A Very Swift Autobiography

I left my parents’ home and the Comprehensive School I attended in Nottinghamshire, ages 11 through 18, following my ‘A’ levels and studied at University on Manchester (recently merged with UMIST) years 1985 through 1992. My PhD [1] in the area known as algebraic combinatorics (essentially “counting things in ingenious ways”, but surprisingly applicable to other disciplines including theoretical physics and bioinformatics in recent years). Professor J. Nigel Ray was my official supervisor and William Schmitt (then at Memphis State University and presently at George Washington University) was my unofficial ‘mentor’ and drinking companion! Both have continued their generous encouragement and support down through the years of my career thus far as a University Teacher of Mathematics.

During my time as a postgraduate student at Manchester I did a fair bit of Tutorial teaching, and even an occasional lecture. I found that research in such an obscure area, at least at that time, was really quite isolating and that I enjoyed the teaching aspect more than the research aspect of being a Doctoral student. This largely informed my choice of job subsequent to completing my education, and after six months of voluntary work, job applications, and much needed resting, I was lucky to find an ideal job for me at what was then Bolton Institute. Like many colleagues I have remained for rather longer than is usual in a H.E. Institution. The job here has almost entirely comprised teaching Undergraduate and HND students, structuring and supporting learning for our B.Sc. Mathematics students, many of whom are mature students, and responsibility for Quality Management of our degree. With Bolton Institute at last gaining the long sought University title in 2005, and receiving final definitive approval of the Academic Quality of our programmes through the QAA Institutional Audit of November 2005, this seems an appropriate time to reflect on my fourteen years of teaching here.

Who Needs Mathematics?

Although in recent years almost all of my teaching has been for our B.Sc. Mathematics programme here at Bolton, which is fast becoming a well-known route for local students who intend a career in Secondary or Tertiary Mathematics Teaching, it is important to say at the outset that the job wasn’t that way in the earlier years.

In early years at Bolton, I taught a large number of diverse classes (often at or close to the 18 hours contact per week contractual maximum) for a bewildering array of Engineering and Technology disciplines at levels from Access through to specialised
topics for B.Eng. programmes as well as modules for the then very new young B.Sc. Mathematics degree at Bolton. For the degree my teaching has focused particularly in Abstract Algebra, Linear Algebra, and some gentle beginnings of Algebraic Topology. Below I make commentary on some of the mathematics modules supporting other disciplines that I developed at and taught at Bolton, followed by some “wart’s and all” comments written by my students.

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My Teaching at Bolton

1. Numerical and Algebraic Skills for Year 1 B.Sc. Psychology students

This has been particularly interesting work, as the non-demanding (to me!) subject matter meant I could concentrate my efforts entirely upon what I was doing as a teacher and watch closely how students engaged with the process of learning. Often these classes were more fulfilling than classes for modules in much more advanced areas of mathematics. Much of the work involved building students’ confidence in their ability to learn mathematics (How often do we hear the comment, “Maths was my worst subject at school!” when we reveal our job to others in social situations?)

The highlight in teaching numerical and algebraic skills was, for me, supporting a student who had been diagnosed (or labelled, perhaps?) with dyscalculia. The diagnosis had most unfortunately an exacerbated effect on a student already lacking confidence. Careful week-by-week confidence building empowered that student to successfully complete the module. Better still the mark gained was precisely the median for her group of peers who did not have the diagnosed condition. Upon showing the student the list of marks (with names covered up, of course), her reaction brought home to me the realisation that fear of mathematics was what had most held her back! The student continued to successfully complete her degree in Psychology, which at Bolton has always included more quantitative statistical work than in many other U.K. Universities.

2. Mathematical Methods for Engineers

For eight years I taught modules for Year 1 and Year 2 of an HND Electronic Engineering programme. Whilst the main goal of the Year 1 module was to give students their exposure to the methods of differential and integral calculus, it became apparent early that it was important to review (or for some students, cover for the first time) topics including laws of indices, logarithms, trigonometry and straight line graphs. It soon became apparent that whilst a very few students of Engineering wished to learn why a given result (for example, product rule for differentiation) holds true, the majority were happy to trust that the result was true and move on with their main business of calculating for specific examples. Thus my earlier tendency to present a few proofs quickly gave way to placing such proofs on a handout for those few (and there are usually some!) who were interested. We should keep in mind that the late Raoul Bott, who is celebrated for his original work in Clifford algebras, cohomology, and many other related areas of our subject originally wrote his doctorate in electrical engineering! [4]

The Year 2 module included the standard tools of the trade for the analogue Electronic Engineer such as Laplace transforms and Fourier series. Now that digital electronics vastly predominates, discrete mathematics (for example Z-transforms rather than Laplace Transforms, and Algebraic and Algorithmic Graph theory) is rightly taking a more predominant place in syllabi for our students of Engineering in some Universities. These areas now also feature more prominently in Engineering Mathematics texts. [2, 3].

Comments from my students who studied Mathematics to support their main subject

I have grouped the selection of comments written by students under headings that I hope will illustrate some of the highlights, challenges, trials and embarrassments of teaching Mathematics to an extraordinarily diverse range of students. The saying “You can’t please all of the people all of the time” is perhaps relevant. I imagine some readers will relate to that sentiment rather too well!

Is the pace correct?

“Good use of time” and “has a tendency to race through the on board examples”

Two different students, both taking B.Sc. Civil Engineering, 2000/01.

All that can be done is to teach to the pace of the slowest, but within limits to maintain progress through the agreed syllabus.

Is the level correct? (HND Textile Studies)

“I feel that the module was not of use to me as I passed my Mathematics GCSE and have therefore done and understood the work before”

“The course seemed to be a revision of GCSE, and as I’ve already passed GCSE I found that it seemed to drag on”

Two students, both of whom were study for HND Textile Technology, 1995/96.

A third student in the class complained of “having to cover so many different areas in short time.”
Such a range of comments makes a case for diagnostic testing, I believe. Should not GCSE Maths be a requirement even for entry to an HND programme? A fourth student, I'm glad to say, wrote, "No changes required!"

Pleas for the Mathematics taught to be more closely related to the main subject

"Much of material covered seems to have little or no bearing in the context of M. Mang.", Manufacturing Management, 1993/94.

"Electrical examples would be useful", HND Electronic Engineering, 1995/96.

"I suggest that the subjects in this module should be better related to the level of technology we would be using in Industry, i.e. would we ever need to work out a quadratics equation by hand?", B.Sc. Manufacturing Management, 1993/94.

"Needs to be more textiles related", student taking HND Textile Technology, 1995/96

"Could be better related to real life scenarios", B.Sc. (Hons) programmes in Built Environment subject areas.

"For the content of the subject to be more applicable to the Industry in general" and "Try to relate to construction where possible, i.e. practical applications", B.Sc. (Hons.) programmes in Built Environment subject areas, 1997/98

The difficulty, of course, is that with mathematics being taught for students of so many different disciplines, it is almost impossible to have relevant examples for all of these.

Is the Mathematics really necessary in this course?

"Cannot really understand the relevance of Mathematics in this course", B.Sc. (Hons.) programmes in Built Environment subject areas, 1996/97

"The module has nothing to do with building and I don’t feel that I will use any of the knowledge gained again" and "Not really relevant to most construction professions", B.Sc. (Hons) programmes in Built Environment subject areas, 1998/99

The stereotypical “Professor” who cannot teach

"Very intelligent but should teach more in the style of the layman", B.Sc. Manufacturing Management, 1993/94.

"Obviously maths teacher (knows his maths but we don’t)", B.Sc. Manufacturing Management, 1993/94.

Crowd control

"Unable to control the noisy element at the back", B.Sc. Manufacturing Management, 1993/94.

Sorely needed humour

"Bad point: not enough fag breaks", HNC Mechanical Engineering, 1994/95.

The Comments that Made Me Cringe

“Please stop banging the duster on the side of the board”, HND Electronic Engineering, 1995/96.

“I think he has been very good and if he could improve his dress sense it would be helpful to students to take him a little more serious”, HND Electronic Engineering, 1999/2000.

I now use light-weight polystyrene board dusters and have purchased myself a smart suit!

Hard Earned Praise

“Lecturer is adept at being able to communicate complicated maths subjects to ‘baffled’ students”, B.Eng. Electronic Engineering, 1994/95.

“Strong point of this module is that the teacher is the best”, B.Eng. Electronic Engineering, 1994/95.

“This module is first class and would suggest NO changes”, B.Sc. Computing, 2000/01.

Conclusion

Being a University Teacher of Mathematics never has been easy, and one learns to ride out the ups and downs of the job! National unrest across the University sector has made the academic year 2005/06 particularly challenging for many colleagues in the MSOR subject areas at my own University and elsewhere across the H.E. sector in England and Wales. To best assure a prosperous and fulfilled future for our younger generations in Britain, it is well that we continue doing what we can. The MSOR Connections newsletter and the Undergraduate Mathematics Teaching Conference [5] are two great assets to us all, in helping us to maintain our enjoyment of teaching and fostering the learning of mathematics through these turbulent times in the UK University sector. I hope to meet some readers of this article at UMTC 2006 next December.

References