On becoming a good maths lecturer

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In a context such as this, which begins with disparate communities observing each other from entrenched positions, it would be as well to begin by inviting you into my dugout. I'm a pretty conventional (white, male, second-generation working-class meritocrat) academic mathematical physicist, who arrived at an academic position via a degree at Cambridge, a PhD at Durham, and post-docs at Kyoto and Cambridge. When I became a lecturer, I already had a great deal of experience of small-group (problems-class and tutorial) teaching, although I was new to lecturing. I was absolutely committed to my teaching, and enjoyed it greatly. I was also convinced that I could be very good at it, and had some supportive preliminary evidence of this.

The course for new lecturers which I attended (not at York) was pretty poor. It was run by someone who had never – indeed, could never have – done the job himself, and I found little of any relevance or utility in it. It introduced me to generic learning theory. The more I learned about this subject, the more shocked I was by its flimsiness and inadequacies.[1] *(There are four learning styles. How many sorts of learner are there, new lecturer? Four, Sir.)* I was outraged by the combination of this weak nonsense with the deficit-model that seemed to be in the air: the idea that new lecturers had a big problem, which the staff-developers knew how to solve. It was no valid objection, it seemed, to point out that the educators could not have taught the material themselves: they were the priests of a revealed faith; they knew the Truth.

When I moved to York I had not fully completed this course and, to avoid immersion in another one, I joined the late, unlamented Institute for Learning and Teaching, for which I now had the requisite three years' teaching experience. This was a very strange organization. From a distance it appeared to be a quango[2], but in fact it was constituted as a professional association, with a board of trustees and directors elected from among its members. Initially it had attracted educational developers like wasps to a jam-jar, but there were always far more of its members who were front-line teachers. I felt that if the ILT could really align itself with the deeply-held

[1] For a thorough demolition see F. Coffield, *Learning Styles and Pedagogy in Post-16 Learning: a Systematic and Critical Review*, Learning and Skills Research Centre, 2004.

[2] A 'quasi-autonomous non-governmental organization'. There has been a resurgence of these over the last ten years.

educational values of its members (from whom it had been alienating itself since its inception) then it could be a force for good. I stood for election to the board, on a platform of protest and reform. I was elected, placed second among thirty-two candidates. Second? I thought — and then I looked through the other candidates' electoral statements and discovered just one which was even more radical than my own. In every election to the ILT and HEA[3] boards, the front-line teachers have come out on top. In our fight for academic control of professional standards and courses in academic practice we were clearly a constant irritant to the quangocracy of developers. The HEA has now abolished its Council's control over professional standards and has become (at its headquarters, at least; I except the Subject Centres) the pointless super-quango I always expected it would.

Simultaneously, I became a supervisor on York's course for new lecturers, its Certificate in Academic Practice (YCAP). (This was because a younger colleague had become so irritated by her former supervisor's approach that she could stand no more, and arranged for a mathematician to join the team to supervise her.) I was thus a poacher-turned-gamekeeper — indeed, greatly to its credit, and very much in the spirit of academic collegiality, YCAP has involved many such people in its running. I was also on the Accreditation Committees of both the ILT and (initially) the HEA; these oversaw such courses nationally. Shortly after this I also joined the LMS Education Committee, with responsibility for such issues. I doubt there are many people with as wide a knowledge, from so many viewpoints, of these courses.

It has always been clear that the concern about courses for new lecturers extends across, at least, the research-intensive universities and the traditional academic subjects. My goal has always been to encourage the incorporation of high-quality *subject-specific* content into them — I think it's a perfectly reasonable, and quite moderate, view to say that no-one should be supervising induction into teaching of material which they would not themselves be capable at least of studying. In fact this is one of the few potentially good things about the metamorphosis of ILT into HEA. The HEA combines the ILT, which oversaw the CAPs, with the network of Subject Centres[4], and thus potentially allows the inclusion of subject-specific material, such as the Birmingham induction meeting or the material developed by Bill Cox and out of Warwick's MWTC, in the CAPs. Don't hold your breath, though. The HEA is very wary

[3]The ILT's succesor, the Higher Education Academy.
[4]The Birmingham MSOR network, of course, is ours.

of treading on the toes of its client community of staff- and educational-developers, and their generic empire abhors balkanization. It should have happened by now, but we on the HEA Council were unable to make it do so. Above all, subject-based material must be included *in place* of existing courses and assessment: the burden on new lecturers must *not* be increased. This is not at all an unreasonable position: after all, PGCEs for school-teaching have strong subject-based strands; it is strange indeed that the requirement for these should evaporate as the learners pass the age of majority

This is pretty much what emerged from an LMS survey of Heads of (Maths) Departments', and their young colleagues', experience of CAPs, which we instigated following the comments about them received by the EPSRC IRM. We received (often long and detailed) responses from most of the pre-1992 universities, and the view was close to unanimous. To paraphrase one Head of Department: 'Should new lecturers have to undertake training-to-teach? Yes, of course; the alternative is indefensible. Does the current system provide useful training? No.' All HoDoMs wanted to see practitioner-led, subject-based, 'apprentice model' training. Many felt that the deficit model imposed by the education community was outrageous. *('Don't use blackboards.' 'The key to technical speaking is not to mention any mathematics.' 'The derivative of x^2 need not be $2x$: allow the students to discuss it and reflect on it.')* Some strong statements were made about the system as a whole (As one HoDoM said, 'The system preys on young lecturers.') Many respondents thought that a toolbox of practical, basic organizational and presentational tips for new lecturers was missing from their courses. As Bill Cox has argued, we would not wish to see a course reduced to these, but neither should they be wholly omitted. I see such training as somewhat akin to stage-training for stand-up comics: of course one cannot train to be a teacher of genius, and genius will always transcend such arbitrary sets of rules, and yet, nevertheless, they can be useful. I also like this analogy because, finally, we are all employed for our unique attributes — our genius, in the 18th century sense of an animating spirit. The comedian's genius creates laughter, ours inspiration. It would be a dull world in which such purposes were forgotten.

My natural conclusion, then, is that a course of initial professional development provided for and by the mathematics community would certainly be a good thing. I believe that it would almost certainly be a vast improvement on what is on offer at the moment. But, for the rest of this essay, I want to think about the absolute value of the extant understanding of mathematics pedagogy for higher education.

If you listen to a conversation in a university maths department coffee room (well, at York, at least) it will very often be about teaching. Colleagues will be discussing, in some detail and grounded in specific content, how to teach a tricky topic to increasingly ill-prepared and mathematically-immature students — the least-upper-bound axiom, perhaps, or Newtonian mechanics for the physics-averse. The people in the discussion will be excellent lecturers, who get consistently good feedback from students, have long-since mastered the presentation and organization of material for contemporary mixed-ability classes, and care deeply that all students who want and try to master the material should be able to do so. What can (the discipline of) mathematics education bring to the discussion?

In my experience, I have not yet found very much. I've read some of the usual sources: recent books (Krantz, Mason, Kahn and Kyle); various shorter articles; anything in the MSOR Connections newsletter; classic works on semi-popular maths. These are doubtless ingredients of the intellectual sea in which I swim, and I've approached them with an open mind and in the hope of making discoveries, but they've never really helped me to solve my teaching problems. Further, one has to remember that staff time is limited. One can devote only a limited time to each teaching issue. I'm certainly now, at my best, the lecturer I always hoped to be (I know this in part because my students tell me so). I've put a great deal of effort into my teaching, and have always been keen to find any new grist for my mill. But the literature I've seen has provided none.

My challenge to the mathematics education community, then, is this: provide something that's concise and useful to us. Tell us something that's true but surprising, something that overturns common folklore or received wisdom. Something that provokes thought, that creates interesting new dimensions in the kind of discussion I described above. Until then, I'm afraid, I think we've all just got too much to do.

Niall MacKay, York, 19/9/07