Teaching statement

My teaching experience began when I was an undergraduate student of Moscow State University in Russia, I was invited to teach my first minicourse. I liked that experience, I think it was very nice to explain new concepts to students (at that time, high school students) and to see how they understand those concepts and started to apply them to some kinds of mathematical problems that were new for them, and now they could solve them easily. After that, I was a teaching assistant at several courses, gave two more minicourses (i. e., three in total), and gave two large courses (the third large course is in progress).

1 Teaching philosophy

In my teaching, I try to reflect the following principles. First, each course I am teaching or I participate in teaching may have a theoretical part (where students learn and understand new concepts) and a practical part (where students learn how to solve problems, and what actual computations they have to do for that). I think I should clearly distinguish between these two parts, because they require slightly different styles of teaching. For example, if the technical equipment permits, I normally use projector and slides to explain the theoretical part of the course, because then it is easier to show the whole picture of connections between objects or properties of a certain objects. This way the students can learn answers to the questions like “what parts or properties does a certain object have?” or “what can, in general, be done with a certain object?” On the other hand, I prefer to explain the practical part of the course using chalk and blackboard, because then the students see how the solution of a problem develops. This way students learn answers to questions like “given a precise numerical description of a mathematical object, what steps should I take to obtain a precise numerical description of another object linked with the first one?”

Second, I should always keep track on the students’ level of understanding, I should check that I am not going too fast or too slow. So, when I teach a lecture course, at the beginning of each lecture (except for the first one) I review briefly the keypoints of the previous lecture and ask if there are questions. After each complicated definition or computation, I make a pause, so that the students have enough time to understand what I was doing, and also ask for questions. Of course, the most important and complicated definitions and statements should come with examples. Also, to see how well the students really understand me, I sometimes ask questions to them, and if they cannot answer, I repeat my explanations and give more details. And of course, I think I should do all possible efforts to make sure the students have all necessary information, materials and knowledge to solve questions asked at the exams. I double-check that the terminology and notations in the exam are the same as in the lectures and that lecture slides are available for the students on the course webpage. For the students who want to have more practice or feel that they need more practice, it is also useful to post optional examples and exercises on the course webpage.

Third, sometimes in my teaching experience, as a TA, I had to check and grade students' oral presentations of solutions. I always tried not only to verify the correctness of the solutions, but also to make sure that the student talking to me understood how to use the basic theoretical concepts introduced in the lectures. In particular, if I saw that the student provided a mathematically correct solution, but this solution did not use the theory explained in the course, and was much more complicated than a possible solution that uses the theory, I, of course, accepted this solution. But then I suggested a simpler solution to this problem, which used the material explained in the lectures.

I hope that after the students have learned how to solve the problems using solutions that are not too computational and complicated, they will like the subjects they study more. (Some of the students in my classes actually told me that they liked "conceptual" solutions that use theory more than the situation when a solution consists of a lot of computations, and one cannot understand "what is behind" these computations.) Sometimes these discussions also helped me to find better solutions of the problems I had had to solve on my own before, when I was a student. And I hope that after this teaching assistantship experience, I now have a better knowledge of what students understand easily, and what they do not understand so easily, and in the future, this knowledge will help me to organize my lectures better.

2 Teaching experience

2.1 Canada

September 2016–December 2016, January 2017–April 2017, September 2017–present, Mathematical Methods II, course number MAT1302 at UOttawa. I taught and I am teaching this course as a postdoc at University of Ottawa. The course is intended for non-mathematicians, and the mathematical content of the course is linear algebra. This is a coordinated course with several sections, and I was the lecturer of one of the sections. I teach 2 lectures per week. Additionally, my section is split into several (2 in Fall 2016, 4 in Winter 2017, and 2 now) discussion groups, each of them has a separate class once a week, taught by a TA. I coordinate these TAs. In addition to the lecture teaching and TA coordination, I have one office hours session per week lasting 90 minutes, and I also write practice problems for students after each lecture and solutions to them a bit later. Every time, the course has 3 midterms and a final exam. The midterms are graded by one more TA, and I grade the final exam. The number of students was 114 in Fall 2016, 151 in Winter 2017, and 128 now.

2.2 Russia

Many mathematical courses in Russia, or at least at places where I used to teach, are split into two parts: the "lecturing part" and the "problem solving part". First, the main teacher of the course explains theory (and sometimes also some examples of problems) at lectures. Then the students receive lists of problems (which can include theoretical problems as well as practical ones), maybe solve them at home, and come to the problem solving sessions. At a problem solving session, each student presents all of his or her solutions orally to a TA, the TA talks to the student and marks the solutions. Other students don't listen to their conversation, they try to solve the problems on their own. In other words, at a problem solving session, there is no teacher who speaks to all of the students at once. To make it possible for each student to present all of his or her solutions during such a session, large and middle-sized classes typically have several TAs. When I say that I was a TA below, it means that I participated as a TA in such a problem solving session.

July 2015, minicourse "Combinatorics of polytopes and Gale diagrams". I taught this minicourse at the "Contemporary Mathematics" summer school in Russia. The students at this summer school were in their first two years at university or in their last two years of high school. This course was organized as a series of regular lectures. There were no regular classes where students could present problem solutions. Instead, some problems were announced in the lectures, and students presented their solutions during informal discussions in the evenings. Also, the level of students at this high school varied, so I made my lecture plans flexible depending on the actual knowledge of the students. The class consisted of approx. 20 students.

September 2011–May 2015, TA at several courses: "Mathematical analysis", "Geometry", "Lie algebras and algebraic groups", "Functional analysis". When I was doing my PhD at Math department of HSE Moscow, I was a teaching assistant there, at these courses. The groups of students consisted of 20 to 40 students, and there were several TAs, and in each class I talked to 4 or 5 students. Sometimes (in addition to what is said in the third part of my teaching philosophy above) I also had discussions with students out of class, where I explained more possible solutions and the related parts of the theory.

September 2008–May 2011, TA at a high school course on mathematics in general. This was a theoretical general mathematics course at a math-oriented high school in Moscow. It included such topics as: propoerties of functions and working with expressions depending on variables, solving different kinds of equations in one variable, basic mathematical analysis, combinatorics, axiomatic construction of Euclidian geometry, and elementary linear algebra. The group consisted of about 20 students, and there were several teaching assistants, so in each class I also talked to 4 or 5 students.

April 2007 and April 2008, minicourses "Gaussian integers" and "Fermat's last theorem for degree 3". The minicourses were taught to a group of high school students who had very good results at mathematical competitions. In fact, the second minicourse was a continuation of the first one, it was taught to the same students. Each class consisted from a short lecture and a problem solving session (in this case, I was the only teacher there, I talked to all of the students). Each time, there were about 10 to 15 students in the group.