Some thoughts on the teaching of ‘numeracy’

I’ve just done a quick web search which revealed that courses in Ecology, Marketing and Primary Education at three different universities all require study of mathematics and/or statistics. Of course, this is no surprise – every September students who thought they had said goodbye to mathematics forever arrive at university only to discover that there is a substantial numerate content in their chosen course, even if it is disguised as ‘research methods’ or ‘data analysis’.

Many of these students are dismayed at having to re-engage with mathematics; they lack confidence and have been labelled – or quite often have labelled themselves – as ‘bad at maths’. Even those with decent GCSE grades often say things like ‘I don’t know how I got a B – I never understood what I was doing’.

While there is obviously a need to examine the reasons for this, the point of this article is not to knock what’s going on in schools – people are queuing up to do that, and it’s hardly constructive. We are where we are, and we need effective strategies for dealing with the situation.

For me, the first priority is to increase students’ confidence in their mathematical skills. Not for nothing is our level 1 basic maths module at the University of Gloucestershire called ‘Confidence Counts’. One way to achieve this is by encouraging students to reflect on how their understanding of mathematical concepts has developed; the Open University’s course ‘Open Mathematics’ does this very successfully by building reflective questions, as well as computational ones, into the assessment process.

While many students dislike this requirement – it cuts across their ideas of what ‘maths questions’ should involve, and they don’t find reflective writing an easy task – nearly all acknowledge by the end of the course that it has been helpful.

Another confidence-booster is to put some structure on to the bits of half-remembered maths which float about in students’ minds – things like ‘change side, change sign’ and (one of my favourites) ‘two minuses make a plus’ which have been learned as instrumental ‘rules’, but the rationale for which they’ve never understood. De-mystifying these ‘rules’ helps make students aware that they know more than they thought they did, and changes the emphasis from ‘what a lot of maths I don’t understand’ to ‘actually I do understand quite a lot of maths’.

I also think that we need to be more adventurous in the construction of curricula. It is surely better to cover a smaller number of topics in a way which ensures proper student understanding than to gallop through a wide range of material most of which isn’t fully grasped. Certain topics seem to appear in syllabuses simply because they always have done – sometimes because of the curious requirements of professional
bodies. For example, much print – and student angst - is expended on the construction of histograms with unequal classes – despite the superiority of the boxplot over the histogram for many practical purposes.

Then there's the relevance issue – of course we are all agreed that mathematical ideas need to be related to students' primary subject interest, so it's clear to them why the maths is important. And this shouldn't be merely a cosmetic exercise – if I am teaching a class of nurses, then I need a proper understanding of what nurses use their mathematics for. This provides a chance to establish a relationship of equality with learners: 'you explain the nursing context to me, and I'll explain the required maths to you'. The MSOR Network has been active here – for example, via its recent conference on 'Numeracy in Disciplinary Contexts'.

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One thorny aspect of the ‘relevance’ debate concerns who should actually be doing the teaching of maths and stats to non-specialists. Much ‘service’ teaching by professional mathematicians and statisticians has been replaced over recent years by the integration of the mathematical material into subject teaching by subject specialists – thus students carry out, say, a psychology experiment, then learn about the statistical methods for analysing the results from their psychology lecturer. I can probably predict on which side of this debate most readers of this magazine will stand; however, the attractions to resource-strapped institutions of allowing specialist mathematics and statistics teaching to wither (or, equally bad in my view, the provision of large classes – despite the superiority of the boxplot over the histogram for many practical purposes. For example, much print – and student angst - is expended on the construction of histograms with unequal bodies. For example, much print – and student angst - is expended on the construction of histograms with unequal bodies. For example, much print – and student angst - is expended on the construction of histograms with unequal classes – despite the superiority of the boxplot over the histogram for many practical purposes.

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And what about the responsibilities of employers? They are quick to complain about standards of numeracy; for example, a press release from the CBI in August 2006 indicated that ‘16 per cent [of employers] had concerns about graduates’ numeracy skills’. But it isn't easy to pin down what exactly these employers are looking for; the press release cites ‘Simple mental arithmetic without a calculator, the ability to interpret data, competence in percentages, and calculating proportions’ as employers' numeracy wish-list, which doesn't exactly define a coherent HE-level curriculum. If the CBI wished to do something constructive on this front instead of telling us what's wrong, it could do worse than to produce some decent case-studies illustrating why these skills are needed, and placing them in their practical context.

One often-quoted fact is the UK's poor showing in international league tables of numeracy skills. Reportedly we languish in the middle of the tables, roughly equivalent to the US, New Zealand and Italy, while being consistently defeated by Asian countries such as India, China and South Korea. The argument then proceeds: these countries have 'traditional' approaches to teaching, involving learning of 'times tables', lots of mental arithmetic and so on. They do well in tests, ergo we should be returning to the use of such approaches.

However, the true picture is a good deal more complex. It's obvious that those who are highly placed in league tables are good at what is being tested – so if the tests examine skills in mental arithmetic, algebraic manipulation and so on, then students who have been taught in a system which emphasises those skills will do well. But my own experience is that, while it's true that students from East and South Asian countries are indeed very capable at the technical aspects of mathematics, they are sometimes less well prepared to deal with questions like 'What does the average you've calculated imply about the data?' or 'Do the solutions you've obtained provide realistic answers to the business problem we started with?'

And encouragingly, it seems that in tests which look at the use of mathematics to solve everyday problems, rather than at abstract competences, the UK does much better, according to a recent OECD survey. Which brings me to my final point: isn't what is required by many students best described, not as 'numeracy' with its off-putting (to many students) connotations of mathematical competence, but rather what I call 'dataracy' – the ability to look at numerical information intelligently, and to link the numbers to the practical situation to which they relate? Of course, facilitating development of this skill is a good deal more challenging than teaching students to plug numbers into the formula for computing a standard deviation – but it's also a great deal more useful. So maybe it's time to get rid of 'numeracy' – too often interpreted by students as 'remedial maths'- and start helping our students to become 'dataracy literate' instead.

Acknowledgement

Professor Clare Morris is author of "Essential Maths", published by Palgrave Macmillan, priced £24.99 (paperback). We would like to thank Clare Morris, Times Higher Education and Palgrave Macmillan for granting us permission to publish this article, which is based on an article "Add assistance, subtract stress" that first appeared in the Times Higher Education newspaper on 12 October 2007 (see http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=310808).