TEACHING STATEMENT

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I have taught mathematics for almost ten years by now, four years in Japan when I was an undergraduate in Tokyo, and six years in the US during my Ph.D. study at Johns Hopkins. In Japan, my students were mostly a small group of highly talented and motivated middle and high school students. I taught highschool mathematics as well as graduate-course level modern mathematics and problem solving (as in mathematical olympiads). In the US, I most often worked as a TA of service courses. I do find teaching rewarding and am confident in presenting materials with clarity, but my history of teaching is the history of constant improvement, especially in the US.

Aside from English skill issue that I believe to have naturally improved over time, the biggest challenge for me was to understand the students' needs. This is partly because I have not received prior education in the US; at first, I did not even know that many of the colledge courses are not proof-based, and I was not sure what role exactly the TAs are supposed to play! However, in retrospect, it was not the root of the problem. Teaching experience in the US have helped me to *relativise* my standpoint.

In an ideal world, students should understand *WHY* of mathematics, not only *HOW*. It is relatively easy to push my standard of rigor and the way I believe how students *should* understand the material. This may be appropriate in graduate courses, and sometimes also in less advanced courses. However, it must be kept in mind that not all students need the same level of mathematical expertise, and I guess my adherence to them in my first few years was more confusing than helpful for students. Over time, I came to realize that my role is not to make them do math in a way that I do, but to guide them to the best version of themselves. For them, this means not only to understand concepts but also to get the right answer and score higher, feel confident with math, and become able to apply it in their own field. Of course, we must not give up teaching students to think logically and rigorously, or to appreciate and enjoy mathematics. Sophistry-detection and self-error-checking skill cultivated by learning mathematics is transferrable to every aspects of life, and I think it is one of the most valuable assets gained, even more than specific sets of knowledge. And math is, after all, one of the best nature's metaphysical beauty, as well as the tallest giant's shoulders, and I believe the joy and the viewpoint offered by it can be appreciated by anyone. Confronting this dilemma of what I *should* teach and what I *want to* teach [1] and striving to optimize students' gain seems to be the only way to be a better teacher.

[1] I wrote *dilemma*, but meeting students' immediate needs and performing as a math guru do not necessarily contradict; rather, I believe they ultimately direct to the same way. For example, if I give a birds-eye viewpoint at the correct timing and conciseness, I think they will somewhat appreciate it even if it does not directly serve to solve exam problems. It all comes down to measuring what students can appreciate at that point and actively reacting to them. It is easier said than done, obviously.

More actionable components of teaching include the following.
Mathematically:

(1) Be concise and minimize distraction from technical complications. Choose what *not* to say.
(2) Set appropriate target level of conceptuality.
(3) Give simple but illustrative examples and exercises, preferably with model solutions. Encourage students to pick up the way of writing.
(4) Give necessary and sufficient amount of exercises. This does not necessarily mean the minimal set to cover the concepts; *exercises* are the place to be redundant (just as physical exercises!)
(5) Employ coherent conventions or clarify variations of them.

Meta-compontens:

(6) Make sure that students are on the same page. Collect feedback. Don't assume that the most active students in the class are the representative of the whole class.
(7) Face to students as much as possible (I have the habit of facing too much to the board and I must be always concious about this).
(8) Be friendly and inclusive. Do not judge students beyond the *current* mathematical proficiency.
(9) Give timely and clear feedback. Grading is not nitpicking. It should directly reflect the points that we want to emphasize.
(10) Give needs/resources-specific directions for allocation of time and effort.

Let me elaborate on the last few points: As in (8), I believe creating inclusive and equitable learing environment is crucial. Not all students are equally given previous educational environment and cultural capital, and my part is not to reproduce this inequality. Anyone, regardless of social background, gender, ethnicity, race, disability, or even preliminary mathematical knowledge, deserves respect and opportunity to find their talent and love in mathematics.

As in (9), timely feedback is vital. This semester, as a head TA of a service course with more than 300 students, I have been trying my best to ensure this. When the grading was delayed, I explained the importance to be punctual to my colleague TAs as follows: Not giving feedback to homework for more than a week is like letting them go for more than 10 minutes in a marathon without telling them that they are going the wrong way. The response time must be minimized reasonably possible.

I had the following instance of (10). There was a student in my section, struggling somewhere around D. She had got her academic study extended due to personal hardship, but she had to pass the course that semester, or to terminate the academic study. I told her to focus on understanding the examples in the body of the textbook and try to reproduce the solutions. It was one of the most rewarding experience to see that she did much better in the next quiz. This kind of advice seems particularly effective when the way to score higher matches the way to understand the basics.

I end this statement by mentioning other teaching experiences than as a TA. I mentored DRP (directed teaching program), and found interaction with enthusiastic undergraduate students delightful. I also have lead a few sets of review sessions for the algebra qualifying exams for early-stage graduate students. It seems that I find more passion in helping fellow students than performing well myself: when I prerpared for the exam, I only solved less than a half of the previous problems.

When I lead the review, I solved most of them while preparing, wrote comprehensive solutions and summaries of concepts and techniques, which complied to 60-pages notes. The review sessions themselves could only target moderately-prepared students due to time constraint, but it seems that most of the students found my notes helpful. I did learn a great amount along the way, and I liked the whole process, which was a great example of *learning from teaching*.