Jared White: Teaching Statement

Experience

This academic year I have been teaching part time at UCL and Kings College London. Prior to that I accrued 4 years of tutoring experience at the University of Lancaster during my PhD. At various times I have taken private students, most recently this year. I have taught a broad range of subjects within pure mathematics and mathematical methods which I specify below. In recent months I have adapted to teaching online and gained experience teaching across a variety of virtual mediums.

Kings College London (October 2019 – May 2020)

My work this year at Kings College London has consisted of delivering "skills sessions" for second and third year undergraduates, for which I had to write and deliver a lecture each week, complementary to the main series of lectures for the module. In the first term I was teaching Real Analysis, and my lectures focused on how to solve the homework problems, whereas in the second term I was teaching Metric Spaces and Topology and my lectures discussed ways to think about the subject, examples not discussed in lectures, and approaches to problem solving. I also marked homework and held office hours, during which groups of students or individuals could come and ask questions. At the end of term this teaching was moved online, which gave me experience of giving lectures and office hours using MS Teams.

University College London (October 2019 – April 2020)

At UCL I ran small group workshops for the second year course Mathematical Methods III. These were one hour classes during which students worked through exercises. My duties included marking students' homework, giving feedback on the homework, and helping the students with exercises during the workshop. I would often go through solutions to exercises or recap key proofs on the board. I also ran Python labs together with another tutor, during which students completed programming exercises in a computer suite. Finally, I gave support to a final year student applying for a master's degree by giving advice on course choices and reviewing his application.

University of Lancaster (2014 – 2018)

During my four years at Lancaster University as a PhD student I worked as a graduate teaching assistant (GTA). The maths course at Lancaster comprised a three-year undergraduate degree, with an optional fourth year leading to an integrated master's degree. I taught students in all four years, mainly taking pure maths courses. The modules I taught were: Real Analysis; Linear Algebra; Groups and Rings; Number Theory; Groups and Symmetry; Rings, Fields, and Polynomials; and Hilbert Space. I also led problem solving classes, which were workshops for first year students aimed at improving their general problem solving skills and mathematical maturity.

The undergraduate teaching at Lancaster was organized around workshops, very similar to those I described above at UCL. As a GTA I would lead between one and three workshops per week, usually with another GTA. In 2018 I was the winner of the first annual award for GTAs in the Department of Mathematics and Statistics at Lancaster.

In addition, I was employed at various times to cover the work of absent lecturers. This kind of work was not typically offered to graduate students. This included giving revision lectures, marking exams, and covering the lecturer's office hour, which involved helping students on an individual basis who came to me with questions. The particular subjects involved were second year Complex Analysis, and a third/fourth year course called Hilbert Space.

I am enthusiastic about communicating mathematics, and also about widening participation, and for this reason I volunteered each year that I was at Lancaster as a helper for 'Florence Nightingale Day', a maths activity day run annually by the university for girls aged 15–18. My job was to help with a mathematics quiz by acting as a 'coach' for a team of about eight girls, and to talk to the girls over lunch about studying mathematics at university.

I was also employed by Lancaster University for three years running to give two or three 'mini-lectures' per year to prospective mathematics students. In my case this was typically a twenty-minute lecture about prime numbers. Only three or four postgraduates were asked to do this each year.

My experience creating materials and content

For my private students, who are typically university undergraduates or A-level maths students preparing for interviews or STEP exams, I sometimes have to write exercises or mock interview questions.

When I was a GTA at Lancaster, on several occasions I had the opportunity to write sets of exercises, either because the lecturer hadn't prepared an exercises sheet for the last week of workshops, or as bonus material for the most talented students. At KCL this year I have had to write and curate the material that I presented in my lectures, which included developing worked examples and retellings of the main ideas of the course.

Philosophy

One of the main challenges faced by students of mathematics, especially pure mathematics, is digesting the large volume of abstract ideas and definitions that come their way. I believe it is important to explain where each idea fits into the wider story: where does it come from, what is it used for, and how might you (the student) have come up with it? Similarly, when going through a proof I usually try to give the argument as much of narrative feel as I can. I believe that this aides both understanding and retention of the proof, and often makes it more enjoyable as well. For example, when introducing students to the formal definition of convergence in terms of epsilons, I often like imagine that the students are giving me smaller and smaller epsilons, each time forcing me to find an N such that the sequence is within epsilon of its limit after N.

Another way that I employ this narrative technique is by explaining a proof by telling the story of how I might have come up with the proof myself. This is nice in part because it can lend a sense of discovery to the demonstration, but it also fits in with another of my key teaching philosophies. Watching a tutor go through a proof or a solution to an exercise should act as a way for the students to witness the process of mathematics as done by an expert. The students should have the opportunity to see the process of creating a proof, so that they themselves might build on this when they have to come up with their own proofs. For me this is one of the most important functions of a lecture, since it is something that the students cannot easily gain from reading the proof in a book.

It is important to remember that students often do not have the same knowledge of the goals of mathematics that we have, and it is often necessary to spend time motivating the course material and putting it into a wider context. For instance, when I was teaching Metric Spaces and Topology at KCL this year, I felt that it was important to motivate the introduction of non-metrisable topological spaces with examples familiar to the students. As such I spent some time discussing how different notions of convergence of sequences of functions, a topic they knew form Real Analysis, can be described by some topology, which in general won't be metrisable. Even as a graduate teaching assistant at Lancaster, for certain subjects I would take the initiative to prepare some additional material and spend 3-5 minutes of the workshop presenting it to the students. For instance, when teaching a third year course on commutative rings, I would outline for my class applications to problems in number theory, as a way of motivating concepts such as unique factorization domains. The students told me that they really valued this part of the workshop.

When teaching I present myself in a friendly and approachable way, and I am always certain to make sure that the students feel that I have time for them. I encourage students to come to my office outside of class if they want help, and this offer is often taken up. I also encourage students to work together and to help each other. Although I think that it is important for students to spend a certain amount of time trying problems by themselves, I think that the students learn more when this is balanced with time spent working together. Indeed, when one student asks another for help, it is usually the case that both students benefit from the exchange.

My philosophy as outlined above continues to stand in spite of the challenges we face due to Covid-19 and moving much of our teaching online, although the best way to implement it may change. Going forward it is important to reflect often on whether we are using technology in a way that utilizes its strengths and not simply trying to replicate what we do in the classroom. With this in mind I think we can provide an enriching and enjoyable experience for our students, and the process of reimaging our teaching in this way may yet prove to have lessons for how we teach face-to-face as well.

For me, the relationship between student and teacher is a very important one, and I see myself teaching for the rest of my career. I bring to my classes a genuine passion both for education and for the subject being taught. I hope to continue to make a valuable contribution to learning at my next institution.