TEACHING STATEMENT

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My Teaching Philosophy

It is certain that one of the most important factors which can either inspire or discourage a person from pursuing a career in a field is the teacher or lecturer. I have experienced the former as I was inspired to become a mathematician thanks to mainly my math olympiad teacher whom I met in the 8th grade; on the other hand, I have also seen a lot of people discouraged from being a mathematician or a scientist because of the unsupportive environment in the classrooms. One of the reasons that I am pursuing an academic career is to be an inspiration to people from younger generations, and encourage more people to become mathematicians or let them have fun while learning mathematics and appreciate its beauty. As a Ph.D. student who has been holding tutorials and problem sessions for six years, this has been my primary goal in teaching.

Creating a positive environment in which the students are unafraid to ask questions, even if they may seem like "wrong" questions or have "obvious" looking answers, is an essential ingredient to creating a supportive environment. In my tutorials and problem sessions, I regularly remind them to not hesitate to ask questions, either at the moment or in private after the tutorials. I try to assure them that when they ask questions, they will be answered without any judgement. On the other hand, asking the right questions is also very important in mathematics, so one should encourage their students to do this through positive reinforcement.

This does not only apply to questions but also to answers given by students. Even the experts in mathematics are making a lot of mistakes, so we should convince the students that making mistakes is an integral part of the learning process. It is also worthwhile to note the importance of encouraging students to notice the lecturer's mistakes to give feedback about it. As a student, getting a positive response during such situations increased both my self-esteem and my respect for the instructor. Now as a tutor and prospective lecturer, I thank my students for noticing my mistakes or providing an alternative better solution to the problem.

Providing a non-toxic environment to the students is one necessary part of being supportive; however it is not sufficient. One should also inspire the students for continuing their careers in the field, or at least make them enjoy the lecture material and maintain their interest in the topic. Throughout my experience both as a student and a tutor, I have realized that there are several key steps for achieving that.

Unlike how it has been perceived by most students, mathematics is not just about applying formulas and doing calculations, but also about understanding the reasoning behind them and the relationships between different concepts. This undogmatic nature of mathematics come from proving the theorems via applying the rules of logic. However, one should also realize that technical proofs can sometimes seem very scary, especially for students of mathematics modules from different majors. In that case, their point of view can change from memorizing the formulas to memorizing proofs. I believe the secret to the solution to this problem lies in establishing the balance between rigor and intuition.

In mathematical research, rigor and formality are extremely important. Indeed, an ambiguity in the argument of a proof or a tiny mistake in details could lead to wrong results. However, focusing on rigor too much and not giving enough priority to intuition while teaching would lead the students not appreciate the material and internalize the concepts. Therefore, the lecturer's priority should be giving the students good intuition and motivation. After the students have a good "picture" in their mind of what is going on, the importance of rigor and formal proof could be much easier for them to appreciate. As Ravi Vakil said in his online lectures on algebraic geometry - AGITTOC, the important question

is "why is a thing" instead of "what is a thing". Learning the proof should be a tool for answering this question, it should not be the end goal. In addition, starting the semester with some motivation about the topic in a broader sense will also get the students' attention to the lecture material throughout the semester. This will also allow the student to realize that learning is not always linear. Although providing examples or applications from the future material at first might make the students get a bit out of their comfort zone, it will help them to internalize the material much better when the time comes.

To give intuition to the students, choosing good examples and counter-examples is essential. Indeed, applying the arguments in the proof of a statement to some non-trivial examples, the students might already guess what the general argument should be. This also applies to teaching a general method for the solution of a problem, and more abstract concepts. On the other hand, counter-examples are helpful for students to understand the importance of details or common mistakes. For instance, if I notice a common mistake done in previous years, I warn them in my tutorials about it and show them why it leads to a wrong result by choosing a counter-example.

Finally, I should note that as a tutor, knowing and learning more in the field of abstract mathematics have affected my teaching simpler topics to my students in a much better way. I first realized it while I was a teaching assistant in Multivariable Calculus. Prior to that year, I had a chance to audit the Differential Geometry module and learn about tangent spaces and what a differential was in a much more abstract way than we did in Multivariable Calculus. I felt that I was much more confident with the material, thus I had been able to provide a much better intuition about these concepts, for example, the multivariable chain rule. In the Introduction to Mathematics module that I have been tutoring for the last four years, I sometimes integrate my intuition from group theory to explain to the students how to solve basic first-order equations.

My Teaching Experience and Future Plans

I have been a teaching assistant and a tutor since 2017 - the last semester of my undergraduate at Koç University, and currently at University College Dublin (UCD), I have had a considerable amount of experience with different groups of students. The problem sessions that I conducted at Koç University were mainly aimed towards mathematics students; which were Real Analysis I, Complex Analysis, Introduction to Abstract Mathematics, Discrete Mathematics in addition to Differential Equations, and Multivariable Calculus which were aimed towards engineering and science students. On the other hand, at UCD, my tutorials were aimed at non-mathematicians, namely Mathematics for Agriculture II, Mathematics: an Introduction, Intro to Analysis for Economics & Finance, and Foundations of Maths for Computer Science I.

Along my compulsory teaching duties, in 2017, I tutored Abstract Algebra II (Galois Theory) in Koç Office of Learning and Teaching (KOLT), and I was a section leader at CS-Bridge which took place at Koç University. CS-Bridge was a programme which was co-organized by Stanford University and Koç University, aimed at high school students that were interested in programming with no prior knowledge. Lecturers from Stanford University taught the students the essentials of programming via using Stanford's ACM library in JAVA.

In the following years I would like to organize modules on various topics aimed both at undergraduate students and graduate students. The graduate modules would be closely related to Algebraic Number Theory and Arithmetic Geometry, but also include topics as Homological Algebra, Category Theory, etc. It is my personal belief that exams are not the best way to measure a student's performance and knowledge, hence in these modules that I would organize, I would like to focus more on homeworks, group projects, in-class presentations, etc.

I am also planning to give lectures related to my research in Nesin Mathematics Village in Şirince (İzmir, Turkey) next summer. It is a mathematics village, founded by Ali Nesin who is a mathematician (and the son of the Turkish author Aziz Nesin) who dedicated himself to make people ranging from elementary school students to graduate students love mathematics by showing them the real essence of mathematics, teaching it the way it is. Many of my mathematician friends realized they loved mathematics in that village. Therefore it would be an incredible opportunity for me to get closer to my goal on inspiring and inviting people to see the beauty of mathematics, and the area that I am working on.