first Olympic venue to be finished), and recently the news of the tickets going on sale and the millions of orders that have been placed.

This issue of *It's in the News!* is the first of a two-part series featuring Olympics 2012. It might provide useful suggestions if you are currently talking about this topic; if not, it might prove helpful for when you do. In these slides there are links to geography and D&T. They give opportunities for work on a variety of mathematical concepts including number, measurement, shape and space and probability.

The mathematics opportunities are endless, so here we give just a few!

Before you use the slides you might find it helpful to look at the following websites for further information:

- The official website of the London 2012 Olympic and Paralympic Games
- CBBC news
- Daily Telegraph (torch route).

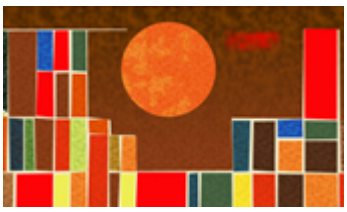
Please note – some of the news items may be out of date at the time of publication, but they will still provide great mathematical activities!

This resource provides ideas that you can adapt to fit your classroom and your learners as appropriate. As always, we would be extremely grateful if you could give us some feedback on how you have used it, if it has worked well and how it can be improved.

Download this *It's in the News!* resource - in PowerPoint format.

Download this *It's in the News!* resource - in PDF format.

Primary Magazine
Issue 35



National Centre for Excellence in the Teaching of Mathematics

The Art of Mathematics
Paul Klee

Paul Klee

Paul Klee was born on 18 December 1879 in Münchenbuchsee, an agricultural town near Bern in Switzerland. He was born into a family of musicians and learned to play the violin. Some biographies claim that his interest in art began when his grandmother gave him a box of chalks. As a teenager, he chose to develop his artistic rather than musical skills and went to the Academy of Fine Arts in Munich to study art, although music was important to him throughout his life. He excelled at drawing and enjoyed drawing caricatures, but his lack of colour sense ensured that his early works were almost colourless. At that time, he believed that colour was simply decoration, neither essential nor even needed.

After completing his studies in Munich, Klee travelled throughout Europe, open to many artistic influences, including William Blake, Francisco Goya and Paul Cézanne. In 1902, Klee settled in Bern. Four years later he married Lily Stumpf, a pianist, and moved to Munich where his set of 11 satirical etchings of grotesque characters, called Inventions, formed his first exhibited works.

During a trip to Tunisia in 1914, a year after he had become aware of new theories of colour use, Klee was deeply impressed by the quality of the light there, writing: "Colour has taken possession of me; no longer do I have to chase after it, I know that it has hold of me forever ... Colour and I are one. I am a painter." His artistic style changed forever, with colour becoming central to his art. Indeed, the coloured rectangle became the basic building block of several of his works. See the 'Art Projects for Kids' using Klee's *Castle and Sun* picture below for how you might use this idea with children.

You can find more of the children's art work at the end of this article

A Department for Education initiative to enhance professional development across mathematics teaching

Klee was influenced by a number of different disciplines, including expressionism, cubism, surrealism and orientalism. He also appreciated the simplicity of children's art. This wide range of influences made his work difficult to classify. He combined sophisticated theories of art with a strong personal inventiveness to give his work the appearance of innocence. Klee worked in oil paint, watercolours, ink and other media, often combining them in one piece. His work was usually on a small scale and sometimes included symbols and signs that were an abstract visual language, as musical notes are for music. The simplified female figure carrying a basket with fruit on her head, the coil shape and other elements make a pattern of symbols that pulsate with energy on the painting. Later works are distinguished by spidery hieroglyph-like symbols.

During World War I, Klee painted camouflage on German planes. Following the war, he taught at the Bauhaus school of art, design and architecture in Weimar from 1921 to 1926 and in Dessau from 1926 to 1931. Colleagues included Wassily Kandinsky. In 1924, the Blaue Vier (the Blue Four), consisting of Lyonel Feininger, Jawlensky, Kandinsky, and Klee, was founded. Klee held his first exhibition in the United States in 1924, with an exhibition at the Museum of Modern Art, New York, in 1930. His first major show in Paris was held in1925. By 1929 he was world famous. In 1931 he was appointed to the Düsseldorf Academy of Fine Art, shortly before the Nazis closed the Bauhaus. After being singled out by a German newspaper, the Nazis judged his work as degenerate and forced him to resign, displaying 17 of his paintings in an exhibition of degenerate art. According to the exhibition catalogue, a painting by a schizophrenic in a mental hospital "looks more human than any concoction of Paul Klee."

Klee fled Germany with his family in 1933, returning to Switzerland. In his series of *Pedagogical Sketchbooks* and lecture notes entitled *The Thinking Eye*, Klee tried to make a science of art and design. He died in Bern on 29 June 1940, aged 61. He had created more than 10 000 paintings, drawings, and etchings. Some 4 000 of his works are in Zentrum Paul Klee, Bern, Switzerland, opened in June 2005. The San Francisco Museum of Modern Art also houses a large collection of his work. Today, a painting by Paul Klee can sell for as much as US$7.5 million.

Further information about Paul Klee from:

- paulklee.com
- Wikipedia.

Activities

Show the children an image of *Zitronen* (World Gallery and Global Gallery both offer good quality images).

Illustration in the style of Paul Klee's *Zitronen*

Ask the children to discuss what they see. You might like to ask them to focus on the background and images separately. Ask questions such as 'What shapes are the colour blocks in the background?' 'Is there any relationship between the colours used?' When focusing on the black images, can the children identify the simplified female figure carrying a basket with fruit on her head, the coil shape, number one and dots? Ask what the other symbols suggest to them.

Explain that you are going to ask the children to create a picture in the style of Paul Klee's *Zitronen* to answer the question, 'What is maths?' Both the background and the black images should reflect their answer. It would be useful to discuss the question as a class before the children design and create their pictures.

Display the finished work with the original question along with speech bubbles with comments from the initial discussion and as work progressed.

There are some interesting projects online for children based on the works of Paul Klee:

- ArtHouse offers a Paul Klee art lesson inspired by a broken window. The lesson explores Klee's use of lines and involves the children in measuring and angles.
- Art Projects for Kids uses Klee's Castle and Sun picture as inspiration for an 'Abstract Castle' picture, using squares, rectangles and triangles. Older children could make their own cut-out shapes

Illustration in the style of Paul Klee's *Castle and Sun*

- Art Projects for Kids also offer a second project based on Klee's *Head of A Man*
- Scholastic offers a colour mixing project, with further ideas in their 'Taking it further' section
- Watch the video on the schools page of the Zentrum Paul Klee for inspiration.

In addition, there are several YouTube videos focusing on Paul Klee's work:

- Paul Klee Art gives you time to look at each painting but they are accompanied by some rather irritating music – best watched with the sound off.
- Paul Klee – 7 Paintings is a gentle view of seven particular paintings, as each fades into the next.
- Paul Klee is a shorter piece, which includes images of the painter himself.

National Centre for Excellence in the Teaching of Mathematics

Image Credits
Paul Klee photograph by Alexander Eliasberg courtesy of Wikipedia in the public domain

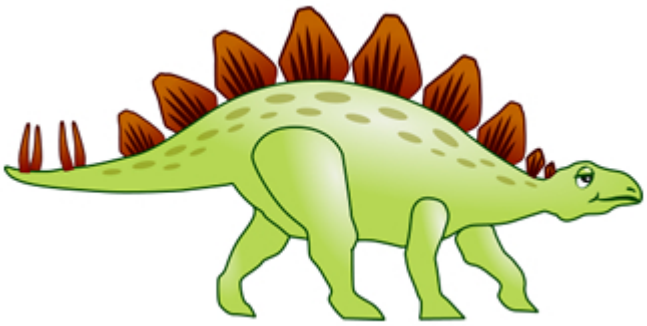
Primary Magazine
Issue 35

National Centre for Excellence in the Teaching of Mathematics

Focus on…Working with dinosaurs!

Mathematics Are you ready to invite an iguanodon into your classroom, or put a parsosaurus into your planning? Can you spot the maths in a microraptor, or the numbers in a neovenator? Children seem naturally interested in dinosaurs; in their sheer size and magnitude, their tongue-twister names and in the almost mystical nature of their long-ago existence. Make the most of this and let our dinosaur facts inspire you and help bring mathematics alive for your children. Try some of these interesting facts to get you started…

- approximately 700 species of dinosaur have been named. This is less than one fifth the number of currently known mammal species.
- the oldest known dinosaurs are from the Triassic period and are approximately 230 million years old
- the triceratops had a skull almost three metres long
- plant-eating hadrosaurs (duck-billed dinosaurs) had about 960 cheek teeth
- the smallest dinosaurs were only the size of a chicken
- the diplodocus had the longest tail – up to 13 metres in length
- the oldest dinosaur egg ever discovered is 100 million years old and was found in France
- the largest dinosaur eggs are about a foot long, and have a liquid capacity of almost three litres
- the fastest dinosaurs were bird-like theropods and could probably only run as fast as an ostrich, up to 43mph
- a brachiosaurus needed a heart weighing 400kg to be able to pump blood eight metres up its neck to its brain



A fun place to start with very young children is with this short song from Suite 101 (to the tune of 'This Old Man'), which practises number order to five. This could accompany the visual image of eggs being 'laid' by a dinosaur, five of which 'hatch' at the end. You might like to ask the children to help you in extending it up to ten. Let us know the results!

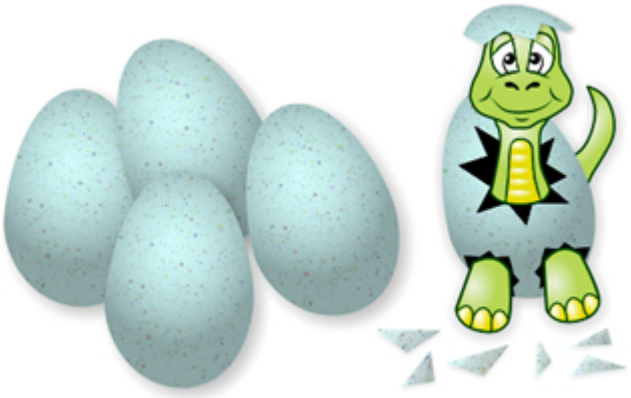
Di-no-saur
She laid one
She laid one egg then was done
Chorus:
Oh she lays dino eggs
One by one
She lays eggs until she's done.

Di-no-saur
She laid two
She laid two eggs that were blue
Repeat Chorus

Di-no-saur
She laid three
She laid three eggs by a tree
Repeat Chorus

Di-no-saur
She laid four
She laid four eggs not one more
Repeat Chorus

Di-no-saur
She laid five
She laid five that hatched alive! (remove top egg shells to reveal babies)



This could be extended either for more able or much older children with the use of careful questioning;

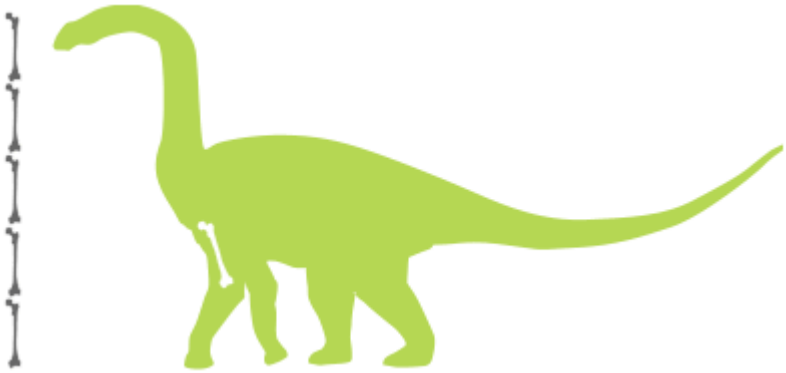
- how many eggs were laid altogether?
- what will happen now five more dinosaurs have hatched out?
- assuming each verse of the song is sung on consecutive days, how many eggs will there be on the fifth day if the new dinosaurs start laying eggs straight away? The sixth day? What will happen on the tenth day?

Children in Foundation Key Stage could benefit from matching the numbers of spots on a dinosaur to the numerals written on various 'dino-eggs'. Explore the idea of 'Finding all possibilities' with dinosaurs, by preparing sets of dinosaurs that have been split into two (head/body and tail) or three (head, body, tail) sections. If there are two dinosaurs split into two parts, how many different dinosaurs can be made? What if they are split into three parts? How many dinosaurs would I need to have split to be able to make at least 15 different combinations? Enchanted Learning shows a lovely simple example of this which could be shared with pupils on large scale using an interactive whiteboard.

Often schools and settings have plastic toy dinosaurs (or the children can bring them in from home) which can be used for a wide range of activities involving ordering and comparison of size. Encourage the children to let the children take control of the activity and decide how they might order or compare

the dinosaurs. Will they sort them into groups according to colour? Length? Height? How might they rank them in order of size? What does the word 'size' mean to them? Take the opportunity to step back, observe and listen to their discussions.

Over four and a half million people visited the permanent dinosaur exhibition at the Natural History Museum last year, many of whom will no doubt have been amazed at the sheer scale of some of the exhibits. Older children can carry out their own research to try to find the heaviest, longest, tallest, fastest dinosaurs that existed all those years ago. Ask them to imagine that they need to display the full skeleton of a diplodocus in school. Where could it go? Is the classroom large enough? The school hall? The playground? Encourage them to mark out the size of the dinosaur in the playground. How many paces long is it? How many children holding hands can reach this far? Further research might enable them to find out which dinosaurs would fit into other rooms in the school. Would any fit into their bedroom?



Palaeontologists can calculate the approximate height of a dinosaur by multiplying the length of its femur (thigh bone) by five. Is this true for their height? Children can gather the data of children of different ages to test this theory and present their findings. 'Maths to Share' in Issue 10 of the Primary Magazine provides guidance on structuring such a data handling task, with the 'Art of Mathematics' in Issue 12 exploring similar activities using Antony Gormley's sculpture *The Angel of the North*. This provides a good context in which to rehearse counting up in multiples of five, or a way in which to introduce the use of the constant function on a calculator. Read 'Maths to Share' in Issue 33 for support in introducing the use of calculators in your classroom.

With older children, share a timeline showing the three main accepted periods of dinosaur existence; the Triassic, Jurassic and Cretaceous periods. Explain that the earliest known dinosaurs have been dated to existing approximately 230 million years ago, with the last dying out approximately 65 million years ago. London's Natural History Museum website shows an excellent interactive timeline, showing individual dinosaurs for the 165 million year period. Ask them questions to support them in becoming familiar with the format of the timeline:

- which of the three periods were the longest?
- how long did the Cretaceous period last?

The children could produce charts similar to those on the Natural History Museum site, showing the length of time for which the more well known dinosaurs were in existence.

As always, we would love to hear about any mathematics that happens in your classroom as a result of these ideas. Please do get in touch or post your thoughts in the Primary Forum.

National Centre for Excellence in the Teaching of Mathematics

One last thing...
Anna Milbourne has written a wonderful book, *How big was a dinosaur?*, that is perfect for exploring scale and units of measurement with primary-aged pupils. This is one of several books in a series, *How high is the sky?*, *How deep is the sea?*, *How big is a million?* You can see them on Amazon.

A little bit of history
The Ancient Egyptians

In this article, we are being really cross-curricular and looking at some of the ways that you can link mathematics into a topic of the Ancient Egyptians. If you are looking at this period of history, try some of the ideas. This will mean you can double up on the maths that you do during the day!

However, due to the large amount of ideas and resources, this feature can only be read directly on the portal, otherwise the interactive nature of the way they are presented will be lost.

Primary Magazine
Issue 35

National Centre for Excellence in the Teaching of Mathematics

Maths to share – CPD for your school

Mixed-ability group work

How we group children for mathematics lessons has been a great debate amongst teachers for many years. Some think that setting is best, others believe ability grouping within class works well; others agree that mixed ability class mathematics lessons are more beneficial and some remain unsure of what is best.

In this issue, we consider mixed ability group work within the classroom. This might be something that you would like to discuss with your staff and possibly try out if you don't work like this already.

Background information
In 1997, the then Department For Education and Employment (DfEE) suggested that schools should consider 'setting' pupils by ability, as it was believed that this would contribute to raising standards. A survey was carried out shortly after this suggestion to find the grouping practices in primary schools. This survey found that, out of the schools that completed the given questionnaire, ability grouping was more common in mathematics than in other subjects, including English. The data showed that 56% of reception classes were taught in class ability groups, rising to 71 % and 72% in years 1 and 2 respectively. In Year 3 the figure dropped to 48%, falling to 41% by Year 6. The reduction occurred because 38% of Year 5 and 39% of Year 6 mathematics classes were set.

It concluded with a couple of interesting quotes: "The evidence from primary and secondary schools indicate that ability grouping, of itself, does not raise standards, and in some cases can lower them (Whitburn, 2001, Ireson and Hallam, 2001; Wiliam and Bartholomew, 2001). It can also have detrimental effects on pupils' personal and social development (Ireson and Hallam, 2001; Hallam et al., in press)."

You might find it interesting to read the full report.

Here are a few quotes you might like to share with staff:

> *"High attaining students are not significantly advantaged by their placement in high groups, but the attainment of students in low groups is significantly reduced by their placement in such groups."*
> Slavin (1990 cited in Boaler & William, 2001:77)

> *"Working in groups can improve pupils' attainment through the exploration and development of their thinking, through planning, sharing and clarification of ideas, and joint decision making."*
> Higgens (2003)

> *"...opportunity within collaborative work for experienced participants to scaffold less competent learners' understanding."*
> Bruner (cited in Pollard, 2008)

In 1999, The National Numeracy Strategy (NNS) encouraged teachers to move to a whole class teaching approach for the starter and main parts of every lesson. The report, Effective Classroom Organisation in Primary Schools: Mathematics (Updated) by Whitburn, J., Institute of Economic and Social Research, UK Oxford Review of Education, Vol. 27, No. 3, 2001, pp.411-428, suggests that in many schools this led to pupils being 'set' by ability in primary classrooms. It highlighted that: "The expectation of greater gain

by schools choosing to set by ability was not supported by the figures; in fact the results supported a tentative conclusion that children of all levels of attainment do better when taught in mixed ability groups and that the diversity of attainment was unlikely to be widened as a result of this."

Before the staff meeting
Before the staff meeting give out copies of Effective Classroom Organisation in Primary Schools: Mathematics (link as above). This is a report that was written using the data drawn from the London Borough of Barking and Dagenham's 'Improving Primary Mathematics' project. It set out to investigate:

- the effects of setting on subsequent mathematical attainment of the group as a whole
- the extent to which the decision by schools to set pupils by ability was a response to pre-existing greater variation in attainment
- whether setting pupils had any discernible effect on the diversity of attainment of those pupil groups.


Ask the staff to read it and bring their thoughts to the meeting.

Little research has been published on this topic recently, but some schools have been carrying out their own. You could ask your staff to read To set or not to set, that is the question, a National Centre regional project form a junior school in one of London's boroughs. It might be worth looking at the results of the project, Maximising opportunities for mathematical learning across the primary curriculum, which shows how mixed-ability grouping can be beneficial, particularly to lower attainers.

In 2007, the British Educational Research Journal Volume 34 Issue 2 published Promoting 'relational equity' and high mathematics achievement through an innovative mixed-ability approach. You might find it worthwhile to read this research article authored by Jo Boaler. Although not primary focussed it is very thought provoking:

> *"…a four-year study of different mathematics teaching approaches, conducted in three Californian high schools. In one of the schools – a diverse, urban high school – students achieved at higher levels, learned good behaviour, and learned to respect students from different cultural groups, social classes, ability levels and sexes. In addition, differences in attainment between different cultural groups were eliminated in some cases and reduced in all others. Importantly, the goals of high achievement and equity were achieved in tandem through a mixed-ability mathematics approach that is not used or well known in the UK."*


You may be interested in digging deeper into this research using the National Centre Research Study Modules.

If you know of any current UK research it would be great if you would share it with us.

At the beginning of the staff meeting give each colleague a set of digit cards and carry out the digit card activity from the What makes a good resource microsite. Lead a discussion on how an activity like this can be done with the class working in mixed ability groups. Consider how the lower attaining children could benefit as they are making really big numbers and can see what other children are doing if they get a little lost. This can help boost self-esteem and raise confidence. If they were working in a lower set they might not have the opportunity to do something like this.

Ask colleagues to list the different ways of grouping children. Take their ideas which might include some of the ones mentioned in the Whitburn report:

- **Age** – twelve months span of births within each class
- **Streaming** – children of a similar ability are grouped together in classes for all subjects
- **Setting** – children are placed in class sized ability groups for single subjects
- **Mixed-ability grouping** – variation in attainment within a given span of one year
- **Whole class teaching and learning** – as advocated by the National Numeracy Strategy.

Discuss the advantages and disadvantages of these. Draw out:

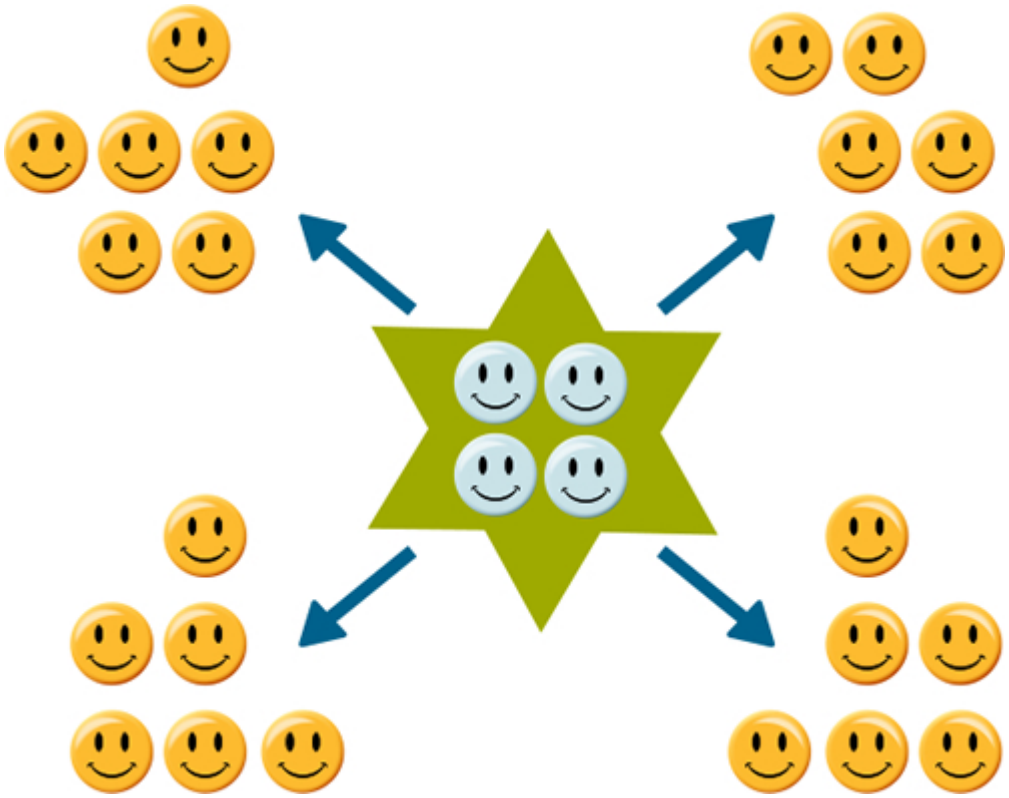
- potential self-esteem issues for children in lower sets
- the fact that they may not ever reach the levels they should be aspiring to because they may not be taught the appropriate concepts
- that they may never access high level talk
- that ability grouping in class may have similar affects to setting
- and anything else you can think of!

What do colleagues think of the author of the report's suggestion that setting is adopted primarily to make a teacher's task more manageable? Ask them to reflect honestly on this comment.

Discuss everyone's thoughts about trying out mixed ability group work within the classroom. Refer to the 'To set or not to set, that is the question' project and any of the comments made as a result of the project 'maximising opportunities for mathematical learning across the primary curriculum' that you might find pertinent.

In the early days of the NLS and NNS materials were produced to encourage speaking and listening. They referred to the strategies below which initially weren't targeted at mathematics lessons but can easily be applied to them if working with the children in mixed ability groups, preferably of four:

- **Think, pair, share** – child thinks, talks about their thinking with a partner and then shares with the class.
- **Snowballing** – child thinks, shares thoughts with a partner, then the pair shares with another pair.
- **Envoy** – one person visits another group to share ideas generated from their group.
- **Jigsaw** (or expert groups) – one person from each group forms a group with members from other groups. This could be a good way to differentiate. You could use a diagram similar to the one below to demonstrate this:



Carry out some activities with your colleagues for each speaking and listening strategy. For this, they need to be organised into 'mixed ability' home groups of four.

You could use these ideas:

Think, pair, share
Individually, think of as many percentages as you can from this statement '100% represents £240' - e.g. '10% - £24', '5% - £12', '2.5% - £6', '15% - £36'. After about a minute, compare percentages with a partner and add any that they have that you don't to your list. Share these with the group and make a combined spider diagram to show them all.

Ask colleagues to think of the advantages of doing something like this.

Snowballing
Individually, make a list of 15 words to do with shape. Share these with a partner. As a pair, share your words with another pair and together choose 20 words, 10 from each pair. Cut these out, swap them with another group and play the 'just a minute game'. To do this, one person takes the words and says the meaning of each in turn. When the others guess the word, place it face up on the table. After a minute, count how many words were guessed, place these on the top of the pile and pass them to another person in your group. This person repeats the activity beginning with the words that were guessed correctly the first time – to build on success. Repeat this, so that everyone has a turn. If doing this in a mixed ability group, the most confident/highest attaining/eloquent child would go first and the least last so that they can hear the descriptions several times before doing it themselves.

Ask colleagues about their thoughts on this type of activity

Envoy
Begin as a group. Show everyone the line graph. You could display this as a slide but it is probably best if you print it out and give a copy to each group. The groups each make up a story of what might be happening to give the result in the graph. After a few minutes, one person from each group visits another group and shares their story. They also listen to that group's story. Then they return to their group and share the story they heard. The group share the story the visiting envoy told them. They then evaluate these and their own, deciding which story fits the graph best and also which was the most interesting. They then feedback their thoughts to everyone else.


Discuss this type of activity.

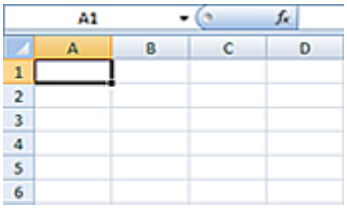
Jigsaw
Show the football kit slide and set the scene. Fred wants to know how many of his football team he can kit – excluding the goal keeper. As a home group, they decide what needs to be done. After brief discussion, send them to four jigsaw or expert groups. Ask them to focus on one shop per group. The shop information has been differentiated, so colleagues could choose which 'ability' they will be. Once the groups have found out how many he can kit, they return to their home groups. They compare answers and then make the decision about which shop – or should it just be one?


Discuss the advantages of working like this.

If appropriate, ask colleagues to plan one of these types of activities to try out in their class.

Encourage colleagues to have a try at using mixed ability groups in future mathematics lessons. If they are agreeable organise a meeting later in the term for everyone to share how they got on.

Primary Magazine
Issue 35



National Centre for Excellence in the Teaching of Mathematics

ICT in the Classroom – Spreadsheets for Probability and Data Handling

"… researchers believe that spreadsheets offer the potential to encourage students to explore and express mathematical ideas that they are likely to use when solving problems. The spreadsheets can help students move from specific examples to generalized relationships. According to Sharp (2003), one of the beauties of using spreadsheets is that it is possible to set up calculations, change some cell values and look at the effect on the results immediately. Today, it is clear that educational research supports the use of spreadsheets both in teacher education and K-12 classrooms."
The Turkish Online Journal of Educational Technology – April 2011, volume 10 Issue 2

The NCETM has established an ICT group and commissioned Keele University to work with them. The National Centre microsite, Using ICT and Digital Technologies for Teaching Mathematics, links to a set of seven skill zones for the use of ICT in Mathematics, including Zone 5 – Spreadsheets for Mathematics.

Zone 5 – Spreadsheets for Mathematics

Although designed for use in commerce, spreadsheets can be used in a wide variety of ways to support mathematics teachers. They can be as useful in teaching situations, where mathematical concepts can be modelled, as in day-to-day administration.
a. Managing cells, formulae, series, charts; statistical operations (including filters, pivot tables, frequency counts, histograms and tables)
b. Making a spreadsheet interactive with slider bars, conditional statements and self-checking methods
c. Knowing when Excel goes wrong, or does not quite get it right!
d. Handling large datasets; selecting columns of data
e. Converting data pasted from website when necessary using "Text to Columns"
f. Sorting data; filtering data.

In this issue, we look at some ideas that can be quickly prepared using a spreadsheet to develop understanding of probability and data handling.

Probability
Firstly, simulate a set of random data, where each of the outcomes is equally likely e.g. dice throws. Enter **=INT((RAND()*5)+1)** into a cell, then copy it into as many cells as you wish. Each cell now contains the outcome of one throw of the die. The saved spreadsheet will display a different random sequence each time it is opened. It is not as much fun as generating the data with real dice, but does allow a large number of outcomes to be collected quickly. Children can use the data to create frequency tables and graphs, and compare with their own collected data. Combined sets of data can be put together to look at how close the outcomes are to 1 in 6. Two dice can be simulated by having two columns of random numbers and a third where the outcomes are added together.

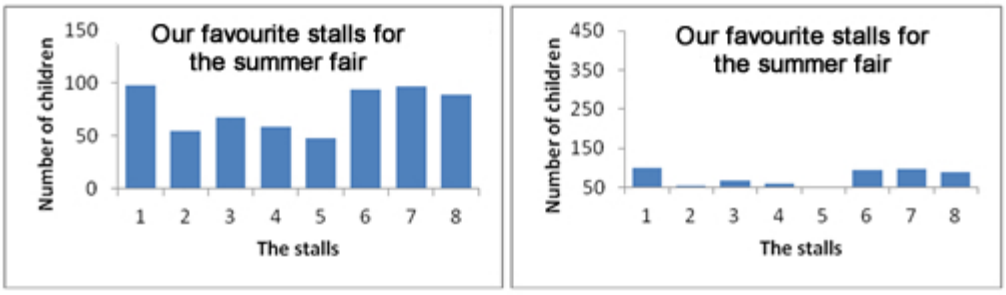
Line Graphs
A similar method can be used to create a random line graph, which can be used to inspire line graph stories. Common themes for talking about a line graph through story are: 'A day in the life', 'The water level of the school pond' or 'The temperature in our classroom'.

A random shape line graph is created by entering **=INT((RAND()*100)+50)** into 10 or more cells in a column on the spreadsheet. Select the column and create a line graph of the data. So that the children are not distracted by the list of values, the list of numbers can be covered over with a solid shape rather than looking at the shape of the graph. The shape can also be moved aside when the values are wanted. Each time Shift and F9 is pressed, the screen will refresh and the graph will change.

Following these random data activities, some children may want to explore the functions used to make the list of random numbers. **INT** stands for 'integer', a whole number, and **RAND** stands for 'random'. Explore what happens to the set of random numbers when the values are changed.

Investigating scale

The way in which axis scale influences how a graph might be interpreted can be seen quickly through creating more than one graph using the same data. Click on the vertical axis to change the scale, including minimum and maximum numbers. If the example below was to do with activities at the school fair and the fifth activity was playing games, the right hand graph could be used to suggest that nobody wants to play any of the games at the school fair, which from looking at the graph on the left is not correct and could be considered as a misrepresentation of the data.



This is particularly effective when the data has come from a problem that the children have an investment in, and they have collected it themselves. Ask children to try different scales for their data using the spreadsheet, and perhaps to use an inappropriate scale on their graph deliberately to help them convince others of their argument.

Advice on the use of spreadsheets can be found here. This was originally prepared to accompany Focus on…The election in Issue 22 of the Primary Magazine.

In the next issue, we will explore the uses of spreadsheets to explore number patterns, multi-step problems and algebra.