Teaching statement

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My view of Mathematics is influenced by Arnold, who said that Mathematics is a branch of Physics, and so, what we study in Mathematics, always has some connections with the real world. In my teaching I always try to emphasize these connections and give a big picture.

Before coming to Cornell, I had some teaching experience in mathematical summer camps for high school students. Students from these camps were already interested in mathematics, so my job was just to help them learn. However, when I started teaching a broader range of students, I learned a very important lesson that have changed how I teach. I realized that in order to be a good teacher it is very important to be able to engage students interest in the subject. Usually, I try to achieve it by different methods, such as giving historical references, suggesting non-mathematical analogies to purely mathematical concepts, adding informal explanations of why a certain theorem is true, besides giving its formal proof. I try to show that the way mathematicians think, is not that much different from the common logical thinking, and that it can be entertaining. For example, in the first semester calculus class, in order to achieve better understanding of the $\epsilon$-$\delta$ definition of the limit of a function I suggested my students to play the game where the first player chooses $\epsilon$, and then the second player chooses a corresponding value for $\delta$. Then, depending on which player had a winning strategy, we were able to conclude, whether the function had a limit or not.

A learning process cannot go well without good human connections. In order to establish them, a special environment should be created, in which each student would feel that they are a part of the learning community. That is why I usually tell my students stories from the times when I was a student myself. I try to share my experience and knowledge with them, because we all are learners. For example, sometimes during review sessions I pick a problem that I have not seen before and show step by step, how I approach the problem and come up with a solution. I believe, this is very helpful for the students, because this way they can see the whole sequence of informal ideas and observations which brought me to the solution.

Another important thing that I have learned is that in many cases asking is better than telling. When I teach, I always ask my students questions. The role of these questions is hard to overestimate. They give me immediate feedback, so, if needed, I can adjust my teaching right during the class. Besides that, by asking questions I encourage my students to actively participate in the class. This way I can either lead them to a correct answer which they will understand better after discovering it by themselves, or emphasize importance of certain results or conditions. Also I hope that the habit of answering questions gives rise to the habit of seeking questions which is an invaluable quality for self education and control of your knowledge.

Additionally to solving standard problems, I want my students to use some creative thinking, so sometimes I give them slightly uncommon problems. For example, I might ask them to find mistakes in a given solution, or create a problem, the solution of which should use certain methods that we study. Another idea that proved to be very effective, is to give a special quiz towards the end of the semester. First part of the quiz happens in class, but after that students have a second attempt to work on the same problems at home. The main purpose of this quiz is not in testing the students but in preparing them for the exams. I try to make problems that relate
several concepts taught in the course, this way helping students synthesize different concepts they have learned. The effectiveness of this quiz can be characterized by the fact that usually before the final exam some of the students voluntarily ask me to give them another quiz of that kind.

Overall, I view teaching as a way of communicating mathematics. This communication can occur between people of all possible levels from high school students to professors in universities. That is why I believe that teaching is an important aspect of the work of any mathematician.