TEACHING STATEMENT

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Communication in the doing of mathematics is very important and inevitable. Elegance of a proof, no matter how hard and technical, is inextricably linked to the mathematician's ability to explain it. One of the effective modes of communication while teaching is the ability to ask questions. Questions that provoke thoughts, intuition and maybe even discussions among students are the ones I ask while conducting my lab. Being able to engage with students and understand their thought process while teaching, has been one of my favorite aspects of being a teaching assistant. One very important goal of mine is, to be able to impart knowledge with precision but at the same time encourage the students to think independently even if students end up making a mistake or two.

Promoting diversity is important in any group or organization, especially in academia. Representation is important; a person is less likely to feel that they belong if they see no one like them doing what they do. It levels the playing field for underrepresented groups. Diversity also encourages multiple points of view. I am committed to promoting diversity in whatever way I can. It is crucial to understand the various ways in which a student may be at a disadvantage when taking a class. Some of these issues may include outside stress, lack of resources, and learning disabilities. It may be difficult to identify these disadvantages directly, but it is on the instructor to keep these potential issues in mind and to strive to make it possible for everyone to succeed, despite such setbacks. As a graduate teaching assistant at Tulane University, I have been fair and just to all my students irrespective of their gender, race and other differences. The environment in my class will be set in such a way that every student would be asked to participate in Question-Answer and discussion sessions. Mentoring, encouraging a diverse student population to work together on mathematical problems is also a way I intend to integrate undergraduate research training with environment of equity and diversity. I have always tried to minimize the fear of making mistakes and more importantly, fear of being judged by fellow classmates among students. Another thing I make sure about is that no two students are ever compared. My teaching style is based on the principle, 'Everyone can learn and appreciate Mathematics'. Every person in academia has his/her own uniqueness and potential for creativity of their own.

Mathematics is indeed the language of the universe, queen of all sciences. But its importance, as a mere source of an intellectual activity and stimulation can never be undermined. Keeping students intellectually stimulated in a class and encouraging a culture of thinking about math problems/puzzles in and out of class can change their outlook towards real life situations and may improve their decision making abilities.

At a basic level, curiosity is the root of all scientific research. One of the most important goals I set for myself at the beginning of any course is to be able to invoke curiosity among students. During the first lecture of any course, I give the motivation behind learning the course. How to understand a *function* that is dependent on an independant variable? What does it mean to be dependent on more than one variables? How does the dependence affect the change of the function with respect to the independent variable? Questions like these do increase curiosity among students and in a way sets the tone for rest of the semester.

Developing confidence among students has been another aspect of my teaching style. I ask and encourage them to solve easier problems, problems proportionate to their knowledge, sometimes even on board and ask them to explain their work to other students. Peer to peer teaching among my students is something I practice and has found to be effective on most occasions. This increases their confidence, self belief and helps develop mutual trust. Moreover, it reduces the fear of making mistakes among students. This is something I emphasize almost every lab session of mine that it is OK to make a mistake. Mathematics is suppose to be hard, and we are bound to make mistakes. I tell my students that learning from mistakes adds to the beauty of mathematics. Once students are comfortable with the basics in a course, we move on to solve more conceptual/challenging problems.

While solving a problem, I make it a point to explain each step, the main idea and motivation behind each step and guide their thought process in a way that lets students finish the problem on their own. In a very subtle way, I try conveying to the students that given a more challenging problem, it is often possible to break it into its smaller and easier parts, parts that they can solve. And then put the pieces together.

For instance, while teaching Linear Algebra, I explained the concept of the best fit line as follows: I asked the students, when does a given point (x_0, y_0) in a plane lie on the line $y = mx + c$, for some $m, c \in \mathbb{R}$. Students immediately recognized that the co-ordinates should satisfy the equation $y = mx + c$. Now what if I consider another point (x_2, y_2), when does it lie on the same line? They write the conditions I mention as a linear system of equations. Then for any finite set of points $(x_1, y_1), \ldots, (x_n, y_n)$, equation of the line passing through the points is equivalent to determining the existence of m, c which is equivalent to the column vector $(y_1, \ldots, y_n)^T$ lying in the space spanned by $(1, \ldots, 1)^T(n \quad \text{times}), (x_1, \ldots, x_n)^T$ and this is exactly when the students realize that the *best fit line* is obtained by finding the projection of $(y_1, \ldots, y_n)^T$ on to the space spanned by the vectors $(1, \ldots, 1)^T, (x_1, \ldots, x_n)^T$. Such a method, increases their confidence as it isn't me answering or solving explicitly a problem but rather asking simpler questions to which students already know or can work out the answer to. This works best while solving an abstract problem more than a concrete one. Say for example, finding the n-th derivative of $\sin x$ for n an even natural number. All I have to do is take the first two derivatives and explain why it suffices to do so. Students intuitively see the pattern, thereby develop an ability to deal with abstraction.

I have often realized as a researcher and a teaching assistant, no matter how easy or boring the basic concepts may seem, it is most important to focus on the fundamentals. Mistakes we make while solving a problem can almost always be traced back to overlooking a comparatively simpler concept.

Before we teach the L'hôpital rule, students may not fully understand and often are confused as to why the identity $\lim_{x\to 0} \frac{\sin x}{x} = 1$ is true. I sketch the graph of $f(x) = \sin x$ and $g(x) = x$ on the same set of axes and ask, how do the functions look like at points *arbitrarily* close to 0. When they realise that the functions appear the same as we get closer and closer to 0, students seem to get an intuitive picture of why $\lim_{x\to 0} \frac{\sin x}{x} = 1$.

While explaining concepts, especially the ones, students maybe encountering for the very first time, I have found it helpful to resort to a daily life situation that could be compared to the mathematical concept. In the calculus I course, the concept of limit of $f(x)$ as $x \to a$ is something many students may not have seen before. I ask students to think of the following situation: If a person, say Mr.X who lives a few blocks away from the campus, claims to have a million dollars with him. Would it be reasonable to believe him if all his neighbors to the right and all his neighbors to the left supported his claim? What if the neighbors to the right of his house support the claim but the ones to the left dismiss it as a lie? Students start getting a picture of where I am going with this. And that's how I introduce the concept of right hand and left hand limits. There are also instances when I begin a new topic with a motivating question/example. For instance, before introducing integration, I always ask students to visualise themselves travelling in a vehicle where they would have access only to their watches and the speedometer of the vehicle. If it is assumed that the speedometer shows the accurate instantaneous velocity, how would one estimate the distance travelled in a given time interval. This is how I plant the idea of a continuous sum rather than a discrete sum in the minds of the students.

One of the things I have learnt from my research in Math is to have uninterrupted focus. It is relatively easy to be focused for short intervals of time, but I think that it is possible to extend that interval with practise and dedication. That is something I try doing with my students. Some of the ways of achieving this are solving and explaining problems that may not have been assigned as a homework problem, yet are conceptual, discuss the similarities among different problems and quite often, change the problem slightly to keep them focused. For instance, after students finish solving $\int x. \ln x dx$ using integration by parts, I usually ask them to solve $\int x.(\ln x)^2 dx$. At first, it might look difficult to them. But as they proceed to use integration by parts, they end up seeing why I chose that problem. As a teacher that is what I enjoy the most, keeping them intrigued, focused and letting them see the beauty in mathematics on their own.

Just like in any other fields, in research too, some people are born talented. In the sense that abstract mathematical concepts come very naturally to them. People with limited talent though, need to work really hard to be able to hold their own. And this fighting spirit is something I try to convey to my students, especially when the students are motivated to work hard but may find it difficult to understand the concepts at first. Being able to cope with a bad grade after the exam, trying and finding the motivation to do better in the next is something I have tried to imbibe in my teaching style and have found it to be effective on several occasions. As I have received a lot of positive feedback from the students and faculty of mathematics department, Tulane University. It gives me immense joy to hone my teaching skills even more, in order to become the best mathematics teacher I can be.