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My first try as a teaching assistant

Last summer, I engaged as a teaching assistant in the “Enrichment Programme for Young Mathematics Talents” (EPYMT) organized by the Department of Mathematics in CUHK. This was the very first time I took part in teaching and it made a really remarkable experience to me.

EPYMT was an intense programme designed for gifted secondary students to learn advanced mathematical topics usually taught only in universities. Eligible students passing the screening test were allowed to take part in one of the four courses featuring different mathematical topics. Each course was divided into the lecture session in the morning and the tutorial session in the afternoon. These sessions were held three times a week, making up to a total of ten days of meeting. Three tests were also held to assess students' performance and learning progress.

I, together with two students majoring mathematics, were invited to help out as teaching assistants in one tutorial class of ten students, ranging from S.3 to S.5, on the topic “Geometric Perspectives and Complex Numbers”, the somewhat easiest course of four. We were required to provide the students with extra course materials and exercises as well as the question-setting and marking of the test papers. Though nervous about teaching a group of elites (since it was the first time I taught!) I decided that I could give it a try. Although things did not go as smooth as I expected, thanks to my professor's advice and the LET Programme, I had prepared well enough for a great experience in teaching.

Before the course began in July, we were advised by the professor that we introduce the course materials “from a secondary student's perspective”, meaning instead of teaching these materials like how we were taught in lectures, we could provide some insights by using knowledge familiar to secondary students. The key point was to understand the students' needs and abilities and let them gradually “feel” the logical thinking and intuitions behind the geometry. It was certainly easier to give them time to think and provide the solution directly, but then they could not possibly gain the skills in solving similar problems. A better approach, though required more careful handling, would be to give them subtle hints and let them finish the remaining. That way they not only gain confidence in solving advanced mathematical questions, but also the skills behind that they could acquire and apply to other questions they encounter.

Yet it was not until I really took part in tutoring that I realized the high importance of adjusting my teaching according to my students' abilities. During the teaching, I had two main observations that made me reflect on my teaching. The first observation was the poor performance in tests. Although a few typical examples had been taught in tutorials and appeared almost exactly the same style in tests, some students still failed to give satisfactory answers. They not only forgot certain examples easily, but also lacked the skills in making use of new theorems they had learnt to attempt the questions. Some simply wrote down the theorems they remembered without any explanation; others even skipped the questions. So I hoped to help them in overcoming the difficulties they found in their problem-solving, but then I observed the second thing: when I gave them questions to try out, they did not know how to finish them; but when I gradually write out the solutions to these questions, they seemed to understand them well. Then I understood that the difficulties came from the main difference between the mathematics subject in secondary schools and universities. In secondary school mathematics, one could readily use a similar approach in solving questions of similar style. In university mathematics, however, the more complicated solutions made it harder for one to remember the proofs in a step-by-step manner. Even when one understood a solution, he might not be able to recall it well in solving a similar problem, unless he really learnt very well about it.

I gradually recalled that I actually had the same difficulty when I first entered university. I often did not understand the relationships between certain examples and theorems. Some solutions and proofs were also tedious and I could only remember a small part of them. After a year in the university, I was glad to have acquired some “sense” in dealing with university mathematics. In light of my own experience, I gave more examples to my students, hoping that some practice would help provide more insight and directions. Learning that it took time for one to acquire that mathematical “sense”, I also understood that even after the three-week course, it was totally normal that only very few students could understand the course materials well, so I had reflected my teaching to aim at giving them the intuitions behind rather than learning the course materials itself. I believed the idea and intuition were more important that learning the tedious calculations and I felt that I had done a decent job in that.

Besides the appropriate way of handling course materials, some guidelines on classroom management were given by the professor, aiming to build up the atmosphere suitable for group discussions. To facilitate interactions and communications, we were advised to ask students to form small groups and sit in circles so that students could discuss and solve the problems together. While students work on the problems, we could also join the group to observe their performance and adjust the pace of teaching accordingly. Other helpful skills including different methods of teaching, time-management and lesson planning were also introduced in the LET Programme pre-workshop that I was recommended to join in late May.

During the pre-workshop, besides a video on group discussions, I could recall that another video on experiments was played. One or two students were also asked to try teaching a science topic in front of the class of tutors. Although experiments could not help in teaching EPYMT, the idea of experiments did help out at times. One common approach that I introduced to my students was to observe the patterns or similarities they find in their problems. They could carry out some kind of “experiments” to see if they could relate to something they had learnt before. As for the part where students were asked to teach, one student used an approach which turned out to be the most useful in my teaching. It was the use of diagrams, together with verbal explanation. I personally found that it way the most effective way for students to acquire the materials I taught. Basically the diagram helped in visualizing the verbal instructions as well as deepening students' memory towards the related knowledge. This was especially important in geometry, the branch in mathematics that required the most visualization.

Skills about time-management and lesson planning, though were not very well applied, acted as very helpful reminders on how to be good teachers. I myself found the time-management part easier to handle, probably because the tutors would remind each other on how much time had passed and could adjust the pace accordingly. Despite failing to cover all the materials required, we did finish almost 90% of the materials, where each lesson was of appropriate length. However, the lesson planning part was the real challenge. One of the main reasons that I did not plan very well for my lessons was the schedule of the course. As tutors got to meet students three times every week, we had very little time to prepare for the class. Although the LET Programme recommended that we should be well-prepared for each lesson, it was very hard for us to prepare for each class within two days, not to mention having three tutors to plan the lessons together. We ended up collecting problems on ourselves and took turns to teach the problems. That way although we did not prepare for lessons together, we still had some kind of preparation. Another reason was the lack of communication between the lecturer and tutors. Since the lecturer did not follow very closely to the lecture notes provided, sometimes we might have covered materials that were not taught in lectures, or missed out some materials that were discussed in lectures. Very often we might even lack the planning required for a part of the lessons.

One thing that really depressed me was some of my students' attitude. As the materials went more and more difficult, fewer and fewer students paid attention in class. Some said they had not understood why they had to use a more “difficult approach” relating to complex numbers to deal with similar triangles. Others were only interested in what would appear in the tests. When really tedious calculations were involved, they gradually lost the interest towards the course. Regarding these thoughts, I had asked myself whether it was the problem of my teaching, but such reflection did not help improve the situation. On the other hand, I was glad that one or two students who did especially well had still showed great interest towards the course materials. Some even asked questions that the tutors did not know how to solve!

If I were to give some recommendations to the course, I would say the schedule of the course needed the most improvement. As for some reflection towards my own performance, the best part that I did was probably the time management. While this experience provided me with greater confidence in teaching, I would bear in mind that I needed much improvement in understanding students' needs and abilities, as well as lesson planning. If time allowed, I would also spend more time communicating with the other tutors and planning lessons together.

All in all, I was really grateful for being chosen to help in this programme. I never expected that I would be capable in teaching a group of students. Now, as a current teaching assistant of another mathematics-related programme, this experience provided me with much inspiration with how I can teach better. Once again, thanks to my professor and the LET Programme for the great advice and skills that truly helped in my teaching. I truly hope my teaching could also inspire my students as much as how I am inspired by my own experience.