Welcome to Issue 45 of the Primary Magazine. In this issue we feature the artist Isaac Oliver. A little bit of history begins a series of articles linking mathematics to famous explorers. Focus on... explores the mathematical possibilities of a farm, and Maths to share looks at lesson study as an approach to improve the progression through division.

Contents

Editor's extras
In *Editor's extras* we have details of various events that are happening during the rest of this term. We provide a link to collections of all the different types of articles that have been published in the Primary Magazine over the last four years.

The Art of Mathematics
This issue explores the art of Isaac Oliver, a French-born English miniature portrait painter from the 16th century. He was a painter at the court of James I. If you have an artist that you would like us to feature, please let us know.

Focus on…
We focus on the work of Farming and Countryside Education (FACE) who help schools enhance their curriculum by connecting them with farms and farmers and creating high quality teaching resources to enrich their visits.

A little bit of history
We begin a short series on famous explorers, starting with Christopher Columbus, who was known as the man who discovered America. If you have any history topics that you would like us to make mathematical links to, please let us know.

Maths to share – CPD for your school
In this issue we look at more research undertaken by a Mathematics Specialist Teacher who explored how lesson study can help improve the progression in division. You will need to print out copies of this research for colleagues to read prior to your meeting. You will need to print out copies of this research for colleagues to read prior to your meeting.

Image Credits
Page header - statue of Christopher Columbus by Ken Zirkel some rights reserved

Editor's extras

The NCETM Professional Lead Development Support Programme

There are still some places available on the PD Lead Support Programme, which is a nationwide series of dates for mathematics PD leads in teaching schools and for other improvement agents working with a number of schools: the remaining events this term are taking place in Newcastle, Liverpool and Wolverhampton. Register your interest now to avoid missing out.

By completing this programme, you will be:

➢ accredited by the NCETM to provide professional development in priority areas (arithmetical proficiency in primary schools/ algebraic proficiency in secondary schools and colleges)
➢ supported to obtain the NCETM CPD Standard - a nationally established, widely recognised and quality assured badge of excellence in CPD provision.

If you are interested in taking part, you can find out more on our news page.

Other events

Norfolk Maths Conference

If you live in the East of England region you might be interested attending the Norfolk Maths Conference on 28 November, where John Mason is the keynote speaker. You can find further details on their website.

Beauty is the First Test

There is an exciting event happening in Wandsworth until 25 November, which, if you are in that area is worth visiting. Pump House Gallery in Battersea Park is hosting an exhibition that explores contemporary craft and mathematics, Beauty is the First Test. Artists include Michael Brennand-Wood, Janette Matthews, Ann Sutton and Laura Thomas.

This exhibition offers multiple learning scenarios for children and adults, using colourful and lively artworks to animate mathematics theory. It has the added attraction of being located in a converted Victorian water tower in the open spaces of Battersea Park. Class visits to the exhibition are strongly encouraged, email info@pumphousegallery.org.uk or telephone 020 7871 7572 to book in a time for these.

The exhibition curator Liz Cooper and Wandsworth Children's Services have developed a learning pack with an activity sheet for use in the gallery and a series of exercises that can be taken back to the classroom. The gallery can also put schools in touch with suitable workshop leaders who can deliver structured, relevant and entertaining activities at the gallery or back in schools. Education visits and use of the project room are being offered free of charge for the duration of this exhibition, but a fee will be charged for workshops.

Primary
& Early Years
Magazine 45

National Centre
for Excellence in the
Teaching of Mathematics

Outside of school hours there will be activities every weekend including the opportunity to join the Craft Club on alternate Sundays to learning basic techniques like knitting and crochet; and demonstrations from local craft groups. All events will be listed in full on the gallery website and most will be free.

More information on their work with schools can be found on their website.

NAMA Conference and CPD

Booking has started for the NAMA conference, Mathematics Learning – Nature or Nurture, which is to be held from 14 - 16 March at Aston University, Birmingham. Colleagues are invited to attend all or part of this conference.

NAMA also have a CPD Saturday event on 17 November 2012 at King's College London 10.00 - 13.30. For full details of these events please visit their website.

Primary Magazine Archive

If you would like to see the different articles that we have published over the last few years but haven't time to search in the archive, you might be interested to know that we have collected them according to type and they can be found in the resources section of the NCETM portal. There is also Guidance on how you could use these to support the teaching and learning of mathematics in your school or classroom.

Number patterns

Here is another fascinating number pattern! If you would like to explore others see *Editor's Extras* in Issues 43 and 44.

The blog Fascinatingmath has this number pattern for 142 857:

When we multiply 142 857 only numerals inside the number change their places.

142 857 x 1 = 142 857
142 857 x 2 = 285 714
142 857 x 3 = 428 571
142 857 x 4 = 571 428
142 857 x 5 = 714 285
142 857 x 6 = 857 142

When we multiply 142 857 with 7 it will become 999 999.

Also,

142 + 857 = 999
14 + 28 + 57 = 99
142 857 squared is 20 408 122 449
20 408 + 122 449 = 142 857.

You might be interested in watching this YouTube clip of fascinating number patterns. Why not share this with your class, pausing after each one to discuss how these work.

And finally

Teacher: What is 2k + k?
Student: 3 000!

Why do you rarely find mathematicians spending time at the beach?
Because they have sine and cosine to get a tan and don't need the sun!

The Art of Mathematics
Isaac Oliver (c 1565 – 1617)

Isaac Oliver was a French-born English miniature portrait painter. He was originally born in Rouen but moved to London with his parents Peter and Epiphany Oliver in 1568 when he was about three. We know this because someone wrote that:

> *In 1571 a certain Peter Olivier of Rouen was residing in London with his wife and had been there for three years with one "chylde" named "Isake." It would seem likely, therefore, that he was not at that time more than six years old. It has been suggested by Lionel Cust, from the Huguenot records, that he is identical with one Isaac Oliver of Rouen, married at the Dutch church in Austin Friars in 1602.*

His parents moved to England to escape the Wars of Religion, a civil war happening at the time in France between the French Catholics and the French Huguenots (Protestants); Isaac's family were Huguenots.

When he was old enough, he studied miniature painting under Nicholas Hilliard. The painting of miniature portraits was an art form that began to flourish in the 16th century and continued to be very popular in the 17th and 18th centuries. Miniature portraits were often used to introduce people when they lived long distances away from each other. For example, a nobleman wanting to arrange a marriage for his daughter might send a courier with her portrait to potential husbands. They were also used to remind people of those they cared about. For example soldiers and sailors might carry miniatures of their loved ones while travelling, or a wife might keep one of her husband while he was away.

Isaac's artwork developed a naturalistic style: realistic objects in natural settings and he was influenced by Italian and Flemish art.

He and his first wife, Elizabeth, had a son, Peter Oliver, who became his student and carried on his father's later style. Elizabeth died in 1599 and in 1602 Isaac married Sara, the daughter of the well-known portrait painter Marcus Gheeraerts the Elder and his wife Susannah de Critz.

After the death of Elizabeth I, Isaac became a painter of James I's court. He painted numerous portraits of Queen Anne of Denmark and the Prince of Wales, Henry Frederick.

He died of unspecified causes in 1617, and was buried in the church of St Anne, Blackfriars.

Examples of his work can be seen in Windsor Castle, the British Museum, Montagu House, and Sherborne Castle.

Mathematical ideas for some of the paintings of Isaac Oliver…

It can be quite tricky to find copies of Isaac Oliver's works on the internet that we are able to reproduce here, so we have provided links to the pictures - click on the title to show the picture.

Show Isaac Oliver's miniature Charity

You could ask the younger children to count the number of people that they can see and ask questions that involve doubling and multiplying by 10, such as, how many legs/arms/fingers/toes should there be? They could do this with practical apparatus or rehearse their times tables facts.

Primary
& Early Years
Magazine 45

National Centre
for Excellence in the
Teaching of Mathematics

The dimensions of this painting are 114mm by 81mm. Ask the children to tell you other ways of writing this, e.g. 11cm 4mm by 8cm 1 mm or 11.4cm by 8.1cm. You could ask them to convert the millimetres to inches which is the unit of measure that would have been used when he painted the portrait. You could use the rounded conversion of 1mm = approximately 0.04 inches. You could let the children use a calculator or, if they are confident, a written method.

Ask them to draw accurately the size of the painting using rulers. Once they have they could make their own copy of *Charity* to fit inside the boarder they have drawn. Discuss how difficult this was to show particular features, e.g. facial expressions, the children.

Show Seated Woman

This painting is 194mm by 139mm. You could repeat the conversion activity from above. The children could then compare the lengths and widths of the two pictures. They could then explore the area and perimeter of both. Which has the longest perimeter? Which has the smallest area? They could investigate the different shapes they could make from the same area. Do they think that Isaac's choice of shape was the most efficient for the portrait?

The children could explore ratios of the body, e.g. seven head lengths are approximately the same as someone's height. One head length is approximately the same as the ulna and foot length. Do these ratios work for the children? Is the woman in the painting to scale or is her head a little too small? Can the children use these ratios to make their own version of the *Seated Woman*?

Show An Amorino with a Lamb

This miniature is 141mm by 193mm. Carry out the conversion activities mentioned above and also the perimeter and area comparisons.

Ask the children what they think is happening in this picture. What animal do they think it is? This could lead into a data handling activity exploring such ideas as where lambs might be found, what other animals could have been used in the painting to give the same effect. Results could be collected as a tally then tabulated and turned into a pictogram, bar graph or pie chart.

The children could then make a frame the same size as the painting and then draw themselves with their animal of choice beside them.

They could look up some of the body ratios of different animals, compare with the ratios of theirs and then draw an animal to scale.

Show some of these Images of Isaac Oliver's portraits

The children could focus on drawing faces in the right proportion. ArtyNess Kids Crafts has simple diagrams showing how to draw faces.

Once they have practised, ask them to draw a miniature portrait of their friend's face on a piece of paper cut to the size used by Isaac in one of his portraits.

We hope that this has inspired you to develop some mathematical activities based on the works of Isaac Oliver.

If you have followed up any of the suggestions in this article or in other Art of Mathematics articles please let us know. We can feature your class's results in future magazines.

Information from:

➢ Artwork
➢ Tate
➢ Wikipedia.

Image Credits
Page header: Nicholas Hilliard's portrait of James I in the public domain, courtesy of Wikimedia Commons

Focus on…
Mathematics on the farm with FACE

How many times do you glance around your classroom and see blank faces, yawns, indifferent stares, and frowns of confusion? Be honest, Mathematics isn't the easiest subject to teach in terms of holding pupils' attention and rousing class participation. But it doesn't have to be this way: why not break those constraints of indoor learning and engage pupils by connecting them to the countryside?

Does your school make the most of the outside classroom?
A farm is an excellent example of how your curriculum can be enhanced by using an outdoor space. Did you know that across England and Wales there are over 2 000 farms that regularly open their gates to local schools? Farming & Countryside Education (FACE) helps schools connect with these farms and farmers as well as enriching the visits by creating high quality teaching resources. You may presume that the venue of a farm could only be used to teach children about farming, food supply and horticulture. However, FACE has some innovative ideas and tips which will bring a range of subjects including Maths to life! The engaging nature of these visits means that pupils become aware of how their studies are relevant to the real world and become more confident in their learning.

How can I possibly teach Maths on a farm?
Shearing sheep, ploughing a field, cutting corn and milking cows are typical sights you would relate with a farm – however a farm can also be seen as an outside classroom, buzzing with a hive of opportunities that will help make your pupils' learning more interactive. Here are ten simple learning exercises which will prove that farming counts!

Views from different angles
Farms are big, much bigger than your classroom and will seem even bigger to children. Use this extra space to your advantage and teach your class about angles. This is how it works. Look straight ahead at Molly the cow. If you turn 180° clockwise, what can you see? Now turn 90° anticlockwise, what can you see?
Tip – You can provide a protractor to help your class. Wait! Not a tractor, a pro – tractor.

field

How big is this field?
Can your class estimate the area of a field? Pull on your wellies because it could get muddy! By pacing a field, your class can estimate the length and width in metres. Now use these two measurements to calculate the approximate area of the field.
Tip – You may want to ask your pupils to round the figures up to the nearest ten before doing their calculation.

What shape?
Can your pupils identify various shapes? Place a marker on the ground in a large field. Ask your class to walk 20 paces north and place another marker, then walk 10 paces north east and place another marker. Again ask them to walk 20 paces south and place a marker. Lastly, ask them to walk 10 paces south west – what shape have they made?
Tip – If you are in a big group, a member of each team can stand on each marker point.

How different?
On a farm your children will want to explore. You can control this and make it safe by setting them tasks – things to find! Ask your class to locate a number of different places around them, for example, sections of different hedges, parts of a field or a pathway. For each one, ask them to pace out three metres in a straight line. Starting at one end and counting the number of different plants that they find along the line, they can compare the number of plants they have found in each of the different places. Why do you think there may be more plants growing in one place than another?
Tip – Your class could collect a leaf of each plant they find or make a drawing to help keep count.

How old is that tree?
On a farm there will be trees all around you. Climbing them may be out of the question so why not use them in a more educational way? Can your class calculate the age of a tree? Decide on a way of measuring the circumference of a tree at a height of 1m from the ground. On average a tree will grow at a rate of 2.5cm per year. Your class can divide the tree circumference by the growth rate to calculate the age of the tree. In what year does your class estimate the tree was planted?
Tip – Your class will need a tape measure to help them.

Taking the temperature
Visit the animals and see the impressive farm machinery whilst introducing your class to thermometers. Ask your class to use a thermometer to measure the temperature of a barn housing animals and compare this to the temperature of a barn holding machinery – which is warmer? And why might this be?
Tip – You could also perform this exercise outside – is there a temperature difference between open fields and forested areas? If so why?

ploughing

How much wood?
Whilst on a farm trail you may stumble across a fence. This can be used to teach your pupils fractions. If a third of a fencepost is in the ground what fraction is above ground? Now ask your class to measure the height of a fencepost, what is the total height of the fencepost including the buried section? Can your class calculate the total length of wood needed to make the posts for a 100m fence?
Tip – Your class will need a tape measure or ruler to help them.

Primary
& Early Years
Magazine 45

National Centre
for Excellence in the
Teaching of Mathematics

How long does it take?

There are many sights to see whilst on a farm. You may witness a farmer ploughing his field. This is perfect for a Maths task! Each time he passes you and your class he ploughs a width of 4 metres. Ask your class to calculate approximately how many times the farmer will have to run his tractor up and down the field before finishing. If it takes him 5 minutes to go up the field once, how many minutes would it take him to plough a field like this?

Tip – You can roughly calculate the length and width of a field by using 1 metre paces.

A collection of shapes

A farm is bursting with new and exciting sights for young children. How many shapes can your pupils find? Can they spot something which is shaped like a rectangle? square? triangle? pentagon?

Tip – Set a task of finding objects shaped like a square, rectangle, rhombus and a triangle and then ask your class to spot the odd one out.

Form a sequence

Your pupils will be eager to explore the farm! Can they search and find objects to form a repeated sequence? They could use stones, pebbles, different leaves, seeds, berries or whatever the environment around provides. Split your class into teams and ask each team to lay out a sequence on the grass. Can the other team work out the pattern in the sequences other teams make?

Tip – This is a great exercise to do in a safe place at the end of a farm visit to release some energy!

Just a final thought

There is a wealth of evidence that outdoor experiences benefit young people's learning and personal development. FACE can help to support you as you make steps to make learning more fun, relevant and engaging! For more information about how your school can embrace the outside classroom and the resources which can help, visit the FACE website.

You can also explore other opportunities for outdoor learning on our microsite, Learning Maths Outside the Classroom.

A little bit of history – Christopher Columbus

In the breadth of study section of the current National Curriculum for history there are expectations that children in KS1 study the lives of significant men, women and children drawn from the history of Britain and the wider world (for example, artists, engineers, explorers, inventors, pioneers, rulers, saints, scientists). In KS2 the children are expected to study Britain and the wider world in Tudor times.

In this issue we begin a short series of articles on some of the world's most famous explorers. Our first explorer is Christopher Columbus who lived during Tudor times.

This article contains a potted history of Columbus' life, together with mathematically related ideas and activities that you might like to try with your class; most of these can be adapted to suit all ages.

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.

Image credits
Page header - Carte de Toscanelli (anonymous) in the public domain, courtesy of Wikimedia Commons

Primary
& Early Years
Magazine 45

National Centre
for Excellence in the
Teaching of Mathematics

Maths to share – CPD for your school

Working collaboratively with colleagues through a lesson study approach to improve progression through division

Lesson study has been a popular method for teachers' continued professional development for several years. In our previous issue, we looked at a research project by Mathematics Specialist Teacher Olivia Moat. In this issue we look at another carried out by Julia Bayman, a Mathematics Specialist Teacher who also studied the MaST programme at Edge Hill University. Her tutor was Vicki Grinyer.

Julia's project had three aims: to improve children's skills in division; to address the issue of slippage in the number of more able children in maths between Key Stage 1 and Key Stage 2 in order to establish progression in division throughout the school; and to successfully provide a new method of CPD that would build capacity for the improvement of teaching and learning in her school.

You will need to print out Julia's article and give copies to colleagues to read prior to your meeting. For clarity, we have indented direct quotes from her article. It would be helpful to ask colleagues to bring examples of teaching plans and activities linked to division that have been successful with the children in their classrooms.

Ask colleagues to reflect on what Julia says in the Lesson Study and Initial Reflections sections on pages 1 and 2. Highlight these points from her article:

> **Lesson Study**
> Lesson Study would give a specific focus, making achievement within the collaboration manageable and impact almost instantaneous. Within two weeks, an intervention could be implemented, children targeted and gaps closed while simultaneously addressing teaching approaches.
>
> Lesson Study would also give teachers the opportunity to make improvements that would directly have impact on the teaching and learning in their class. Much of the literature that has been written regarding collaborative CPD champions classroom based approaches, for example, the EPPI review (2003:7):
>
> > Collaboration and coaching highlighted in this review as being linked with positive effects for teachers and students are grounded in classroom observation and sustained support related to it.
>
> Lesson Study involves a number of staff each having a different role within the collaboration, roles which everyone got chance to experience. Furthermore, as there were three of us, evidence collection would be more reliable. We were effectively using a 'triangulation technique' as Elliott and Adelman, (cited in Hopkins, 2008:133), explain:
>
> > The process of gathering accounts from three distinct standpoints has an epistemological justification. Each point of the triangle stands in a unique epistemological position with respect to access to relevant data about a teaching situation.

Initial Reflections

One caution I did have in my enthusiasm for the Lesson Study approach was that not everyone would have a similar view, however, may feel threatened by the process. I would be working with teachers of five years' experience and more. Bringing them together to plan collaboratively could present insecurities. Furthermore, issues within relationships between colleagues could compromise the effectiveness of the study.

I was also concerned that in starting such a process, there was a need to ensure it was completely followed through to demonstrate the positive worth of such a method of CPD. Therefore, staff needed to ensure they were committed to the project and understood the value of such an exercise. My priority was to ensure open communication and trust between the selected staff and myself. Being a senior leader in school, I did not want them to view the project as something they were having done to them but that in collaborating, we were 'Pooling intellectual, experiential, and resource-bases of multiple professionals focused on common goals...' (Helterbran, 2008:90). Teachers from Year 1 and Year 3 were involved in the collaborative work.

Ask colleagues to discuss how they think that lesson study might help them to achieve the aims that Julia had during her project:

➢ what do they think lesson study is?
➢ how could this improve the teaching and learning in their classrooms?
➢ is it reasonable to expect instantaneous results?
➢ would they feel threatened if they worked with a colleague in the classroom?
➢ would they see this as something being 'done to them' or as an opportunity to work collaboratively with other colleagues?

Ask colleagues to discuss with a partner the lesson study process that Julia writes about on page 2:

➢ do they understand the approach?
➢ can they see the possible benefits?
➢ what are these possible benefits?
➢ are there any pitfalls? If so, what might they be?

Discuss the positive responses to lesson study:

➢ are colleagues surprised the observers were observing the children and not the teacher?
➢ would they agree that working with consecutive year groups would be more beneficial? Why/why not?
➢ what issues, if any, would there be for three or four colleagues to be involved in this process?
➢ what subject area is weakest at your school?
➢ what is the weakest area of subject knowledge for teachers?
➢ could lesson study be used as a method to improve these weakest areas?
➢ could lesson study be used as a method to fulfil performance management targets? If so, how

Primary
& Early Years
Magazine 45

National Centre
for Excellence in the
Teaching of Mathematics

would you set this up?
➢cost was an issue in Julia's school. Is it one in your school? If so, what could you do to overcome this?

As a staff discuss the progression through division. Invite colleagues to share their lesson plans of successful lessons and the associated activities. Together try out these good activities and discuss how they can be adapted to different age groups:

➢how practical were they?
➢would the children benefit from using practical equipment for division in years 5 and 6?
➢how often were models and images used?
➢what difficulties do colleagues have in teaching division?

As a staff come to a conclusion about whether lesson study would be a good teaching and learning improvement tool in your school. If you decide to give this a try, agree some next steps which will enable three or four colleagues to try this out. Division might be a good place to start as it is generally one of the weakest subject areas for teachers.

Arrange a further staff meeting so that they can feedback how it went.

Suggest that they explore the NCETM Self-evaluation Tools to assess their confidence in teaching division.

We hope Julia's article has given you and your colleagues food for thought about improvement in teaching and learning through lesson study.