MATHEMATICS SUPPORT NEWSLETTER

NATIONAL NEWSLETTER FOR ACADEMIC MATHS SUPPORT ISSUE 6 SPRING 1997

Does Numeracy Matter?

The BBC numeracy campaign, 'Count Me In', in January (page 5), coincided with two reports on Numeracy.

The first was 'International Numeracy: a comparison of the basic skills of adults 16-60 in seven countries' (page 6), and the second, 'Does Numeracy Matter? Evidence from the National Child Development Study on the impact of poor numeracy on adult life' (Yes, it does affect employment and particularly of discriminated groups).

Is it still true that students are resistant to resource-based learning? The survey at the end of this issue (page 19) suggests that attitudes to this have undergone a sea change.

The article on Diagnostic testing by Peter Edwards of the University of Bournemouth and the Open Learning Foundation, and by Andy Fitzharris of the University of Hertfordshire on Distance Learning using the Internet, provide models for us.

How does your institution support students with visual impairment? David Bowers' maths workshop at University College, Suffolk, made Herculean efforts and confront many issues (page 13).

He also comes up with problems resolved and problems avoided. All the heart of learning support is in this article, which makes the point that resource based learning can open doors for students with disabilities.

Graham Newson at the University of York circulates a MATHS HELP notice to non-science departments each October and gives us (page 2) the results of his initiative.

Birkbeck College has a long history of part time degrees but a relatively short one in running a maths drop-in centre for mature working students. Jenny Nelson outlines her work in this project (page 3).

Finally we have a letters page (page 16). Your involvement in this newsletters is wanted so please contact the editor with appreciation, criticism, and questions.

See back page for complete list of contents

Marketing Maths

DARE WE ASK students during induction week about their mathematics knowledge?

There is a risk that we might undermine other departments who have carefully hidden from them the maths requirements of their courses.

Nevertheless, diagnostic testing in numeracy informs curriculum planning and sometimes provides a programme of study for individual students with support from drop-in maths workshops.

Sheffield Hallam University has gone even further, together with the British Society for the History of Mathematics, and put on a conference supporting teachers in schools.

The University of Luton plans to facilitate a Sixth Form Problem-Solving day in mathematics for schools in Bedfordshire.

At the first national conference in maths support, Professor Kath. Hart made us aware how diverse were children's understanding of maths concepts at the age of 11; small wonder that it is diverse at the age of 18.

The enlarged entry into FE and HE confronts us with those realities.

In a spirit of partnership, we have a lot to gain by working with the secondary education sector, not least a greater understanding of our own students.

Maths Help

"I am a mature (Access) student now in the 1st Year Biology and am finding the level of Maths very difficult."

"I would appreciate it if you could help arrange extra stats lessons for me—I am studying combined Economics and Politics."

"I am a third year English student doing a Maths GCSE at the local college. Every week I have assignments to do in my own spare time. Would it be possible to put me in touch with a PGCE student to give me some help once a week?"

"I need help preparing to take aptitude tests."

"You may be able to help me with a problem I have with Maths, namely understanding any of it." (Computer Science student)

The last may be a bit extreme but the above give a typical cross-section of the requests I get every year in response to the MATHS HELP notice that I circulate to the non-Science departments in the University each October.

This advertises help for students who fall into three broad categories — those sitting GCSE externally, those needing basic maths support in some areas and those needing specific help in their field of study (often statistics).

The notice concludes:-

"Individual tuition and advice is available free from our Maths PGCE students, as in previous years, on a 1:1 basis in an informal and relaxed atmosphere."

I write in, as a requirement of the students on the PGCE course, that they be expected to take part in this scheme. We have about 20 Maths PGCE students each year and I typically get about a dozen enquiries during the year which I offer to my students to volunteer for.

The pair then arrange mutually convenient times and venues for the expected one hour a week tuition and between them agree content. It is left to them to agree how long is needed — some pairs maintain regular contact right through a year, others agree a set period of help before ending the arrangement.

I feel the advantages are two-way; verbal feedback I get confirms that those needing help appreciate the non-threatening atmosphere (in particular not their subject tutor), while the opportunity for my PGCE students to experience 1:1 work with students with specific mathematical requirements is a valuable insight into teaching strategies and learning processes.

The scheme is informal, requests during main Teaching Placement often have to be discouraged and feedback has hitherto only been opportunistic — one day it may be possible to research our non-Science undergraduates' needs more systematically and offer more structured assistance.

It may also be, of course, that our science area students have areas of 'innumeracy' that need to be addressed — GCSE and A levels notwithstanding!

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MATHEMATICS SUPPORT

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The next issue will be:
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The deadline for contributions for inclusion in the next issue is July 1st, 1997

Birkbeck College and the Maths Problem

Mature part-time science students and maths

Birkbeck is the part-time college of the University of London. It is unique in that it offers degrees only by part time evening study, and in certain subjects, such as physics, is the only institution to do so.

It is a small college with around 3,000 undergraduates of whom only a few hundred study subjects with a significant mathematical component. This article is concerned with the provision of maths support to this small but important group of mature part-time students.

Birkbeck caters for mature students (average age around 30) who work or are otherwise 'gainfully employed' by day. Students choose to study science at Birkbeck most commonly through a desire to improve job prospects together with a fascination for the natural world.

Non-traditional entry requirements mean that on entry our students have a wide range of qualifications and experience. Of new science students about one-third are qualified to A-level, a further third hold Access or similar qualifications, while of the remainder many are qualified to degree level in another subject.

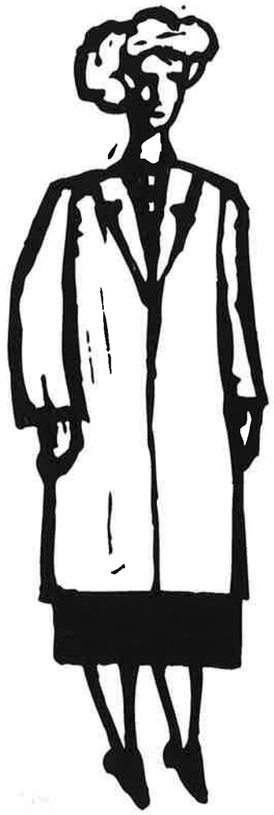
Most are returning to study after a break of several years. At Birkbeck they will attend classes two or three evenings a week to complete the equivalent of a full time degree in four years.

The picture thus emerges of a mature, diversely qualified, highly motivated student body with very little time.

Over recent years Birkbeck has experienced a decline in both the number of students applying to study science (possibly reflecting the waning perception of pure science as a vocationally useful degree for mature students) and in the level of their mathematical skills.

The consequence is that in science departments a smaller proportion of new undergraduates are skilled in maths to the level formerly assumed.

This problem is not unique to Birkbeck. Other, larger institutions



recognising this problem have resolved it typically by arranging additional 'remedial' maths classes for new undergraduates in the first term. In Birkbeck, however, the situation is complicated by several factors.

First, the departments which offer degrees with a significant mathematical component (such as physics, chemistry, geology) are small. Staff and resources are already overstetched with the difficulties of teaching an experimental science part time in the evenings.

Second, the fact that all teaching takes place between 6 and 9 pm on weekday evenings places huge pressures on teaching accommodation and staff and creates timetabling difficulties for any additional teaching.

Moreover, lack of time makes it imperative that the teaching should be seen as relevant to students' own subjects.

Third, there was until recently no central resource in the College for arranging additional academic support.

The first of these factors rule out the possibility of additional course-specific maths activities. At a departmental level, maths support must be integrated into the core course. Anything additional must be organised on a College wide — or at least a science-department wide — basis and preferably outside the normal teaching year.

A final important consideration is the fact that mature students often lack confidence with mathematics and many have rather negative memories of the subject from school.

Most of the students I meet are studying science in spite of, rather than because of, their previous experience of maths. Many are intent on avoiding the subject as far as possible even though they know

that will handicap them in their chosen discipline.

For these students it is important to create opportunities where they can explore the subject in a relaxed and open way, something which is extremely difficult within the tight time constraints of a Birkbeck degree.

Approaches to maths support at Birkbeck

At a departmental level, changes have been made either to increase support in foundation mathematics or to make maths more subject specific.

For instance, in 1995/6 a new half course unit in maths and computing was introduced into the first year of the Chemistry BSc. In 1996/7 the existing maths course for first year Physics students was restructured to include integration, which had formerly been assumed.

The maths course for first year Geology BSc students was recently taken over by the Geology department from the Maths (now Statistics) department in order to enhance the relevance to the subject.

Such changes have been been positive but still leave a significant minority of students struggling.

The importance of a sound mathematical base is recognised, similarly, in the College's Extra-Mural Certificate in Science.

Since 1992 this course has been offered as a qualifying year to a science degree at the College and elsewhere. Mathematics is a compulsory partner subject of equal weight to physics and is also taken, voluntarily, by many chemists.

On an inter-science-departmental level, support has been provided since 1990 in the form of a pre-sessional refresher course in maths for science students. The course covers core A-level maths topics and elementary statistics over ten sessions in September.

It is advertised to students on admission, who self select with the aid of a diagnostic test. It is taken up particularly by students who have not studied maths for several —sometimes over 30—years.

Students have found it extremely helpful in refreshing skills and building confidence. The problem is that the large number of late admissions means that many students who would have benefitted from the course do not hear about it in time.

The two or three Saturday classes arranged as follow-up throughout the year were welcomed but were too infrequent or too inconvenient to help very many students.

In 1995 the College appointed a half-time post of Study Skills Officer with the specific objective of extending maths support for science undergraduates. In an initial survey three issues emerged: the need for support in elementary mathematics for life and social scientists; a growing need for support in statistics; and a need for ongoing—rather than merely pre-sessional—support for physical scientists.

As a consequence we extended the pre-sessional programme in 1995/6 to include a parallel course in elementary maths and a short course in statistics, and introduced a short in-term course in basic maths for biologists and geologists, and a couple of Saturday schools in statistics.

For physical scientists a more flexible response to students' individual needs was needed. Therefore we have introduced, from October 1996, a mathematics drop-in workshop. This is open to all but particularly targeted at physics and chemistry students.

The workshop is staffed by two tutors for two hours a week. A small library of textbooks and various self-study materials are available. Students are encouraged to bring their own work.

Participation has, so far, been encouraging with students dropping in to ask questions about anything from Hilbert space to statistical sampling methods.

Problems are the difficulty of finding a time slot when students from several different courses are free (we have opted for Tuesday from 5-7 pm in order to cater for students who do and who do not have lectures that evening) and the wide disparity of interests which is heavy on tutor time.

Nonetheless the resource does seem to be greatly welcomed by those students who have used it.

Another interesting development in 1996/7 is an extension to the new maths module in the Chemistry BSc.. Experience of the first year of the new module indicated that the pace was too fast for some students and not challenging enough for others.

This year the department is thinking of offering an optional follow-up course using the Mathematica based module developed at Imperial College (see last issue of the Maths Support newsletter.)

It will be very interesting to see how this self-paced approach works with mature, part time students.

Many thanks to Paul King, Michael de Podesta and Peter Hughes for helpful discussions, and to all my present and past students.

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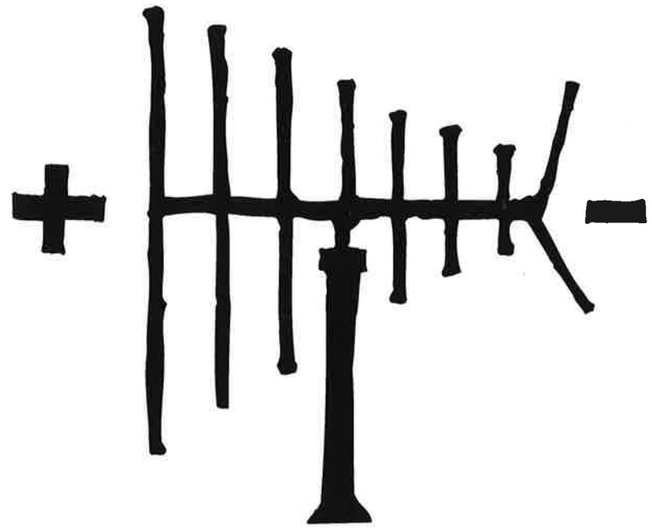
BBC Numeracy Campaign



Starting on 25 January 1997 the BBC began one of its mass campaigns aimed at improving the nation's skills. The theme on this occasion was numeracy. As usual the centrepiece of the campaign was a collection of motivational 'shorts' appearing after popular programmes such as Eastenders to maximise the audience.

In the past this strategy proved very effective — the Read and Write Together campaign in 1995 prompted more than 300 000 calls by adults interested in receiving the campaign pack.

The campaign is organised in collaboration with the Basic Skills Agency and hopes as one of its aims to encourage adults to enrol on mathematics courses at their local college.

As with other initiatives of this kind a helpline operated for the week of the campaign and offered callers a free booklet, details of a low cost CD-ROM and the possibility of one-to-one advice. The advice line refered callers to their local college.

As well as the shorts, popular TV series broadcast in the week (25th - 31st Jan) featured items on numeracy or maths. Radio 5 Live ran a campaign in parallel with the TV initiative. BBC2 also ran a number of special programmes on the theme:

An Education Special on different approaches to teaching and learning maths.

From Zero to Infinity an investigation into maths in the modern world.

Breaking the Code, a powerful drama about code-breaker and mathematician, Alan Turing.

In The Learning Zone targeted programmes for education was broadcast.

The popular **A Way with Numbers**, showing mathematics at work in everyday life was repeated in the FETV Collectables slot.

FETV Short Cuts provided a special compilation on **Application of Number** to help lecturers deliver this key skill to their students in an integrated way. Application of number is regarded as a key skill both for vocational and academic study. This compilation provides examples of number used in everyday contexts.

It is not designed to be a didactic teaching resource but to give lecturers and teachers contextual examples to help students see the relevance of mathematics to everyday life and how people use numerical skills to solve everyday problems. Suitable for use with students from foundation level up to level 3 GNVQ.

The sections are:

1. *How we learn maths*

A look at the theoretical underpinning to mathematical learning and why some individuals fail to learn, as a way of decreasing student anxiety and improving their potential for learning.

2. *Numbers in Sport*

Sports and games use number for measuring, scoring and developing patterns of play.

3. *At Work*

A variety of work situations from nursing to construction, where the use of number is demonstrated.

4. *In Leisure Activities*

Gardening, carpentry, cooking and photography are a few of the leisure activities that require some numerical ability.

5. *In the News*

We are daily bombarded by statistics, percentages, rates of exchange and enormous numbers by news reporting. Improving our mathematical abilities will help us understand what's going on in the world.

6. *Money*

We all need to understand something about money management if we are to survive.

As with other Short Cuts programmes lecturers could use each section to initiate or reinforce a course unit on the subject. In this case the contextualisation of numerical skills is designed to assist in their integration into vocational and academic courses.

In addition to the FETV programmes other strands in The Learning Zone provided valuable resources for mathetical learning:

✔ The open university had twelve programmes in the week ranging from Florence Nightingale's passion for statistics to how mathematics can save the blue whale

✔ The National Council for Educational Technology presented programmes on how to learn maths using IT

✔ The Small Business Programme looked at the importance of mathematical skills in running a small business

These resources provided by the numeracy week are a great asset for FE lecturers but the involvement of colleges in providing a first port of call for adults motivated by the popular TV campaign is essential to its success.

Gill Hind, BBC Education Adviser working on the campaign, comments on the vital role of the FE sector: 'We hope Further Education Colleges will see themselves as key partners in the campaign, especially since the target audience is people who are beyond the basic level. If they wish to progress further they need to access the courses only Further Education provides.'

She wants colleges to be ready for an increased interest in mathematics courses during this spring and if possible arrange some special drop-in sessions. Free posters and leaflets are available and this could provide a starting point for colleges to plug into the campaign.

For free posters and leaflets and any other information about the campaign ring BBC Education Information on 0181 746 1111.

Induction/ice-breaker exercise.

1: Pairs meet
2: Pairs meet in 4's and each introduces their partner from the pairing
3: New pairs—what do they want to get out of the programme they are doing
4: New 4's discuss that
5: New 4's discuss what they have learnt about the group and the institution
(No discussing individuals) and from that exercise each 4 produces a short statement.
6: Both seminar groups (52 people) get together and hear the statements.
What was really nice about the way it worked was that the students started spontaneously welcoming each other, saying how good it was to be in a group with different backgrounds, and offering each other help. The groups were identifying themselves as groups and assisting their own entry into them.

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Diagnostic Test of Numeracy Skills

Question 1
Subtract 1.78 from 5
Question 2
Take away 2.43 from 5
Question 3
Add together 5.5, 7.25, and 3.75
Question 4
What is the total of 4.25, 6 and 7.74
Question 5
Multiply 6 x 21
Question 6
Multiply 16 x 21
Question 7
What is the area of a room 11 metres x 18 metres?
Question 8
How many apples does each person get if a box of 72 is shared by six people?
Question 9
What is 15% of 700?
Question 10
How many children are there in a crowd of 7,900 if the proportion is 10 percent?
Question 11
What is 5/6 (five-sixths) of 300?
Question 12
How many books are not in a sale if a third are in the sale and the total number is 420?

This is the first diagnostic test which I feel comfortable using with adults wishing to study numeracy in Access courses. It may well be used on the first week with new students.

It provides an internationally and nationally tested set of questions which give a benchmark with which to place the numeracy skills of your class in a broader context.

The well chosen questions were based on numeracy skills found to be in everyday use. It has been recently used in a survey of 6,000 adults between 16 and 62 in seven countries.

42% of Japanese adults got all 12 questions correct, which was the best performance of any participating country.

Second to bottom were the Australians with 32% of them answering all correct. The English were last with only 20% able to answer all of these questions correctly and another 20% getting a score of 5 correct or less.

For further information, you may try to get in contact with the Adult Basic Skills Agency (see letters page for details).

Ian Beveridge
University of Luton

MATHS SUPPORT ASSOCIATION MEMBERSHIP APPLICATION

NAME _____

JOB TITLE _____

INSTITUTION ADDRESS _____

_____

_____

TEL/FAX: _____

E-MAIL _____

Are you willing to join the editorial board for the next newsletter?
YES/NO

Are you willing to help plan the next conference?
YES/NO

I enclose a cheque for £15.00, made payable to "The University of Luton."
In return, my institution will receive the next two copies of this newsletter and discounts for all delegates to the next conference.

RESEARCH INTERESTS:

_____

_____

Send to: **Ian Beveridge**
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Diagnostic Testing–Who's doing What?

Background

Early in 1995, a meeting of the 'Mathematics for non-Specialist Mathematicians' Working Group of the Open Learning Foundation (OLF) discussed the difficulties in mathematics experienced by the current generation of university undergraduates.

The general consensus of the meeting was that most members present used diagnostic testing in order to try to identify mathematically weak students and that most had devised their own tests.

Such a duplication of effort seemed unnecessary and a proposal was made by the author to conduct a survey into the extent and nature of diagnostic testing amongst OLF members (all, necessarily, being amongst the 'new' universities).

Those present agreed that the survey should, amongst other things, identify universities where diagnostic testing is taking place — together with useful contacts — and, further, give an indication of the level and method of testing with some ideas of 'best practice'. The resulting report would form a useful reference work in this area.

The Survey

The survey, conducted during July to September 1995 and restricted to courses in which Mathematics is taught as a non-specialist subject (Engineering and Business Studies, for example), used both a telephone questionnaire and a visit questionnaire.

The first gave an overview of work in this area and an analysis of the resulting data highlighted five universities for a 'visit'.

These were selected on the basis of providing different insights into the way that diagnostic testing is handled, namely:

— a single, paper-based, 40-question, multiple-choice test set at the basic numeracy and GCSE level,

— paper-based, student-centred assessments, staged over two semesters,

— a computer-based test using Diagnosys,

— a computer-based test using Question Mark Designer, and

— a paper-based test incorporating A-level mathematics.

Some Results

The survey showed that diagnostic testing is widespread, though not universal.

Telephone contact was made with lecturing staff directly involved with diagnostic testing within 22 of the 25 the OLF member universities.

Of the 22, seventeen were currently using diagnostic testing and two had tests under development. (It is possible that in the three universities for which no diagnostic testing was found, the appropriate contact had not been made.

Additionally, contacts that were made within a university would not necessarily represent all those involved within that university.)

Twelve respondents indicated that their tests include material at 'basic numeracy' level, of which 9 incorporated GCSE level Mathematics.

Eight respondents include material at A-level, although this forms less than half of the test.

Some respondents use several tests—tests tailored to a variety of courses.

All respondents use diagnostic testing for first-year students, with a large majority setting tests in the students' induction week in order to gain an early assessment of student potential and to target mathematics support.

Nearly all tests have been written by staff within each university - the only exceptions being material contained in proprietary computer-based test packages.

Although paper-based testing is commonly used, seven universities had recently introduced computer testing, in some cases complementing paper-based testing.

Three software packages are used: Diagnosys, Question Mark Designer and Maths Assessor.

The survey report (Edwards, 1996a) has been freely distributed to all OLF member universities through their OLF representatives.

A follow-up publication (Edwards, 1996b) offers information and advice to those involved with diagnostic testing - this being based upon the information and experiences obtained from the survey.

The latter publication is available directly from the Open Learning Foundation.

Publications

Edwards, P., *A Survey of Mathematics Diagnostic Testing on non-Specialist Mathematics Courses.* OLF, 1996a (distributed amongst OLF member universities)

Edwards, P., *Implementing Mathematics Diagnostic Testing on non-Specialist Mathematics Courses.* The Open Learning Foundation, 1996b

Peter Edwards,
Senior Lecturer in
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Distance Learning Using the Internet

Andrew Fitzharris is a senior lecturer in mathematics at the University of Hertfordshire.

He is Scheme Tutor on the BSc in Mathematics and is responsible for the day-to-day running of the mathematics courses on the engineering and science programmes.

His academic interests include mathematical modelling, numerical analysis and computer simulation. He has used IT aids such as spreadsheets, computer algebra and modelling packages in his teaching for many years.

INTRODUCTION

AT THE University of Hertfordshire there is considerable interest in distance learning. It is hoped that this form of teaching will attract additional part-time students to the university, save staff time and encourage students to learn independently.

This year one of the major initiatives in this area has been the development of a distance learning package on the Internet. The system is designed to introduce students to the PC version of the spreadsheet package Excel.

The Internet was chosen as the medium for this system because of its availability on and off campus and because it would support the development of an interactive, multi-media system.

Excel was chosen as the subject material because of its popularity at the university. The package is taught to hundreds of students each year across a wide variety of disciplines and is also used extensively by the teaching and administrative staff.

THE EXCEL SYSTEM

The Excel system consists of a title screen, an alphabetic index and three lessons.

Figure 2

These components are interlinked as shown in Figure 1 *(right)*. The students can move around the system by clicking on buttons and 'hot words' embedded within the text.

The title screen contains the university logo, the user instructions and the main menu. (See Figure 2: *previous page*).

The lessons contain the main subject material.

Lesson 1 considers basic spreadsheet skills such as creating a worksheet containing text and numbers, navigating around a worksheet, using the on-line help facilities and saving a worksheet.

Lesson 2 considers editing, formatting and printing a worksheet and lesson 3 considers more advanced topics such as formulae, producing charts and diagrams and exporting spreadsheet data to a word processing package.

All of the lessons have exercises embedded within them at various points so that the students can practice the spreadsheet skills being considered. Figure 3 *(below)* shows a typical lesson screen.

The alphabetic index contains an ordered list of the spreadsheet skills described within the system.

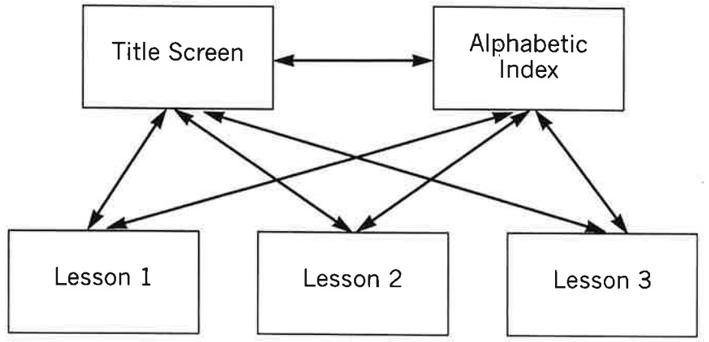
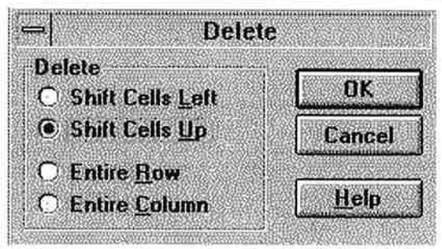


Figure 1

- Choose *Edit, Delete*. If you are deleting an entire row (or column) then Excel will automatically shift the remaining cells up (or to the left) to replace those you have removed . If you are deleting an individual cell or a range of cells then Excel will display a dialogue box below to enable you to specify how the deleted cell should be replaced.



Main menu page

"Clear the contents of cells."

Index for lesson 2

Exercise 6

Figure 3

Students wishing to learn a particular skill (e.g. Add Borders and patterns to cells) can scroll down this list to find the required topic and then click on the entry to display the appropriate instructions. (See Figure 4: *below*).

USING THE SYSTEM

The university has been given permission by Microsoft to make the system available on the Internet. However, access has been restricted to ensure that the system can be used only by registered students at the university.

In September a pilot study will be undertaken in which the system will be used to teach Excel to students on the first year of the mathematics degree. The students will be expected to work through the lessons and the exercises in their own time and at their own pace.

To ensure that they participate in this study the students will be expected to submit solutions to selected exercises.

The marks awarded for these solutions will then form part of their assessment.

Staff-student interaction will be conducted largely via email. Students will be able to communicate with their supervisor and the other students using the system via an Excel Users News Group.

If this pilot study is successful then it is planned to use the system with other groups of students during the following year.

FURTHER DEVELOPMENT OF THE SYSTEM

In parallel with this pilot study it is intended to develop an enhanced version of the system.

This will include improved navigation facilities, better screen layouts, more user interaction and will incorporate multi-media features such as screen dumps with embedded 'hot spots' and animation's which simulate the use of Excel.

It is hoped that the enhanced version of the system will be ready for use in September 1997.

CONCLUSION

The use of distance learning at the University of Hertfordshire is likely to continue in the future. It is hoped that within the next few years the university be able to offer whole schemes of study in distance learning form.

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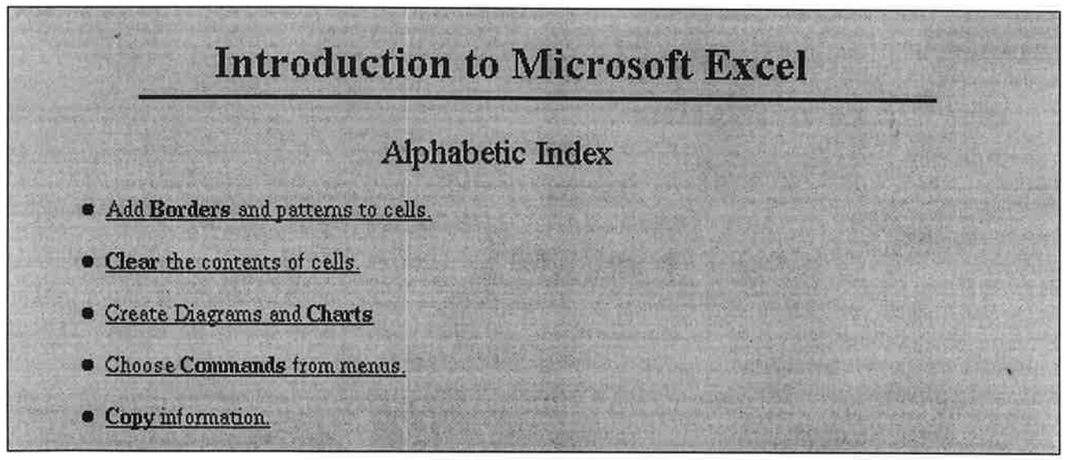


Figure 4

Maths Support for Students with Visual Impairment

Providing support for students in mathematics concerns not only those who find the subject daunting but also those who have special needs of other types.

This article describes the experiences of Alan (not his real name), a school-leaver with fairly severe visual impairment, who embarked on a mathematics A level course at Suffolk College.

The First Term

Alan arrived with a range of GCSE's, including mathematics, and the desire to take A level maths to support an A level in computing, his main subject.

His visual impairment was such that he could read printed text only with the help of a powerful magnifying glass, which only focussed on a few words at a time and was of little help in viewing larger diagrams such as graphs or geometric constructions.

He had a small telescope with which he endeavoured to see the white board, although this was still difficult even when care was taken by the lecturer to make the writing particularly large and clear.

He could not see well enough to write or draw confidently himself with pen and paper. He could, however, read fairly comfortably from a computer screen (being backlit), and had well developed keyboard skills for touchtyping text.

The first few weeks of class were a challenge, not only for Alan but also for the lecturers, who had no recent experience of students with this kind of special need.

It soon became apparent how much mathematics is a visual process. Simple algebra operations, such as the two-step transposition of **y = ax+b** into **x = (y–b)/a,** rely as much on visual identification of the terms and pattern recognition as on a breakdown of the composite functions and their inverses.

Try explaining to students with no prior knowledge how to go about solving equations such as **4(2+3x)–3(1–2x) = 95** without waving your hands about, pointing at the negative signs, underlining like terms in different colours, etc! All of this would have been a distant blur to Alan.

We also quickly noticed just how much the exposition of mathematical techniques relies on the use of verbs such as "look at", "look for", "can you see", "identify", and so on. How frustrating this must be for a student who is partially sighted.

> ***It soon became apparent how much mathematics is a visual process***

Alan brought a small cassette recorder into classes to tape the lessons, which he would transcribe on his computer at home. Who has ever listened to an audiotape of their own maths teaching? It is a salutary experience!

Rarely is a sentence fully formed and there is continual use of words such as, "this", "that", "here", "down there" etc. as reference is made to written statements or diagrams. And do we realise just how imprecise we often are in the description of what we are doing?

Ask yourself how you would read the expressions: **2(x+1)** or **1/(x–3)**. Of course, when pointed out in isolation like this, it is easy to spot the potential ambiguities but in the maths classroom they crop up at every turn.

Equally worrying, we felt, was our own inconsistency in reading mathematical expressions. We tend to use alternatives which we consider equivalent (such as "two into x plus 1", two times brackets x plus one", and "two…(pause)…x-plus-one.) and rely on the students looking at what we have written to make sense of our utterances.

Too often (I claim) what we say when standing at the blackboard serves more the purpose of proving to our class that we are still awake than of providing a sufficient verbal statement of what we are doing. The analogy of football commentary on television compared with that on radio seems appropriate.

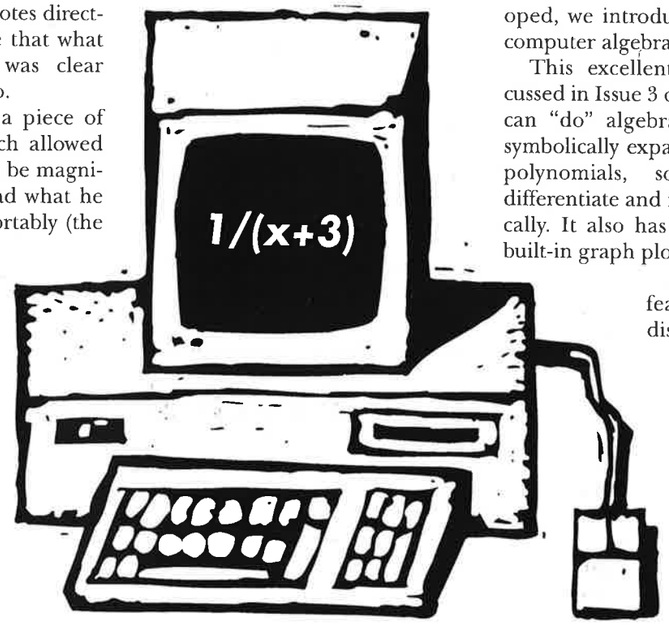
The recognition that a student such as Alan was in the class and would be relying on an audiotape of the lesson to understand the subject matter heightened our awareness of this matter.

But is it not a worth while aim for all of our teaching to endeavour to keep ambiguity and inconsistency to a minimum? If we do not do so, are we not inadvertently compounding the problems students have in understanding what is going on? Imagine Alan is sitting in on every class!

The Second Term

In the meantime, Alan's special needs had been diagnosed more clearly by the college's student services. He now had his own laptop computer, which he brought into classes.

His keyboard skills were such that he was able to make a reasonable attempt at taking notes directly—provided or course that what we as teachers said was clear enough for him to do so.



The computer had a piece of specialist software which allowed sections of the screen to be magnified. He could now read what he was writing fairly comfortably (the backlit computer screen was essential for this), and refer back to it immediately. Alan could now contribute more to class discussion, for example by recalling key formulae or steps involved in a calculation.

An extra hour of one-to-one tuition in mathematics was provided for Alan from special needs funding. This was generally given by the same maths lecturer immediately after the main lesson of the week. It allowed the lecturer to "proof-read" on the computer what Alan had noted in class, to ensure that he had an accurate set of notes and to clarify any details of methods.

The lecturer could also load into Alan's machine the word processor file of any handouts issued in class and at the same time take away on floppy disk a copy of the work Alan had done at home to check through.

An obvious requirement was to ensure that the software was common—in our case Microsoft Word v. 6 under Windows 3.1.

It was during these computer based sessions that both Alan and the lecturer learned to exploit a range of features of the word-processor, such as short-cut character allocations, for example, ALT+a for alpha and CTRL+SHIFT+= for superscript.

Judicious use of copy and paste allowed Alan to concentrate on the overall structure of mathematical methods rather than spending time retyping the routine explanations.

We also discovered that is is possible to copy and paste simple arithmetical expressions into the Windows calculator, press the "=" button to get the answer and then copy and paste this back into the document. (Not a lot of people know that!)

In short, the use of modern computer technology (Alan's first love) provided considerable motivation to grapple with the sometimes complicated mathematics.

The Third Term

As the algebra in the course became more demanding and the concepts of calculus were developed, we introduced Alan to the computer algebra software Derive.

This excellent program (discussed in Issue 3 of this newsletter) can "do" algebra. For example, symbolically expand and factorise polynomials, solve equations, differentiate and integrate analytically. It also has a very versatile built-in graph plotter.

An invaluable feature is how it displays algebra in "pretty print", with fraction lines, superscripts, brackets and the like in their proper positions. Alan no longer had an excuse for keying in **1/x+3** when he meant **1/(x+3)**.

Using Derive, it is possible to annotate your work and save it to disk. Alan soon learned to produce solutions to standard A level style problems as a Derive file.

Admittedly, he used Derive to perform the differentiation and solve the equations but we do not consider that that is "cheating". The technology is there to be used by those who need it despite what the exam boards say!

A student can demonstrate understanding through clear explanation and comments throughout and it is also possible for the lecturer when viewing the Derive file on screen to verify that each step is properly structured and the correct syntax used.

The Second Year

Supported by the technology, Alan continued to progress with algebra, calculus and related areas. He also used his knowledge of

spreadsheets to look at sequences and series, tables of function values, and graphs.

At the same time, there were some topics which he still had difficulty coping with, such as geometry and trigonometry, which rely on visualisation and diagrammatic constructions. (There were simply not enough hours in the day to start playing with geometry packages such as Cabri or Sketchpad.)

Also, we made the decision not to embark upon any mechanics or statistics work. Instead, Alan spent time putting together a portfolio of work on the topics of pure maths he had covered, ending up with an impressive folder of documents generated using Word, Excel, and Derive.

His pride in this achievement was considerable. In June, he sat the AS exam in pure maths. Sadly, though not unexpectedly, the examining board did not make many concessions to Alan's visual impairment.

An exam paper was sent with slightly larger type than usual, which Alan still had difficulty reading. He was permitted to produce his answers on a word processor under strict supervision but not to use any of the other software tools he had mastered.

The board would only allow an extra 25% of time, which was inadequate for Alan's special needs. He failed to achieve a pass grade.

Conclusions

Technology is often the key to providing appropriate maths support for students with special needs. Visual impairment is one scenario when meaningful communications can take place via keyboard and screen.

Such students can also "do" mathematics, although the process might rely on the mastery of specialist software rather than on the mastery of pen-on-paper.

The experiences and lessons learned when working with students such as Alan can make us aware of issues in understanding and delivery which should allow us to enhance our delivery to all students.

Footnote

Alan has been accepted onto a Higher National Diploma course in Software Engineering, where his experience of doing mathematics in a computer-based environment has already given him a head start over most of his peers.

David Bowers
Mathematics Workshop
University College Suffolk
Ipswich IP4 1LT

Psycholinguistics

*"Colourless green ideas sleep furiously"**

Baffled by this new-ideas-crammed book, you put it down;
Read but not comprehended.
The colourless ideas creep into your subconscious.
They doze, one eye open, watching.

Happy, understood ideas,
Happy, at least thinking-that-they-are-understood ideas,
Preen and frolic in the forefront of your mind;
Iridescent;
Sparkling'
Mocking the envious, hidden seas of thought.

One day, your conscious mind,
(Temporarily unoccupied while awaiting a bus),
Becomes a kaleidoscope.
Drab, muddled concepts flash out, smelling delicious;
Your head feels like bunch of freesias;
When the bus comes, you forget to get on it.

It is the waiting that counts, the vernalisation.
Until this is accomplished, furiously sleep ideas

* This is Noam Chomsky's example of a nonsense phrase but it isn't a nonsense phrase; it contains a concept.

June R. Pitcher
Dept. of Mathematics & Statistics
University of Luton.

Letters

GENERIC MATHS AND NUMERACY UNITS

Does anyone out there have an example of a maths, data handling or numeracy unit offered across an institution to students from different disciplines? Cheltenham & Gloucester have one called 'confidence counts'—does anyone else?

If so, I'd be interested to know brief answers to the following:

(1) content and level of unit
(2) is it credit rated?
(3) how do you deal with students who already have a higher level maths qualification—e.g. A level?
(4) how is it taught?
(5) How do you make it an attractive option for students, or is it compulsory for some students?

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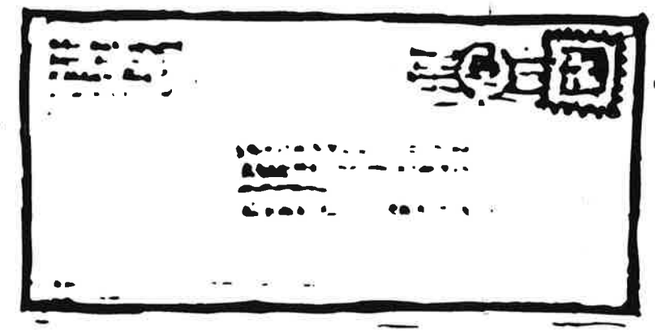
0171 753 5116
0171 607 2789 x 2889
0171 753 5012 fax
s.cock@unl.ac.uk

COOPERATIVE GROUPS

Is there anyone interested in sharing information about small group learning practices in maths. I am particularly interested in the kinds of problems you have which work effectively with this environment.

How do you inform or teach students about effective small group behaviour? To what extent can you mix abilities? Does anyone 'teach' students how to listen and be supportive? Are there varied environments where small groups solving problems dovetails into whole class efforts to crack larger, more complex problems?

Ian Beveridge, Univ. of Luton



THE PHANTOM POSTMAN

Thanks for sending the Newsletter. I'm not sure how you got my name but thanks anyway. I'm also uncertain if the University subscribes to the Association or not. If not I intend to do something about it. Plenty of 'negatives' here but I see the newsletter as a positive means of helping us all.

I've only just moved into the University field (on a part-time basis after taking early retirement from a Sixth Form College)so all this is very new. One of the jobs I'm trying to do is to help departments face up to the situation they face rather than moan about 'what it was like'!!

Pity the Nene College conference was cancelled through lack of support—I'd been looking forward to it.

Don Maskell, Univ. of Hull

SHOULD MATHS BE TAUGHT AS SEPARATE UNITS OR IN CONTEXT?

My engineering school is currectly considering ways in which we can best teach maths. We have two proposals:

1. Teach maths as separate units; e.g. Maths 100, Maths 200.
2. Teach maths within other engineering units on a need-to-know basis.

An advantage of the first approach is that students may get a deeper and wider coverage of the material thus leading to better understanding of a wider range of concepts.

An advantage of the second approach is that students immediately see the applicability of what they are taught, rather than doing maths for maths sake. This may lead to a greater motivation to learn and use the material.

I'd appreciate any comments from staff or students in science or engineering schools on these approaches. For example, how is maths taught in your course? Which of the proposals above is stringer?, etc.

I will summarise and post the replies I receive. We very much appreciate your input. Thank you in advance.

Cheers,
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FAX:(+61 9) 351 2584

CALM

Thanks for the copy of the Mathematics Support. It makes interesting reading. You might possibly be interested in some of the things we do here in the CALM area. Dr Martin Greenhow and his team lead this work which has been going on for a number of years.

John C Newby,
Brunel University.

BASIC SKILLS AGENCY

My name is Elspeth Everitt and I am the librarian in charge of the Basic Skills Agency Resource Centre in the Institute of Education library.

The Centre is funded by the Basic Skills Agency and is a collection of practical teaching materials. We were established in 1993 to collect adult oriented materials but will be expanding during 1996 to include resources for basic skills support in secondary schools.

The collection does not include software.

The collection in available whenever the library is open :

Term-time:
Monday–Thursday 9.30–8.00
Friday 9.30–7.00
Saturday 9.30–5.00

Phone to check vacation opening hours—0171-612-6080 (main library enquiry desk).

If anyone comes across new, useful resources for maths support please let me know. I work part-time but will reply to requests for information on resources as soon as possible.

Elspeth Everitt
Basic Skills Agency Resource Centre, Institute of Education library
20 Bedford Way
London
SW1H 0AL
Tel: 0171-612-6069
Fax: 0171-612-6093
Email: e.everitt@ioe.ac.uk

JUMPING IN.

Thanks for the copy of the Newsletter. It's interesting to see what other people are trying to do, and how they feel about it. I don't know if you know about our Maths Support project at King's: Peter Gill is running special tutorials for engineering and physical science students with especially weak maths backgrounds. It's only been in place for a year, so we haven't really had a chance to evaluate it yet.

By the way, I'm pretty sure I didn't say that the lectures became easier to write (see previous issue leader). What happened was that at first they were no harder than before, but that was only because I didn't take full advantage of the technology! I suppose what it amounted to was that I could slowly improve my use of the system in the lectures, but with the exercises I had to jump in at the deep end.

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Fax +44-171-873-2017

GUTTER PRESS

It was good to see my article finally in print. You never told me about your background in tabloid journalism ("Even superbly qualified students may have had no exposure to complex numbers")!

Dr Phillip Kent
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The METRIC Project
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http://metric.ma.ic.ac.uk/

"What does not change / is the will to change"–Charles Olson

HELP WITH RESEARCH INTO ADULT NUMERACY WANTED.

I am currently undertaking some work on the mental computational skills of adults. I am looking into the varieties of mental methods that adults use to calculate basic arithmetic.

I am particularly interested in how, if at all, adults who have limited computational skills can be helped to develop them.

I would be pleased to hear from anyone who has any experience or knowledge in this area or who could recommend any useful literature.

tel: 01525 872726
e-mail:
100754.2157@Compuserve.Com
Kathy Bocutt.

Useful WWW addresses

MEANS, Statistics Teaching & Learning Network:
http://www.maths.nott.ac.uk/rsscentre/means/means.html

E-mail mentoring (great idea):
http://maths.ntu.ac.uk/nd/www/communicating/lectures.html

Follow this screen for job postings and conferences:
http//www.niss.ac.uk

SEE PAGE 19 FOR MORE USEFUL ADDRESSES

Conferences & Seminars

REVIEWS

HEFCE Mathematics Learning and Assessment: Sharing Innovative Practices

The ever increasing demands in the teaching and learning of mathematics brought about by such things as reducing resources, teaching quality assessment, larger classes and diverse entry points to degree courses will have presented problems. It is very difficult in these circumstances to continue to make mathematics teaching and learning accessible to students.

The HEFCE Effective Teaching and Assessment Programme (ETAP), with five funded projects across several disciplines, attempted to provide workable solutions. Within ETAP, the Mathematics Learning and Assessment project has addressed some of these issues to help staff to manage these changes and to breathe new life into courses.

The project has run developmental workshops throughout the UK and a national symposium at the University of Birmingham and the Mathematics Learning and Assessment pack is a further product from a large consortium of 15 universities.

Mathematics can be a conceptually difficult subject to understand and special teaching methods are often required. The Mathematics Learning and Assessment pack meets the challenge of both sharing innovative practices amongst teachers and also engendering a delight for mathematics amongst students.

The pack—consisting of a boxed set of a video and five booklets—presents best practice teaching methods in mathematics and forms an essential and useful resource for all mathematics teachers and mathematics departments.

It is relevant to teachers of mathematics at all levels up to senior undergraduates and it will be of interest to those teaching mathematics in other disciplines such as engineering and business studies.

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Research and Practice in Adult Basic Education

Goldsmiths College and FEDA held a series of 6 seminars on research and practice in adult basic education.

The first seminar, on 7 November, was entitled, 'Meaningful Maths in Context', with Diana Coben, Head of the Higher Degrees in Education programme at Goldsmiths College and Chair of Adults Learning Maths—A Research Forum (ALM).

Other seminars in the series covered a range of topics, including using television in adult learning and learning support and refugees in FE.

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(messages 0171 919 7302)
FAX: (+44) 0171 919 7313
Internet: aea01dcc@gold.ac.uk

UPCOMING

Mathematics Diagnostic Testing and Following it Up!

a Day Conference on **Wednesday, 12 March, 1997**

Peter Edwards is organising this conference which will take place at the Open Learning Foundation's headquarters in London. For further details, contact Peter at:

Department of Product Design and Manufacture,
Bournemouth University,
Studland House,
Christchurch Road,
Bournemouth
BH1 3NA

Situated Cognition in Mathematics

a Day Conference on **Friday, April 11th, 1997**, 9.30 am to 5.00 pm

This conference continues and develops themes discussed at a day seminar here with Jean Lave on May 3rd 1996, at which numbers were limited.

We are able to accommodate many more for the conference, and attendance at the seminar will not be assumed. Familiarity with Jean Lave's work, or related ideas, will be helpful.

If you wish to have copies of the wide-ranging discussion notes and transcripts from the seminar, please indicate on the form below.

Apply to: c/o Anne Watson,
Oxford Mathematics Education Research Centre
University of Oxford
CALL FOR PAPERS

The day will be well structured to enable significant discussion in the following areas:

Adults and workplace mathematics

Mathematics in home/school/ preschool

Classroom cultures

Computer Environments

Participants are asked to choose a working group for the day, and any participant may submit a paper to their chosen group.

Papers will be distributed to those who have signed up for a group for reading in advance of the conference. There will be no presentations actually on the day.

We ask all participants to read the papers sent so that work for the group can be planned on the assumption that the contents of the papers are known. This is critical to the success of the day.

Anne Watson & Barbara Jaworski
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Department of Educational Studies
15/28 Norham Gardens
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Great Britain
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Fax: 44 01865 274027
Email:
anne.watson@edstud.ox.ac.uk

The Seventh Bridging Mathematics Network Conference in 1997, Auckland, New Zealand

Saturday 12 July to Monday 14 July 1997

The Bridging Mathematics Network (in Australasia) was established about 6 years ago to provide a support group for all teachers of bridging mathematics and statistics — practitioners sharing ideas or researchers sharing findings. Members of the Network come from a variety of institutions and teach in a variety of settings.

These include university lecturers involved in teaching pre-tertiary mathematics for service courses/papers, to those involved in teaching numeracy skills to industrial workers. The interests of the group are as wide-ranging as the membership.

The annual conference provides an interactive forum for the presentation of ideas and results in the teaching of bridging mathematics, and the chance to meet and mix with others in this area. The conference has traditionally maintained an informal atmosphere, and that tradition will continue next year.

The presentations may be of three types:

1. a paper relating to the theory of bridging mathematics or reporting on research (20 minutes).

2. the sharing of practical teaching strategies either in a one hour workshop or through a short 10 minute presentation.

3. a poster display.

Costs for registration and meals will be approximately NZ$200. Accommodation on Saturday and Sunday nights costs an additional NZ$41 per night. Accommodation at Grafton Hall is available both before and after the conference at extra cost.

Expressions of interest in presenting a workshop, a paper or a poster are welcome. An abstract (100-150 words) will be required by early May 1997 and the full paper by early June 1997.

The conference is being organised by representatives from several Auckland institutions involved in bridging mathematics programmes: the University of Auckland (Mathematics Education Unit and Student Learning Centre), Unitec Institute of Technology, Auckland Institute of Technology, and Manukau Institute of Technology.

This Bridging Mathematics Conference follows the Twentieth Annual Conference of the Mathematics Education Research Group of Australasia (MERGA 20) to be held in Rotorua, New Zealand, from 7-11 July, 1997. Convenor: Andy Begg, University of Waikato, PB 3105, Hamilton, NZ. Email:

a.begg@waikato.ac.nz

A day long workshop is also planned prior to the Bridging Mathematics Conference. It is entitled "Mathematics Education for Undergraduates", and will be held at the University of Auckland on Saturday 12 July.

For more information contact Bill Barton (barton@math.auckland.ac.nz), or Jan Thomas (JanThomas@vut.edu.au).

Please reply to:

Barbara Miller-Reilly
Bridging Mathematics
Conference Convener
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barbara@math.auckland.ac.nz
Phone:
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Fax: +64 9 3737457

Web Pages

DELIBERATIONS

DeLiberations is a new interactive WWW magazine about teaching and learning in HE. There are now some pages about maths. Look them up, if you can, on

http://www.lgu.ac.uk./deliberations/

and see if there's anything you could contribute?

MATHS SOFTWARE FOR SECONDARY SCHOOLS

http://ncet.csv.warwick.ac.uk/WWW/projects/cits/maths/software.html

this web page gives information about a 1996 catalogue of maths software and should include anything around for GCSE!

To get the booklet send an A4 envelope with £1.40 stamp to:

NCET (National Council for Education Technology)(maths)
Milburn Hill Rd
Science Park
COVENTRY CV4 7JJ

MATHS SUPPORT LIST

Mailbase has changed the name of the MATHS-SUPPORT mailing list to LEARNING-MATHS. We have done this in order to redefine and broaden the remit and coverage of the list.

The description of the new list (in 300 characters!) is:

"Links: maths and numeracy teachers, researchers in post compulsory education. Emphases: adults, other students outside traditional education, learners in colleges and universities for whom maths is ancillary. Based on: Adults Learning Maths Research Forum, Maths Support Network."

One specific change is to include issues to do with adults and their learning of maths. We could define our interest by exclusion, that is to say, we are concerned with issues to do with maths learning and teaching in the post school sector, except for mathematics specialists. (They have their own specialist interest groups).

This is because vast and increasing numbers of students take maths and numeracy courses as part of their studies; success at maths is a stepping stone to educational successes.

The teaching and learning issues of these students are not the same as for the highly motivated student of mathematics.

There are well over 100 members of this list, both in and outside the UK.

You can use it to have discussions, collect information, or announce events.

To send a message to the list, just address it to:

I N % " L E A R N I N G - MATHS@MAILBASE.AC.UK"

(as from 1st November). You will get a very wide coverage among those that teach and research into maths among over-16s in the UK.

Anyone got a burning issue they want to raise???

Sybil Cock
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University of North London
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London N7 6PP
0171 753 5116
0171 607 2789 x 2889
0171 753 5012 fax
s.cock@unl.ac.uk

Useful WWW addresses:

Learning Maths (maths support) list (includes back copies of this newsletter):
'join learning-maths' to:
mailbase@mailbase.ac.uk

Innovations in Student Learning
'join isl' to:
mailbase@mailbase.ac.uk

CTI mathematics (TLTP projects):
http://www.bham.ac.uk/ctimath/

CTI statistics (TLTP projects):
http://www.stats.gla.ac.uk/cti/

Deliberations journal deals with teaching and learning issues in FE and HE:
http://www.lgu.ac.uk/deliberations/home.html

ALM newsletter (Adults Learning Maths Research):
http://www.gold.ac.uk/alm/welcome.html

Women mathematicians:
http://www.mailbase.ac.uk/>

Adults into the equation:
http://www.leeds.ac.uk/educol>

ATM (Assoc. Teachers of Maths) Annual Conference:
http://acorn.educ.nottingham.ac.uk/SchEd/pages/ATM/conf.html

Teaching Maths Effectively Conference (24.4.97)
http://www.brookes.ac.uk/services/ocsd/ocsdhome.html

IF YOU HAVE ANY MORE USEFUL W3 ADDRESSES, PLEASE CALL THE EDITOR.

SURVEY: *Learning Support for Mathematics in FE and HE*

A survey of the amount and quality of support for learning mathematics by non-specialist learners was undertaken over the summer.

In the first National Conference for Maths Support, it was suggested we measure the extent of the different support activities of those teaching maths in FHE. We did so and published the results in the first issue of *Mathematics Support*. The diversity of initiatives was established but not the amount or quality of them.

Higher Education has been replaced by Further Education as the main area of expansion of student numbers during the past three years. There are enough changes in education over this period to warrant a second look at how those teaching maths have developed their work.

Tensions between FE and HE surface occasionally and a comparison between the various sectors of tertiary education is probably long overdue. Moreover, funding squabbles over a shrinking amount of 'real' money have emphasised, along with those league tables, the differences between new and old universities.

Colleges of Higher Education, often renamed now as University Colleges, have developed links with local universities and produce most of the nation's maths teachers.

They have a specific interest in teaching and learning mathematics and may be expected to be pioneers in support issues.

This current survey sets out to compare these sectors in the way they teach and support mathematics learning.

Table 1

TYPES OF LEARNING SUPPORT IN MATHS IN FE AND HE

Questions	Count	% of all FHE
Do you run bridging courses?	**124**	**62.0**
Do you offer Tutoring in support of lectures?	**124**	**62.0**
Do you use paper based Open Learning material?	**113**	**56.5**
Is there a drop-in workshop?	**111**	**55.5**
Do you use Computer Assisted Learning? (C.A.L.)	**105**	**52.5**
Do you use diagnostic tests at induction?	**99**	**49.5**
Do you have Maths videos for student use?	**61**	**30.5**
Have you numeracy classes?	**51**	**25.5**
Are there peer assisted study sessions?	**46**	**23.0**

1 missing case; 200 valid responses out of 201 institutions

Table 2

PERCENTAGES OF TYPES OF LEARNING SUPPORT IN MATHS BY EACH FHE SECTOR

	Old Universities	New Universities	HE Teaching	FE Colleges
Bridging Course	**73**	**67**	**34**	**77**
Tutoring	**86**	**79**	**81**	**41**
Open-Learning	**29**	**57**	**54**	**91**
Drop-in Workshop	**31**	**64**	**38**	**86**
C.A.L.	**47**	**73**	**37**	**54**
Diagnostic tests	**57**	**83**	**56**	**82**
Videos	**13**	**37**	**37**	**41**
Numeracy classes	**77**	**89**	**56**	**n.a.**
Peer study help	**24**	**27**	**34**	**13**

Table 2 is organised by frequency of use as reported in table 1. The current development of numeracy classes for first year undergraduates is understated since this development was not applicable to FE colleges, whose main work is GCSE retakes.

The numbers reported are the percentages of valid responses answering 'yes' to providing that form of support service.

Background

The percentages of 18 year-olds in the UK continuing study after school has risen fourfold between 1972 and 1992. The populations of students in each part of FE and HE have changed qualitatively as well.

The low rating on Numeracy in a recent survey by the Basic Skills Agency (*see page 7*) tells us that all age groups in Britain are below every other country. However, the expectations of success by young people in FE and HE have never been higher.

As a result, problems of supporting the learning of maths for non-specialist students of mathematics have emerged.

Another trend of the last two decades is the decline of service teaching. Apart from the decline in Engineering and Science courses, local financial accountability has encouraged many departments to 'hang on to their FTE's (full time students).

Moreover, the tendency for maths to be learnt in context has added to this decline. For example, the British Psychology Society insists that only psychologists teach statistical methods or they won't recognise that institution's psychology degree.

As a result of these changes, more maths is taught outside of maths departments and there is not often a co-ordinated response to student needs.

Initial Conjectures

The amount and depth of support of non-specialist learners of maths depends on the:

- method of financing
- teaching problems
- students' existing study skills
- particular sector of FHE.

Steps in the Plan

1. Update the survey of maths support (*see Issue 1*)

2. Apply for a grant to develop a 'handbook' (*see Peter Samuel's article on page 23*)

3. Involve maths educators in routine discussions on all related issues.

Survey Methodology

A survey was undertaken three years ago that quantified the amount and kind of support being given to non-specialist students of maths (1). An attempt has been made to keep to the sets of questions applied at that time.

Typical responses to these questions have now been identified and it became apparent more precise responses would require supplementary questions.

In addition, over the last three years the question keeps arising as to how similar are the needs of FE and of each part of HE.

It was decided to survey about 50 institutions from each of: (i) the traditional university sector; (ii) the new university sector; (iii) the other HE colleges (mainly teacher training); (iv) FE colleges.

All institutions from the first three sectors were contacted and a random sample of FE colleges were chosen from among those having maths departments.

Table 3

A COMPARISON OF STUDENTS' MATHS SKILLS SINCE THE INTRODUCTION OF GCSE

SKILLS	Old Universities	New Universities	HE Teaching	FE Colleges
Algebra	worse (92%)	worse (96%)	worse (78%)	worse (91%)
Algebra range	more (69%)	more (69%)	same (63%)	same (65%)
Numeracy	worse (89%)	worse (87%)	worse (69%)	worse (74%)
Numeracy range	more (69%)	more (69%)	same (52%)	same (60%)
'Ability to Learn'	better	better (67%)	better (46%)	better (45%)
Technology	better (85%)	better (100%)	better (88%)	better (94%)
Problem-Solving	worse (67%)	better (67%)	better (39%)	worse (57%)
Reading maths texts	worse (44%)	worse (50%)	worse (41%)	worse (54%)
Talking about maths	better (50%)	better (83%)	n.a.	n.a.

An initial telephone survey discovered who was in charge of supporting students' learning maths, if anyone, or who was in charge of service teaching, if anyone, or who was the head of the maths department, if there was one.

This was followed up by a correctly addressed postal survey.

The more complete and unambiguous responses were kept and formed about 20% of the sample selected. The remaining 80% of the sample were contacted by telephone.

Observations

- The outstanding observation was that maths teachers are in equal need of support as their students.
- Maths departments in the new universities would appear to be in decline and in some cases even disappearing altogether.
- Maths education departments in traditional universities rarely were aware of the learning support facilities of the mathematics departments in their own universities.
- There is a need to develop bridging courses between GCSE and A level mathematics.

Results

The assessment of current students' maths skills shouts out from all sectors of a decline in basic skills — both of algebra and numeracy.

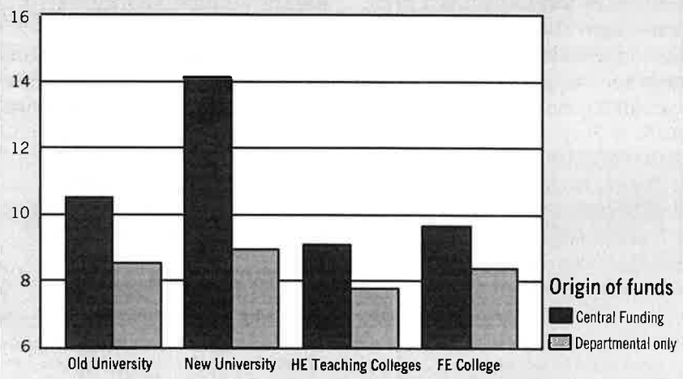
FE and HE colleges observe a mean shift downwards in these skill levels and the universities perceive increased variability as well.

Moreover, many institutions feel that students' ability to read mathematical texts and to cope with open-ended problems has not improved. However, the low skills in these latter areas were felt to exist even before the changes of the last decade.

Students' abilities to learn new

AMOUNT OF MATHS SUPPORT BY TYPE OF FUNDING AND BY INSTITUTION

Diagram 1:



material and to cope with computers and calculators is improved and offers a direction for new teaching materials.

More problematic is the interpretation of students' increased willingness to talk about maths. Some feel that students are willing to challenge fundamental ideas on the haziest of understanding and so slow up the process of learning.

The detail of the support offered suggests a lack of funds and time to develop in-house specific support for students.

The case of computer assisted learning is an example where almost all FE colleges offering this support use Topclass and most new universities have tried only Calmat or Mathswise.

The number innovating and producing in-house programs is very small. It was decided to develop a scale of maths support in order to compare the amount offered by institutions which had some central funding with those having none.

Institutions in new universities and HE colleges sectors split about 60:40 in favour of departmental funding only; the old university sector splitting 80:20 in the same direction but the FE colleges split 60:40 in favour of central funding.

A Scale for Maths Support was created by combining all the support initiatives of table 1 into one variable. Supplementary questions from the telephone survey enabled a 5 point scale for each support area to be developed based on how much support was offered and how well integrated the support is to lecture material.

A second scale was devised to measure the perceived extent of the problem. The first seven of the categories of table 3 were transformed into three-point scales and then summed to constuct one 'problem-scale'. The three levels were (1) better, (2) same, and (3) worse.

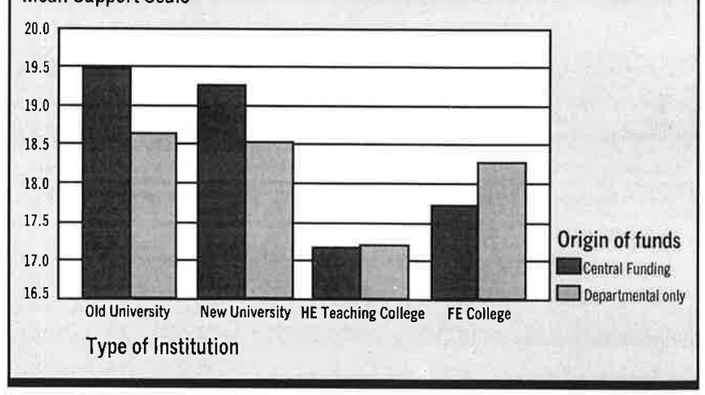
Diagram 2 presents the results of this problem scale where a score of 21 represents an institutional view that all seven study skill characteristics were worse. A score of 14 would represent the view that little has changed. All sectors of FHE perceive students as being less well equipped than before recent changes to GCSE.

The extent of the problem and the response to it by learning support initiatives were believed to correlate. The problem scale was used to filter out that effect before analysing the effect of type of funding and institution.

The result of this simple ANOVA

PERCEPTION OF PROBLEM BY INSTITUTION TYPE

Diagram 2



analysis with a covariate was a significant main effect for type of funding ($p=0.003$) and for type of institution ($p=0.042$).

There was no significant interaction between funding method and institution type ($p=0.296$) as might have been supposed. Maths departments with central funding scored above 10.5 on the support scale compare to 8.4 for institutions without this characteristic (*see Diagram 1*).

Conclusions

- That access to central funding makes resources to support the learning of maths by non-specialists much more likely to exist, particularly where modular courses are offered.
- That different types of FHE institutions have significantly different perceptions of the extent of the problem facing student learning and offer significantly different amounts of learning support.
- Maths educators in colleges of HE are the most optimistic in believing the strengths of student-teachers in technology and in problem-solving skills will adapt teaching practices to meet student learning styles more closely.

For Discussion

- How would you construct a bridging course between GCSE and A level/ between GCSE and HE requirements?
- How would you rank in importance the various aspects of maths support ?
- What are the strengths of new students coming into the tertiary sector and what adaptations have you made to exploit them?

Ian Beveridge
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University of Luton

Maths Learning Handbook Proposal

Progress Report

A preliminary version of the proposal was given in the last newsletter. The main features of the proposed handbook are:

✘ it is targeted at further and higher education staff involved in maths support

✘ it will describe available resources from an educational, rather than a technical, perspective.

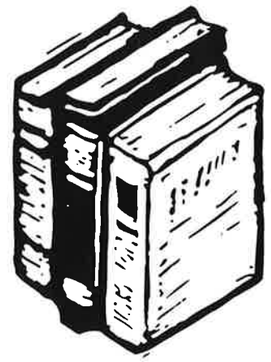
✘ It will include all types of resources but will only cover basic mathematics

✘ it will be available in a variety of formats

✘ the production process will be grounded in existing social networks as much as possible in order to encourage ownership, usefulness and actual use.

This proposal was also advertised through the 'Maths-Support Mailbase' group on the internet (now called 'Learning-Maths').

An organising committee was formed and met to discuss the proposal. Comments were received from both these sources, as summarised below:



✘ the title should be changed

✘ it should focus on entry level students in HE and all students in FE

✘ more justification of the need for a handbook should be provided

✘ more emphasis needs to be put on educational methods than just describing resources

✘ basic statistics should be included

✘ it should make more of a link with surveys

✘ the proposal should contain more information on the current status of the project

✘ the need for ongoing maintenance of a finished handbook should be recognised

The proposal was amended in the light of the above comments. It was decided that the contents should change to include sections on using innovative teaching methods, such as those identified in Ian Beveridge's survey.

Budgets and timescales were provided and the proposal was sent off to The Leverhulme Trust for their consideration for an institutional research grant.

Unfortunately, Leverhulme turned it down on the grounds that it was a book and so fell outside their areas for funding.

We are therefore in need of ideas on how to proceed. All suggestions are welcome. Please contact Ian Beveridge or send a message to the 'Learning Maths Mailbase' list.

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University of Newcastle

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