

TEACHING PHILOSOPHY STATEMENT

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It is a fundamental part of the development of science to communicate results. Throughout history, major scientific discoveries and breakthroughs have been made because of the knowledge passed down from previous generations, or as Isaac Newton said, *"If I have seen further it is by standing on the shoulders of giants"*.

The process of exploring science and then transmitting new findings to younger generations is what makes research an active field in human activity. Without this process, there would be no scientific progress whatsoever, especially given that, these days, new findings require a high level of specialization that almost certainly cannot be achieved without any external help.

Accordingly, teaching is an important part of both, current and future scientific development, as well as a social need that affects everybody.

Mathematics has always been classified as a tough and unattractive study topic. Many young students begin college with the idea that mathematics is a hard subject and that it mainly deals with numbers and equations. One of my teaching goals is to show my students that mathematics is not simply restricted to the study of numbers and equations. Rather, mathematics is a language through which one can precisely describe real life phenomena. Additionally, mathematics constitutes a broad area of study in and of itself.

I believe that an indispensable concept in the study of mathematics is to be able to have different points of view, as making connections between these different views is of great importance for problem solving and critical thinking.

METHODOLOGY

I strongly believe that a teacher has to be more than a guide; a teacher also has to be a motivator. One way to accomplish this is to expose and lead the students to find solutions to real life problems.

One key aspect of mathematical learning is to develop scientific social skills. Whether working in industry or academia, the ability to interact with others is important to achieve success in any task. Working in groups, in class activities or course projects, is a great method to achieve these social skills as well as to provide challenging mathematical assignments. The advantages of this are manifold, as students learn how to apply critical thinking in a social environment, as well as to develop patience and persistence, which are prime in real life situations.

When transmitting knowledge, I personally think that it is of great importance to work with examples before deriving general concepts and ideas. Such an inductive approach is a natural way in which the human mind learns, whether it be for basic skills in the younger years or cutting-edge research work. Providing examples as well as analogies constitutes a key factor to understand abstract concepts that often appear underlying mathematical tools used to solve problems.

Also, I strongly believe that class participation makes students connect more with their classmates, and with the class itself. By answering simple questions during class time, the student can reinforce the learned material as well as gain more confidence towards the course material. Great part of the lack of success in mathematics education is due to the fact that many students are afraid of the subject itself, or that they believe it is too hard. By participating in class, they can gain more confidence to break those paradigms that tear mathematical education nowadays.

Like any sport or performing art, mathematics requires practice to master it. For this reason, I believe that most of the progress in developing mathematical skills is made by problem solving, in and out of class time. Giving a fair amount of homework is key to assess the necessary aptitudes to succeed in the learning process. I think that homework is very important to achieve important results in class. It can be directed

towards two main objectives: one is to prepare students with the basic skills needed to study mathematics, and the other is to stimulate their thinking process. The first one is achieved by doing several exercises of the same type, in order to built up some mechanical skills needed in order to go to higher topics. The second one focuses into more elaborated exercises, even entire projects, where the students can use several of the previous skills learned through practice and repetition in order to solve a bigger problem.

Besides traditional teaching, I have experience with the Flipped Classroom methodology. Here, students access the class topics beforehand so the theory is covered prior to class time. This opens up various opportunities to explore during class meetings. It enables the teacher to gauge how students feel about the content, to dig deeper into complex concepts, to talk about important examples, and to focus on problem solving strategies.

I find great advantages of using blended teaching methodologies and feel myself very comfortable applying them. I think that these give the advantage of having a more personal experience with the students and enables the instructor to share problem solving experiences. These blended methodologies provide a way for teachers to make a deeper impact on the learning process and to connect more with the class.

Also, I have experience with Inquiry Based Learning, which is a great methodology that pursues to develop critical thinking on students. The teacher becomes a mentor and a guide, and not only a source of knowledge. By asking the right questions and posing the correct problems, the teacher is able to direct students to find and discover by themselves the contents of the course.

COMPUTATIONAL AND EDUCATIONAL RESOURCES

I believe that using technology is essential for mathematical education. I have experience using applications like Wolfram Alpha, Mathematica, Geogebra, R, among others, for in-class activities and group projects. The use of these tools can redirect the focus to the underlying mathematical theory and make the students realize that computation can be left to a secondary role. Also, with the help of computational software, it is possible to achieve more realistic descriptions, obtain better images, calculations, and approximations of the described phenomena.

Online educational tools are fundamental for improving the educational experience. From communication to class videos and online assignments, these tools can greatly enlarge the capabilities of a teacher and the success of the learning process. I have used great tools like Piazza, Blackboard, Canvas, Quest, and MyMathLab that improve class management, communication with students, and enhance assignment assessment.

MENTORING

Another way of motivating development in mathematics is made by mathematical challenges. Mathematics finds motivations in real life problems by developing tools for other sciences, but also mathematics is a rich area of study in itself. I believe that mathematical olympiads share the same spirit as many areas of pure mathematics, being made just for the sake of mathematics development. For these reasons, I find mathematical competitions to be really motivating for developing mathematics, even more at young ages. This can be a good way to engage undergraduate and graduate students into mathematical research. I have been part of the training team for several international mathematical competitions in my home country, and I have seen how motivating it can be for developing skills as a mathematician, being myself attracted to mathematics in the first place when participating in such competitions.

ACTIVITIES

As a way to motivate students, I have developed several activities throughout my career as a teacher. I think that social networks can effectively be used for engaging students in learning activities. I often manage Facebook pages for each of my classes, where we share news and media related to mathematics, in an effort to make the class more accessible and appealing for students. I also write on my blog about topics involving mathematics and special applications of it in many situations. I write of the interaction of mathematics and other disciplines using my background of electrical engineering, as well as topics that have applications

within mathematics itself. I also have participated in programs involving mathematics divulgation, specially for younger students. I have given talks about mathematics and applications, intended mainly for middle school, high school and young college students.

I strongly believe that sharing the passion and excitement that mathematics produce, is one of the best ways to engage students and to motivate them into going deeper into any mathematics course.

EVALUATION

Personally, I classify class evaluation in three different stages: Personal Preparation, Personal Evaluation, and External Evaluation.

- Personal preparation is mainly achieved by the student doing homework. I believe that practice is very important in order for a student to develop mathematical skills and that can be obtained only by completing the homework.

I strongly believe that a good strategy is to give two kinds of homework assignments. As previously described, with these types of homework it is developed both the basic skills and the thinking process of the students. Since these are the most important achievements, these homework assignments should make up to 10% of the grade.

- Personal evaluation gives students the opportunity to discover for themselves: how well do they understand the fundamental concepts in the class. I pursue this by giving students weekly quizzes that cover the topics for that week. Part of motivating the students is to show them how much they are learning and improving in the class.

These type of small evaluations help to gauge both the students and the teacher as how well the class contents had been learned. This is a good indicator and a great feedback in order to determine which topics need to be strengthened and emphasized.

I believe that a course plan has to be flexible and adjustable to the actual class that is been taught. Through these evaluations it is possible to adjust the class material and techniques accordingly to the specific group of students. These should make up to 10% of the grade.

- External evaluation is accomplished mainly with examinations and group presentations. Through these means, I can evaluate how well students understand the concepts and also gauge their mathematical skills after having been prepared through the two previous stages.

These are the most important ways in which students can built up a grade. As the two previous indicators prepare them to success in learning the material for the class, these evaluations will represent a good measure of what has actually been learned. My idea is to give an exam every time major sections of the class material are concluded. These will be normal tests which can be between 2 and 4 per semester, according to the topics of the class. Then a final exam gives an overall idea of the concepts learned in class, and serves as a good indicator of the assessments for the class.

Group presentations and group projects help also to measure the ability that students have to work together in groups. I think that this ability is key not only in mathematics but in many different areas in today's world. Preparing people to work in groups is part of preparing them to make part of society. Nowadays, it is important to learn how to work in connection with different people of different backgrounds. Interdisciplinary groups are taking over the job market, hence learning to work with people from different specialties and interests is an important skill that needs to be developed.

ASSESSMENT

My main goal when teaching is to motivate students to get interested into the subject, and more generally, into mathematics. I am deeply concerned with students learning the material and be available for them to explain important concepts and answer questions during class time and office hours. As my faculty evaluations show, students feel comfortable asking questions and reviewing material, not only in class, but also during office hours and review sessions. Having above average

results in the faculty evaluations tells me that my teaching philosophy and aptitude towards students is in a good direction.

I also think that having a respectful attitude towards students is key for the success of the teaching methodology. It is important for the students to feel comfortable with the teacher without taking aside the hierarchy of the role of the teacher. This is also reflected in my evaluations where I have above average scores.

As stimulating the students into the class and into critical thinking, my faculty evaluations also reflect that my groups are above average. They also manifested my interest into the subject, which I believe is important to lighten their attitude towards mathematics. When presenting mathematics as an appealing subject, their attitude and appreciation of the subject change, and this helps them to better learn and become interested in the subject.

Also, my high school students from mathematical competitions have shown me how effective can motivation and proper use of homework be reflected in a concrete way. During my time as a trainer of the national mathematics teams, my students won several bronze and silver medals in international mathematical competitions.

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