Post-16 Group Newsletter   February 2011

The Mathematical Association and The National Association for Numeracy and Mathematics in Colleges working together to support post-16 mathematics education

What is the Post-16 Group doing?

Working Groups are under way preparing for professional development days on *Engaging Level 3 Learners* and *Teaching the new GCSEs*. The first event on *Engaging Level 3 Learners* will be on 7 March in Loughborough.
[more]

Using the History of Mathematics in the Teaching of Mathematics and Numeracy

Practical help on how to incorporate the way mathematics has developed across time and cultures into your teaching.
[more]

Geogebra

A short introduction to a powerful but easy-to-use piece of free software which includes graph plotting, dynamic geometry and a spreadsheet.
[more]

A Mathematical Moment

Another of LSIS's *Mathematical Moments*, an activity for learners and stimuli for discussion and reflection by teachers.
[more]

Numeracy and LLU+

What does LLU+ do to support the teaching and learning of numeracy? Here is a short account from the person in charge.
[more]

Initial Teacher Education (Mathematics and Numeracy) in Further Education

A description of the qualifications available for those teaching mathematics and numeracy in the lifelong learning sector.
[more]

Short notices

MA Annual Conference | NANAMIC Annual Conference | NANAMIC at the MEI Conference
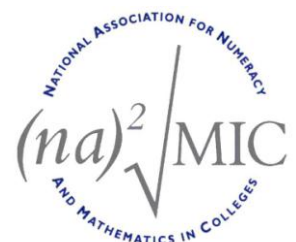
Your contributions are welcome

If you would like to comment on this newsletter or contribute to a future issue, or become involved in the work of the Post-16 Group then please **email** us.

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For more information about the Post-16 Group:
visit our **website** or **email** us.

More information about **MA** and **NANAMIC** can be found on their websites.

The Mathematical Association
Supporting Mathematics in Education

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What is the Post-16 Group doing?

The Post-16 Group's first two working groups have been working on *Engaging Level 3 Learners* and *Teaching the new GCSEs* in preparation for professional development days this spring (see below) and summer.

Engaging Level 3 Learners

Presenter: Jane Annets   When: Monday 7 March 10:00 – 4:00   Where: Loughborough College

This event is a Post-16 Group initiative which is being administered by NANAMIC and supported by LSIS.

Aims

• To reflect on our current practice of teaching mathematics and identify small changes which will have a big impact on learning.

• To share and adapt resources, ideas and activities that engage learners and help them to develop a deeper understanding of mathematical concepts and the connections between them.

• To develop strategies to deal with the challenges of using active approaches to learning.

Target Audience

Teachers and trainers of mathematics at level 3 who wish to introduce or develop more active approaches to teaching and learning mathematics.

Content

This one day, practically based, event is for you if you would like to introduce or develop active approaches to teaching and learning mathematics such as group work, discussion and the use of open questions. You will hear about what has worked for other teachers and have the opportunity to share what has worked for you. You will get tips on how to manage the learning within the time constraints of covering the content of your course and without overburdening yourself with preparation and marking. You will try out resources, ideas, activities and think about how you can use or adapt them for your own learners.

Throughout the day you will have opportunities to reflect on your current practice and plan the small changes to your teaching that could have a big impact on your learners.

Cost: Members: £40 Non-members £60

Teachers working in SFA funded provision may be eligible for free places. Please contact the Administrator for details.

Further details from the Administrator, Lesley Way, on 07757 816402 or **committee@nanamic.org.uk**

For more information about the Post-16 Group please visit our **website** or **email** us. We are keen to know what you see as the priorities to be addressed by future working groups.

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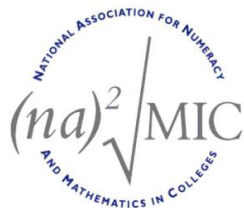
MEI Conference

Thursday 30 June to Saturday 2 July 2011 at Keele University

On the Saturday NANAMIC will be leading several workshops for teachers in the post-16 sector. The exact programme is yet to be decided but details will be available from MEI and from NANAMIC.

Professional Development Events

More details, including booking forms and how to have courses presented at other venues, are available from the Administrator by email **committee@nanamic.org.uk** or by phone 07757 816402.

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Using the History of Mathematics in the Teaching of Mathematics and Numeracy

The picture above, available at Wikipedia (**http://upload.wikimedia.org/wikipedia/commons/d/d9/Rhind_Mathematical_Papyrus.jpg**), shows the Rhind mathematical papyrus. Dating from about 1650BC it is kept at the British Museum. It contains reference tables and mathematical problems.

Mathematics (including numeracy) has evolved over the past millennia and taken shape with the help of creative minds in both the East and the West. Early rough hewn mathematical thoughts were transformed into well crafted methods and well understood concepts. Mathematics has emerged and matured through different cultures and each culture has made its unique contribution. Sometimes mathematical ideas have been lost to be developed again by others in later centuries.

In teaching mathematics we can so often present the finished product and not the creativity of the mathematician or the struggle required for new concepts to emerge. Learners can be left with a solely western-centred view of the development of mathematics and that concepts should be easier to understand than they are. If we are to deal with such problems and introduce another dimension to engage learners how might we do it? What resources are available to help us to do this?

We suggest that you take a look at your teaching of mathematics. How much does it help show that:

1. mathematics has developed in all cultures?
2. mathematics has developed over time?
3. as a consequence of these, the language of mathematics is now universal?
4. certain concepts such as the number zero and negative numbers have developed after quite a struggle?
5. mathematics at its heart is a creative process?

Possible routes forward include:

i. Using the NCETM subject association materials that will soon be available. The NCETM has commissioned the subject associations to produce a number of units on the development of understanding of number using the history of mathematics. They are expected to be available from Spring 2011. Units under construction include ones on: Books of tables, Egyptian fractions, Logarithms, Multiplication and Zero. As part of this work, this article has been submitted as a NCETM Mathmapedia article History of Mathematics which can be found at **https://www.ncetm.org.uk/mathemapedia/HistoryofMathematics**.

ii. Using parts of TV programmes such as the BBC Open University DVD *Story of Maths* with presenter Marcus Du Sautoy to stimulate discussion. The second programme 'Genius from the East' reminds us of Eastern contributions to the development of mathematics. Teachers TV *History of Maths* with presenter Matthew Tosh available to view and download from the Teachers TV website at - **http://www.teachers.tv/video/37915** is 'intended for mathematics teachers to use in sections with their pupils and looks at the historical background to some of the mathematical concepts that KS3/4 pupils often find difficult - place value, negative numbers, metric measures, algebra and geometrical proof.' Matthew remarks "If you find negative numbers hard to understand, you're in good company, because so did some of the greatest mathematicians of the past!"

iii. Listening with learners to radio programmes such as the Radio 4 *5 Numbers* looking at five of the most important numbers in mathematics presented by Simon Singh on Zero, Pi, Golden Radio, Imaginary Number and Infinity (15minutes each) available to download from **http://www.bbc.co.uk/radio4/science/5numbers.shtml** or to Melvyn Bragg's *In Our Time* broadcast on BBC Radio 4, November 29, 2007 for an introduction to the Fibonacci Sequence and the Golden Ratio. (45 minutes) available from **http://www.bbc.co.uk/programmes/b008ct2j**

iv. Learners and staff accessing specialist sites on the history of mathematics such as that of the British Society for the History of Mathematics (BSHM) **http://www.dcs.warwick.ac.uk/bshm/resources.html** or the MacTutor History of Mathematics archive at **http://www-history.mcs.st-and.ac.uk**. Wikipedia at **http://en.wikipedia.org/wiki/Main_Page** offers a good place to start searching but as with all websites take care.

v. Engaging with other teachers through joining subject associations such as the British Society for the History of Mathematics (BSHM, **http://www.bshm.org.uk**), the Association of Teachers of Mathematics (**http://www.atm.org.uk**), the Mathematical Association (MA, **http://www.m-a.org.uk**) and the National Association for Numeracy and Mathematics in Colleges (NANAMIC, **http://www.nanamic.org.uk**); reading their journals and newsletters and attending their conferences. The NCETM History of Mathematics Community (**http://www.ncetm.org.uk**) offers a discussion forum for teachers to discuss ideas and share resources with other teachers on the use of history of mathematics in the teaching of mathematics.

vi. Building background knowledge in history of mathematics through reading books (and articles) on the History of Mathematics. See for example Katz. V, (1998) *A History of Mathematics: An Introduction*, Addison-Wesley – which covers a range of cultures and is set out chronologically or Fauvel, J. and Gray, J. (1987) *The History of Mathematics: A Reader*, Palgrave Macmillan for the Open University – which contains translations of significant mathematical works and extracts from letters and diaries or Gherverghese, J. (2000) *The Crest of a Peacock: the non European roots of mathematics*, Princeton University Press.

vii. Using websites that offer teaching resources incorporating the history of mathematics such as the *Maths is good for you* website of Snezana Lawrence at **http://www.mathsisgoodforyou.com** and by a search for *history* at the NRICH site at **http://www.nrich.maths.org**.

Happy hunting as you seek to enrich your mathematics or numeracy sessions.
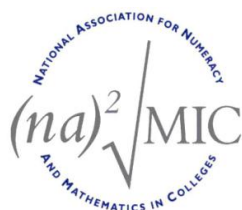
Professional Development Events

NANAMIC Annual Conference, CPD workshops and AGM

Wednesday 6 July 2011, 9:30 – 4:00, in Peterborough

The keynote address: "Proof, Pizza and the Electric Guitar" will be given by David Acheson, past President of MA.

More details, including booking forms and how to have courses presented at other venues, are available from the Administrator by email **committee@nanamic.org.uk** or by phone 07757 816402.

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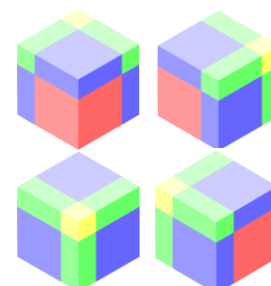
Geogebra

Geogebra is free software that integrates algebra, graph drawing, dynamic geometry and spreadsheets readily providing multiple representations of mathematical objects. Teachers and learners find it fairly intuitive to use and can quickly become confident with it. You can install it locally or use it online. Much can be done using the drop-down menus and the input box although there are many more sophisticated things you can do if you delve deeper.

You can use Geogebra as a straightforward graph drawer, for example to draw a quadratic curve, entering its equation using the input box at the bottom of the screen. You can then either edit the equation, in the algebra window on the left, or drag the curve, in the graphics window on the right, and see the effect. Here a point, A, has been added to the curve and using the menu shown a tangent has been added whose equation is displayed in the algebra window. As you drag A along the curve, you see the equation of the tangent change. This gives you a very quick and rich resource for learners to use when first meeting differentiation.
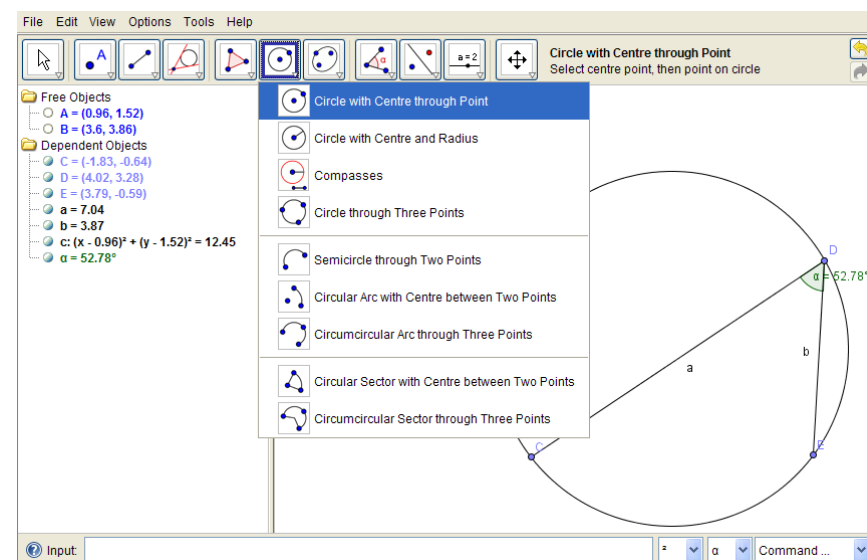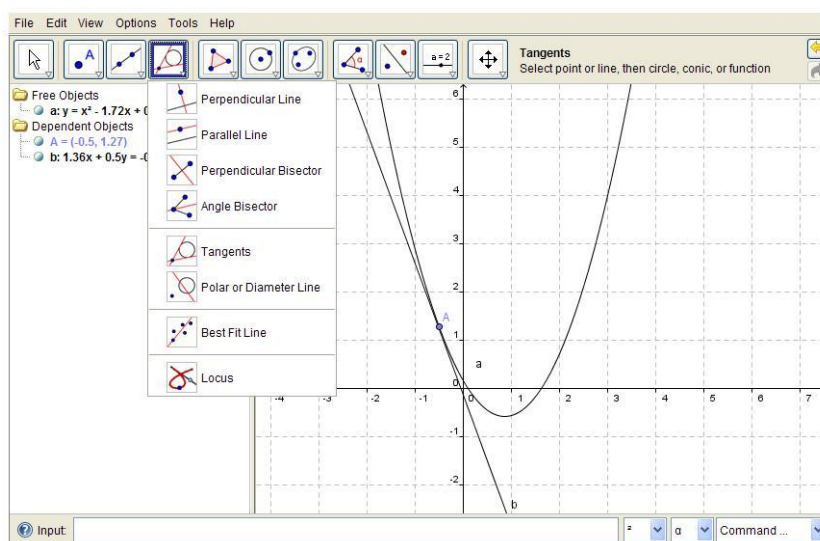
Geogebra can also be used for dynamic geometry. This example was created to bring home to learners that angles in the same segment of a circle are equal. The circle was created using the points A and B (which were later hidden by right-clicking on them so as not to distract attention) and using the menu item shown; then the other details were added. Now moving D round the circle leaves the angle unchanged, and changing C and E lets you see it was not a fluke. Of course, this doesn't prove the result but it is highly persuasive. (You could also use Geogebra to construct a suitable figure to use in a proof.)

Once you start to find your way around the menus, you can very quickly put together a resource or pull up Geogebra to illustrate a learning point in a lesson. Help in getting started can be found on the Geogebra **website** (both the **Quickstart** and the **Book** are helpful); also, ATM produce a handy book: **Getting Started – Geogebra**. Geogebra also has a **Wiki** which allows you to download resources made by others (and to upload your resources). Geogebra can also be used to prepare interactive worksheets or to create images which can be cut and pasted into worksheets and other teaching materials. (The images on the right were created in Geogebra to give four views of a cube to illustrate the identity $(a + b)^3 \equiv a^3 + 3a^2b + 3ab^2 + b^3$.)

If you have not tried Geogebra, it is worth a look as an extra tool in your teaching toolkit.   **[top]**

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A Mathematical Moment

Here is another from among the many **Mathematical Moments** developed by LSIS. As well as providing ideas for activites with learners, they are intended to stimulate discussion between teachers.

(The activity here is suggested in the context of number but could be used in other contexts, for example with algebraic expressions.)

What is your favourite *Mathematical Moment* (or other resource)? Please let us know what it is and how you used it.

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Mathematical Moments

The LSIS STEM Programme

Topic: Number operations (Using co-operative small group work)

Objective

- To explore number bonds and multiplication facts.

Materials required

- Mini-whiteboard and marker pens (per pair or small group)

Suggested activity

Consider appropriate 'target' numbers for your learners to reach using addition and multiplication: 12 = 5 + 7, 12 = 3 × 4 etc. Ask each pair or small group to write down as many different calculations as they can think of that gives the target number as the answer. Explain that the aim is to have more calculations than any other group, or to have calculations that no other group has thought of. Emphasise that the pairs have to be able to explain their working.

What prior knowledge would you want to check? What connections between these operations are you looking for the learners to make? What approaches could you use to share the learner's responses with the whole class?

Could you extend the activity by encouraging learners to use other operations as well?

How could you extend the activity by limiting the integers used? (For example, you could use only the digit four to make all numbers to 10: 4 ÷ 4 = 1, (4 + 4) ÷ 4 = 2, 4 + (4 ÷ 4) = 5, etc.)

Further ideas

- Mathematical Moments: 'Exploring the 'Four rules' calculations' (Using technology creatively and appropriately)
- Creativity in Mathemapedia

This resource is delivered by the STEM consortium as part of LSIS's Teaching and Learning Programme. For more information visit www.excellencegateway.org.uk/STEM.

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The Mathematical Association
Supporting Mathematics in Education

special conference discounts for new attenders

[click here to find out more]

Annual Conference
Mathematics: The Big Picture
14th – 16th April 2011 · Loughborough University

A 3-day event for all your **CPD needs**

Matt Parker   David Acheson   Lynne McClure   James Grime

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Numeracy and LLU+

Graham Griffiths, Head of Numeracy at LLU+ writes about its work.

I joined LLU+ at **London South Bank University** in April 2003 after working with Noyona Chanda, currently the Dirctor of LLU+, on a project looking at numeracy teacher development for London. LLU+ had first been set up as the Language and Literacy Unit for the then Inner London Education Authority. Since then it has moved to London South Bank University (via Southwark College) and developed numeracy, dyslexia, family learning and workplace skills - hence the + in the current name. Before Noyona's work for the unit, Diana Coben and Dhamma Colwell had been the torch holders for adult numeracy in the unit. Diana is now a Professor of Adult Numeracy at King's College.

Following the Moser report, the Skills for Life agenda was initiated and LLU+ expanded in staffing with the numeracy team growing from one to six within a few years. Since this time, the unit has worked on a range of numeracy projects and developments in the London region and nationally.

The numeracy team led developments within the QIA Skills for Life Quality Initiative and its successor programmes, the LSIS Skills for Life Improvement and Support Programmes. For these programmes, the team produced a **modular programme** to deliver the then existing Level 4 certificate for adult numeracy specialists. These resources were welcomed by the sector and many of the activities are still used by teacher educators today. The team developed and rolled out resources to address the numeracy '**minimum core**' developed for all teachers in the post compulsory sector. Both these resources used approaches promoted by the team; these include a focus on self assessment of learning and the use of collaborative, discussional tasks which enable learners to work in a variety of ways.

Some resources that may be useful for teachers and teacher trainers are still available from the Excellence Gateway.

Advanced numeracy – a package of resources to support the mathematical development of prospective adult numeracy teachers.

Videos of numeracy classes – produced for use within the Training the Trainer programmes to support the development of numeracy teacher trainers.

We have influenced a range of curricula. The numeracy division were part of the writing team of the '**Application of the professional standards for teachers of Mathematics (Numeracy)**', the revised standards that have defined programmes of study for subject specialists since 2007. The team also led the revision of the **adult core curricula**, consulting with the sector, re-writing the elements and providing guidance and exemplars.

In the November 2010 edition of this newsletter, the **Skilled to Go** resources were showcased. These well received resources were developed by LLU+ and have shown how interesting, challenging, contextualised adult focused resources may be produced.

At the moment the team are working on: numeracy teacher training; a small scale family mathematics research project while undertaking a number of family learning courses for Southwark and Lambeth; a European project, Financial Literacy Competencies for adult learners (finlico) with a range of partners using Grundtvig money; and supporting LLN (Lifelong Learning Networks) development in London and the South East for LSIS.

In addition to these projects, we started the active email list **adult-numeracy@jiscmail.ac.uk** which has some 450 subscribers sharing ideas, events and discussions on adult numeracy. We also contribute to ALM – Adults Learning Mathematics – A Research Forum (**www.alm-online.net**) – an international organisation concerned with the development of mathematics at all levels for adults. Indeed, the sixteenth annual conference was held at LLU+

in the summer of 2009, the proceedings are now available for purchase. Back issues of ALM publications are freely available electronically on the ALM website.

 All this would not have been achieved but for the collaborative work of the whole team at LLU+, including colleagues (Jackie Ashton, Noyona Chanda, David Kaye, Beth Kelly and Daian Marsh) and former colleagues (Phil Aylward, Sonia Fox, Ruth Moulton, John Pearson and Rachel Stone), together with professionals from other organisations (Helen Allsop, Viv Brown, Bill Buckingham, Martyn Edwards, David Holloway, Maggie Hughes, David Martin, Anita Moore, Tracy Part, Diane Rawlings, Valerie Seabright and Jon Swain). Our work has also been influenced by several prominent thinkers in adult education (such as Dave Baker, Diana Coben, Dhamma Colwell, Joan O'Hagan and Alison Tomlin) and mathematics education (including Malcolm Swan, Geoff Wake and Alison Wolf) as well as by members of the NANAMIC Committee and many other practioners and researchers too numerous to mention here.

We look forward to developing more teaching and training resources and supporting others in professional development for adult numeracy.
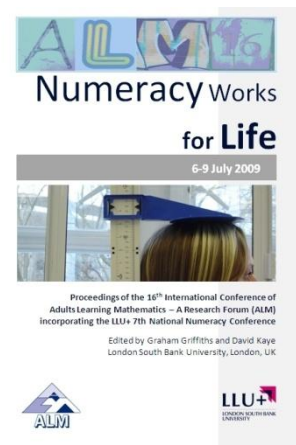
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Initial Teacher Education (Mathematics and Numeracy) in Further Education

The teaching qualifications framework (TQF) for the Further Education (FE) sector has been developed by Lifelong Learning UK (LLUK) and courses at each centre have been endorsed by Standards Verification UK. New entrants, for full teaching roles, in FE (since 2007) are required to successfully complete within 5 years a qualification based on 'units of assessment' within what has been entitled the Diploma in Teaching in the Lifelong Learning Sector (DTLLS) (though Higher Education Institutions can use their own nomenclature). Qualifications, perhaps containing additional units, based on this diploma, are delivered at validating Universities or at FE Colleges associated with validating institutions at Level 5 or 6.

DTLLS-based qualifications are generic, delivered to groups of students preparing to teach different subjects. The mathematics or numeracy component of their course will arise from their 150 hours of teaching practice, impact on assignments and any mentoring they obtain from a mathematics or numeracy specialist. On these DTTLS courses teaching, marking of assignments and observations of teaching practice will not usually be performed by a mathematics or numeracy specialist. Employing institutions are usually expected to provide subject specialist mentors to trainees although this is proving to be difficult for some organisations. This DTTLS qualification will be regarded as sufficient if the teacher teaches Mathematics but not if they teach Skills for Life Adult Numeracy.

For teaching Adult Numeracy they will either need an Additional Numeracy Diploma (usually studied after the DTLLS) or have studied a specialist, integrated DTLLS (see later). The Additional Diploma courses are Level 5 or Level 6 part time in-service courses taught by mathematics and numeracy specialists to groups of mathematics and numeracy teachers who already have a DTLLS based qualification or have been teaching in the sector for some time with an older Certificate in Education or Postgraduate Certificate in Education teaching qualification and who can also demonstrate level 3 skills in mathematics. This one year part time course involves 75 hours of reflective teaching practice at a range of levels below level 3 in mathematics and numeracy and four observations, mainly performed by a mathematics and numeracy, specialist. A limited number of colleges have enough students to combine the DTLLS and Additional Diploma into a single course.

After achieving DTLLS new entrants may then progress to gaining Qualified Teacher Learning and Skills (QTLS) status.