APP EXP Physics Route to Associate Fellowship

Sample of a Narrative of Professional Practice

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Professional Practice in Teaching: A Narrative Piece

My recent experience demonstrating first-year undergraduate physics laboratories at the University of Warwick has been an eye-opening and valuable experience. As a PhD student, it is only a short while ago that I was an undergraduate myself, and I have completed my first three years of teaching with a newfound understanding of the teaching and learning process. This reflective piece details my thoughts and experiences, in the context of the UKPSF dimensions of practice.

A2 – Teach and/or support learning

Traditional pedagogies for teaching undergraduate physics involve lectures, in which concepts are transferred to passive students by a lecturer, and laboratory sessions, where these ideas can be experimentally demonstrated. However, it has been acknowledged in the pedagogic literature that this does not promote the skills and critical thinking that professional physicists employ (Robinson, 2010). In my role as a lab demonstrator, the primary aim was to teach the processes which physicists use to solve problems and arrive at conclusions [K1]. The approach I have taken to teaching is a signature pedagogy, specifically 'real-time physics' – this means focussing more on the process of experimentation and analysis, coming to an independent conclusion, rather than simply verifying principles that students have already been taught (Robinson, 2010) [K2,V3].

I demonstrated two sets of labs – the first was a general first year physics course, the second focussed specifically on electronics. In both cases, one of the main aids for this is the lab script, developed by the module organisers, which gives some background and explains the basic steps of the experiment. The lab script encourages students to ask 'why?' at every stage, something I reinforced by encouraging students to attempt their own solutions when problems arose, rather than relying on a demonstrator as the first port of call. This is a key aspect of the 'real-time physics' pedagogy (Robison, 2010) [K2,K3].

To prepare for the lab sessions, I familiarised myself with the script and arranged to practice the experiments myself beforehand [K2]. One challenge faced was a lack of preparation from a minority of the students. It is of course important to distinguish between students who have simply not done the preparatory reading of the script, and those who have read it and have further questions [V1]. In addition to the lab script and extra online materials (available on Moodle) [K4], there is a marksheet for assessment purposes. For the 1st year 'introduction to labs' module, students were marked and given feedback face-to-face at the end of the session [K2]. Giving feedback became easier as I started to mark the students progressively throughout the sessions, rather than making a full evaluation at the end [K5].

At the end of the first year, I participated in a peer review of my teaching [K5]. It was interesting to compare my own practices to others and to receive feedback. For example, in one of the experiments I was demonstrating, it was logistically useful to coordinate the students so that they all took data at the same time (as the lights needed to be dimmed in order to see a faint electron beam in a low-pressure hydrogen chamber) [K1]. Students inevitably work at different rates, and it was pointed out during peer review that I could provide faster students with other tasks while they wait, something which I took on board in subsequent labs [K6]. This awareness was particularly useful when teaching the electronics module, as some had prior electronics experience (having taken GCSE electronics) and were reaching the extension material within time, whereas others needed more support [V1,V4]. I tried to answer student questions by building on physics they had already been taught (James & Pollard, 2011), and this improved in subsequent years as I gained better familiarisation with the structure of their 1st year courses.

The clarity with which I convey ideas in physics has been improved by communicating them to wider audiences. I have participated in departmental outreach, in particular an inflatable planetarium is taken out to local schools to promote physics and astronomy, and to encourage the later study of these subjects in higher education [V2]. I have also helped on several University open days, allowing me to interact with a variety of audiences of all ages and to convey my enthusiasm for the subject with non-specialist language [V4]. I now have a greater awareness of the need to mediate the use of technical language, and to make sure my explanations are at the right level for the audience in question.

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

I have come to realise that an 'effective learning environment' does not simply refer to the physical layout and learning equipment available but extends to the expectations of the students (Marshall & Linder, 2005), and the teacher/demonstrator. My understanding of the different styles of teaching and associated learning environments discussed here was aided by attendance on a 'preparing to teach in higher education' course, which introduced the concept of pedagogic styles and the flipped classroom.

For two of the sessions I demonstrated, the laboratory was set up with seating along both sides of the room, and the required equipment laid out in advance. Both experiments required the lights to be switched off (to see a faint electron beam/screen showing a star cluster). I made the students aware of this at the start, as part of a general aim-setting and safety talk [K1]. I was also keen to note the needs of students with disabilities and any allowances they might require. For example, I helped a visually impaired student take measurements where necessary [V1,V2].

By creating an open atmosphere, I hoped to promote questions, but in addition this was also an opportunity to stimulate discussion between the students [V1,K2,K3]. In some lab sessions, the students were split into groups who used different strategies, in others, they were encouraged to cooperate for practical reasons (e.g. needing to turn the lights off). Such discussions about strategy are not something that the layout of the rooms would necessarily stimulate without prompting.

The lab sessions were organised according to the flipped classroom model (Kettle, 2013) [V3]. Students prepare for the lab in advance and perform experiments with the demonstrator present. Often, the students were not told what the outcome should be; this is part of the 'real-time physics' pedagogy which aims to reflect the 'real-life' practice of professional physicists (Robinson, 2010).

The lab sessions are by their nature experiential, which can help to reinforce otherwise abstract concepts [K3]. However, it is not the preferred learning style for all students (Kettle, 2013), and I was happy to have more conceptual discussions about the work if that aided student understanding [V1,K2,V3]. It was useful for the students to have a summary at the end of the sessions, ideally as a group. In these wrap-ups, I summarised the key points and asked what the students thought they had learned. This was primarily to prompt the students to reflect on their learning, but also to provide feedback on my teaching, as I could see what they had taken away from the session [K5]. For example, I asked conceptual questions at this stage to gauge whether the group had understood a key idea – if not, I focused more on that aspect in the next lab.

The undergraduate labs were organised such that different demonstrators marked the students each week. The ability of different demonstrators to mark consistently is essential to maintaining a high quality of practice [K6]. This was achieved by comparing notes on how we would mark an example lab book or piece of work and agreeing on a more detailed set of requirements that are needed to gain the marks for each part of the lab. Consistency is expected and maintains student trust in the teaching and learning process, crucial for maintaining a good relationship between student and teacher and therefore a good learning environment (Marshall & Linder, 2005) [K3].

In summary, I feel that my first three years of teaching in higher education has provided me training, experience and feedback which covers the breadth of the UKPSF dimensions of practice. My time spent demonstrating in laboratory sessions has been enlightening, as has the process of reflecting on my teaching experiences in the writing of this piece.

References

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