TEACHING PHILOSOPHY STATEMENT

DENIS D. PATTERSON

Teaching mathematics is an opportunity for me to share my subject and my passion for it with others. My enthusiasm for mathematics and determination to help students achieve highly underpins both my teaching philosophy and practice. I believe that critical thinking and problem–solving ability, coupled with persistent hard work, are key components in long–term achievement, both inside and outside of mathematics. Through my teaching, I aim to foster these general qualities in my students whilst also promoting discipline specific attributes such as mathematical thinking, rigorous argument and clarity of presentation.

In order to appeal to a variety of learning styles and to give all students the opportunity to participate fully in the learning process, my methods of presentation vary from the use of the blackboard to slideshows, and problem sheets for self–directed learning. Whatever medium I am using I try to keep my students engaged by regularly asking them questions and encouraging them to interrupt me with their own questions or comments — if they don't ask me questions, they can be sure that I will start asking them questions! Sometimes I suggest false conjectures to encourage the students to challenge me with a counterexample. For example, in a recent computer lab concerning the Central Limit Theorem I challenged my students to explain some suspicious output arising from taking the sample mean of simulated Cauchy random variables — this forced the students to closely reexamine the relevant hypotheses to see that the output was entirely plausible (albeit counterintuitive). In this way, I hope to develop my students mathematical thinking, scepticism and spirit of inquiry.

Over time I have found that my personal style naturally leads to a great deal of discussion and interaction with students; numerous past students have commented in teaching evaluations that my "interactive teaching style"[1] was one of their favourite aspects of my courses. I believe a high level of student–lecturer interaction is key to keeping students engaged and active in lectures, as opposed to the traditional passive/transmissive roles of students and lecturers. In my role as Maths Learning Centre Director at DCU, I have trained undergraduate and postgraduate maths tutors in providing one–to–one and small group maths support, and I have also worked as a maths support tutor since I was an undergraduate myself. These experiences have been vital in helping me to learn how to structure and maximise the benefit of student interactions during lectures, tutorials and office hours.

Teaching and learning are more than the transmission and memorisation of content. As such, I endeavour to emphasise the "bigger picture" to my students. By the "bigger picture" I mean understanding the intuition that is being formalised in a particular definition. Knowing not just what compactness is but why it is useful. Not just being able to define σ–algebra's but being able to justify their necessity. Some will argue this type of understanding is the reserve of "top students" but in my experience, all students find it easier to recall and apply concepts when they have a clearer idea of where a concept sits in the "bigger picture". This conviction

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[1]Anonymous student (4th year/Masters), Simulation for Finance mid–term teaching evaluation, 2017.

is reflected in my assessments and grading by asking students to express theorems in their own words or to explain why a certain result is useful or necessary. For example, in an assignment for my Simulation for Finance course, I asked my students to explain in their own words why both strong and weak convergence are useful concepts for quantifying how well a discrete–time stochastic process approximates a continuous process. Similarly, asking students why a converse or related result is true or false serves to test the depth of their understanding far better than simply reproducing statements and proofs of results. Naturally, I still expect my students to be able to state definitions, prove important theorems and carry out standard calculations but all of these learning outcomes are immeasurably enriched by understanding how they form a cohesive whole. When teaching mathematics to non–specialists the "bigger picture" extends naturally to focus more on how the theoretical results are useful in applications in the students' own field of study — it is my firm belief that applied mathematicians have a particular duty to highlight the enriching role of mathematics in other disciplines, and in society in general.

When presenting material to my students, particularly to younger undergraduates, one of my key goals is to model how mathematics should be practised. I impress upon my students that mathematics is about the precise, clear, and rigorous presentation of ideas. The belief that "one should aim not at being possible to understand, but at being impossible to misunderstand" is at the heart of my teaching philosophy. I use marking rubrics and provide early and regular opportunities for feedback to ensure that my expectations and standards are always clear to my students. These steps are also intended to alleviate student anxiety about assessments. Many of my past students have commented that timely return of marks and feedback, clearly laid out course web pages, and regular class email updates are much appreciated; these seemingly small details are important as they give students added confidence in the instructor and avoid unnecessary stress for the students.

Finally, I believe that excellence in teaching can only be achieved (and maintained) by continually re-evaluating and trying to improve one's practice over time. As I am guided in my teaching by the principles of student–centred education I highly value feedback and evaluations of my teaching from my students — I garner feedback through a short qualitative mid–term teaching evaluation and a longer end of term survey. Assessing students regularly also provides useful feedback both for the students and teacher, and I find this allows me to make adjustments to better meet students needs while a course is still ongoing. For example, based on students' mid–term feedback in my Simulation for Finance course I made a conscious effort to include more examples when explaining definitions for the remainder of the course. Along with these forms of feedback, and my own self-assessment, I feel it is also essential to regularly discuss my teaching with departmental colleagues to identify areas for improvement and to keep up to date with best practices in my discipline. I hope these steps will ensure that my instruction accurately reflects my pedagogical beliefs while helping my students to achieve as highly as possible and to reach their personal educational goals.

School of Mathematical Sciences, Dublin City University, Glasnevin, Dublin 9, Ireland.

E-mail address: denis.patterson2@mail.dcu.ie

URL: denispatterson.com/teaching/