Particularly with increased student fees coming in, the formal recognition of teaching is now high on the HE agenda. It is therefore timely that the Higher Education Academy has recently revised its UK Professional Standards Framework for teaching and supporting learning in higher education, (henceforth UKPSF), which sets out the standards that HE teaching should meet. Full details can be found on the HEA website, www.heacademy.ac.uk/ukpsf. Here we outline what it means for the training of a new MSOR (Maths, Stats and OR) lecturer.

The UKPSF is a generic description of the main dimensions of the roles of teaching and supporting learning within HE, written from the perspective of the practitioner. It outlines a national framework for recognizing and benchmarking learning and teaching support roles within HE. It has two components: the dimensions of practice, outlining the activities, knowledge and professional values our job entails; and the descriptors of what characterises a given level of professional role. These components are given below.

The dimensions of practice

A set of statements outlining the:

1. Areas of Activity undertaken by teachers and supporters of learning within HE
2. Core Knowledge that is needed to carry out these activities at the appropriate level
3. Professional Values that someone performing these activities should embrace and exemplify.

These statements are listed below, supplemented with some examples from chalk-face teaching.

Areas of activity

A1. Design and plan learning activities and/or programmes of study

- Preparing a lecture on a particular topic such as integration by parts, with theory, a range of examples and appropriate student exercises.
- Designing a complete module, say on Linear Algebra, from specifying objectives and content to appropriate learning activities such as lecture periods and exercised/problem classes, and assessment by coursework and exam.
- Putting together a complete degree programme.
A2. Teach and/or support learning

• Giving lectures that enthuse and engage students through careful explanation of theory and a wide range of illustrative examples.
• Running tutorials and problem classes that emphasize the key points of a topic, motivate and challenge students and promote the attitudes and values of the working mathematician.

A3. Assess and give feedback to learners

• Setting and marking regular coursework to provide students with deeper understanding and frequent feedback.
• Use of quizzes to develop facility in key mathematical skills.
• Writing a module exam, with a range of questions at an appropriate standard.

A4. Develop effective learning environments and approaches to student support and guidance

• Encouraging interaction in lectures through appropriate examples and opportunities.
• Developing deeper understanding through stimulating exercise/problem classes.

A5. Engage in continuing professional development in subjects/disciplines and their pedagogy, incorporating research, scholarship and evaluation of professional practices

• Regular debate with colleagues and students on how to teach particular topics.
• Engagement with the more practitioner-based output of Mathematics Education, for example through the HEA website.

Core knowledge

K1. The subject material

• Recognizing that the teaching of a particular topic requires a broad and deep knowledge beyond that delivered to the students.
• Explaining and motivating the material so as to promote interest and understanding.

K2. Appropriate methods for teaching and learning in the subject area and at the level of the academic programme

• Teaching routine skills such as differentiation through structured opportunities for practice.
• Teaching a deep theorem through a discursive approach, breaking it down into palatable sections with a variety of activities.
• Using projects and other enquiry-based activity to promote deep learning.

K3. How students learn, both generally and in the subject/discipline area(s)

• Tapping the accumulated wisdom of experienced colleagues and the more accessible areas of Mathematical Education.
• Realising that having been taught a lot does not necessarily make one a good teacher – that requires training.

K4. The use and value of appropriate learning technologies

• Using computer assisted assessment for developing facility in routine skills.
• Using software such as GeoGebra to illustrate a range of mathematical concepts and tools.
• Knowing how to make effective use of ‘traditional’ technology such as black and white boards.

K5. Methods for evaluating the effectiveness of teaching

• ‘Minute’ quizzes to gauge student understanding in real time.
• Student questionnaires for longer term evaluation.
• Peer observation of lectures by experienced colleagues.

K6. The implications of quality assurance and quality enhancement for academic and professional practice with a particular focus on teaching

• For a new lecturer the main manifestation of this will be through mentoring and the teaching portfolio required in most teaching certificates.

Professional values

V1. Respect individual learners and diverse learning communities

• Realizing that most students are not like you, a highly qualified and motivated mathematician, but still deserve respect and support.
• Recognizing that to many learners mathematics is a tool, not necessarily an end in itself.

V2. Promote participation in higher education and equality of opportunity for learners

• Using a wide range of teaching approaches to accommodate a diverse background in skills and interest.
• Being aware of any special educational needs within your student group.

V3. Use evidence-informed approaches and the outcomes from research, scholarship and continuing professional development

• Particularly in mathematics teaching there is a plethora of opinion and a dearth of evidence – apply the same rigorous thought you use in your mathematics to your teaching.
• In teaching, try to expose students to how you actually do mathematics – very different from the definition-theorem-proof format of many maths textbooks.

V4. Acknowledge the wider context in which higher education operates recognising the implications for professional practice
• In mathematics rigorous proof may be more interesting to the lecturer, whereas practical utility may be more useful to the students.
• The methodology of rigorous analysis and argument key to mathematics may be more transferable than the actual content.

The descriptors

The HEA has four categories of membership: Associate Fellow, Fellow, Senior Fellow and Principal Fellow of the Academy, defined by Descriptors 1, 2, 3, 4 respectively, outlined on the website. For a new lecturer, in your first few years of teaching, you would normally be aspiring to Fellow level, for which the corresponding Descriptor 2 is as follows.

Demonstrates an understanding of specific aspects of effective teaching, learning support methods and student learning. Individuals should be able to provide evidence of:

I. Successful engagement across all five Areas of Activity
II. Appropriate knowledge and understanding across all aspects of Core Knowledge
III. A commitment to all the Professional Values
IV. Successful engagement in appropriate teaching practices related to the Areas of Activity
V. Successful incorporation of subject and pedagogic research and/or scholarship within the above activities, as part of an integrated approach to academic practice
VI. Successful engagement in continuing professional development in relation to teaching, learning, assessment and, where appropriate, related professional practices

If you are starting with little teaching experience, then you will normally be expected to take an in-house teaching certificate, which will probably be matched to the UKPSF described above. Provided the course has been accredited by the HEA, then successful completion will automatically give you fellowship of the HEA. This course is usually run by the department responsible for generic training of teachers, and you may take this course along with new lecturers from a wide range of disciplines across the university. The mathematics input to the training will be through colleagues in your department, a kind of on-the-job apprenticeship which may include mentoring, peer observation of teaching, moderation of your exam papers, etc. Depending on your experience there may be the possibility of direct application to HEA membership as an exemption to the in-house teaching certificate.

You may also have the opportunity to attend the annual two-day HEA Induction Course for New Mathematics Lecturers which takes place in September each year. This course, run by experienced mathematics lecturers, has earned a high reputation in the HE Mathematics sector. It was formerly mounted by the MSOR Subject Centre and is now to continue as subject discipline provision under the auspices of the HEA. The course provides the link between generic provision and your departmental apprenticeship. It is practitioner led and enables you to put the generic requirements of the UKPSF into a mathematical context. The content has varied from year to year, but typical topics which have been covered, with their relevance to the UKPSF Dimensions of Practice, are: lecturing mathematics (A1, A2, K2), constructing mathematical examples (A1, A2, A4, K2), assessment of mathematics (A3), small group work in mathematics (A1, A2, A4), introductory mathematical education (K3), the computer environment in mathematics teaching (A4, K4). There has been nothing specifically devoted to A5, K5 and K6, which are normally covered in depth in generic teaching certificates. However, two days in the company of experienced and committed maths teachers, as well as new lecturers from across the UK (indeed, across the world), allows one to absorb directly the ethos of continual improvement through day to day professional development.

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