Teaching Statement

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In this statement I would like to describe my teaching philosophy and how it translates into practice. For the purposes of this statement what I mean by a student-teacher relationship (STR in short) is any situation that is mathematics related, and in which I could reasonably be considered as the teacher, and someone else could reasonably be considered as the student. Me teaching a mathematics class at a university as an employee of said university is certainly such a situation; however this more strict description seems to be too reductive to properly describe the role of the mathematics teacher as I see it.

1 My Teaching Philosophy

At the core of my teaching philosophy there is respect. Respect in this context trifurcates in its direction and in its aspect. In terms of its direction, respect trifurcates into respect toward the student, toward the environment that establishes and keeps stable the STR at hand, and toward myself[1]. In the case of me being assigned to teach a class at a university, the environmental element would include for instance the university both as an entity and as a place, as well as people in supporting roles like course coordinators and departmental administrators. On the other hand in terms of its aspect, respect trifurcates like so: respect of mental capabilities of people involved, respect of people's priorities, and respect of the human conditions of people involved[2]. Let me describe some of these branches; I will be selective due to a lack of space.

Capabilities, Priorities, and Human Conditions of Students I think of any one of my students as having mathematical capabilities[3] comparable to mine; the only

[1] This is of course the well-known phenomenological triangle in disguise.

[2] What differentiates the latter two is the extent to to which agency for change is lacking, roughly speaking.

[3] Implicitly I am following the Universal Declaration of Human Rights ([UNG48]); any such statement is to be taken to be "without distinction of any kind such as race, color, sex, language, religion, political or other opinion, national or social origin, property, birth or other status"; see Article 2 there.

essential difference is that I have spent more time doing mathematics, and as such I have more experience, which is why it makes sense for me to be in a teacher's position and for them to be in a student's position.

I reconcile this belief and the reality of the, roughly speaking, normal distribution of performance evaluations of the students with the help of the other two aspects of respect toward students. Not everyone who is in an STR with me has the same priorities and each student has a right to their priorities. For a student it may not be a priority to succeed in fully internalizing the relevant material, or performing in such a way that is convincing to the evaluators that the student understands the material sufficiently well. In this regard I try to be supportive while still respecting the student's autonomy.

Even though a student prioritizes their understanding and performance in a class it may happen that whatever human condition[4] they find themselves in may get in their way. As a general rule I try to be as flexible, within the bounds of fairness, as possible. Such situations are almost always unique, and as such I think it's best to evaluate them on a case by case basis. I find such situations, together with the myriad of ethical decisions involved, the most challenging part of teaching mathematics[5].

Capabilities, Priorities, and Human Conditions of Supporting Staff[6] I believe that all the people who are in supporting roles are fundamentally capable, and they have the jobs that they have because they do them well. Despite the fact that the supporting staff is highly competent, their jobs may not be a priority for some of them at all times, or else due to circumstances they may not be able to apply themselves to their jobs fully at times. For instance, the exam booklets for my exam may be delivered to me later than the promised time say because the technician who is responsible for printing the exam booklets just happened to be very busy and he gets paid hourly from 9 to 5. I try to anticipate such issues as much as possible and plan ahead. Especially when it comes to teaching at a university, teaching is team work, and I realize that in the eyes of the student I as the teacher am the primary representative of the team, let alone of the department, and the university. I am responsible for providing as smooth a learning experience as possible; it is irrelevant what the primary causes of problems may be.

My Capabilities and Priorities Succinctly, I respect the profession of being a mathematician, of which teaching is an integral part. I am aware of the importance of the role of the mathematics teacher that I am filling, and as such my role as a mathematics teacher is a priority for me. I am also highly competent at teaching; my emphasis is on building personal rapport with students on one-on-one meetings and adapt-

[4]By "human conditions" I mean things like (possibly undiagnosed) disability, illness, death of a loved one and so on.

[5]I would presume this is not specific to mathematics.

[6]Supporting staff are those people whose work is crucial in the continuation of my role as a teacher; they make up the human part of the stabilizing environment of an STR as mentioned above.

ing my teaching to the students' way of understanding on a case by case basis[7]. The biggest challenge in my approach is to have the students get accustomed to interact with me personally and be comfortable enough to ask me questions or ask me to explain things from different angles[8]. I have served as the instructor of 11 classes throughout my time as a PhD student at Penn State, and I believe I have the experience and flexibility to make the necessary modifications to my approach to teaching no matter who the audience is[9] or how large the audience is.

2 My Teaching in Practice

Here are some highlights from my teaching experiences, as understood in the broader sense above:

Sections of Large Classes When it comes to section teaching it is important to keep in mind fairness across all sections, even the ones one is not teaching. For this being in communication with the course coordinator and the instructors of other sections is crucial. At the other end, the students of such sections tend to be highly variable in their priorities. As such I think that adjusting the classes so that they are most appropriate to "the average"[10], but at the same time mentioning more advanced tangents from time to time to keep the top of the class motivated works the best[11]. Similarly it is important to be more encouraging toward students who might be having some trouble following the class; although again in accordance with my teaching philosophy I outlined above it is very important to be respectful of their capabilities and priorities; in practice this means to be clear that only they themselves can change the tide and I as the teacher can only be helpful and supportive. I was lucky to serve as teacher to many a student that started off a semester slow but with

[7] So far I have not taught more than 100 students in one semester; presumably I would need to alter this emphasis if a much larger pool of students is at hand.

[8] In this regard in my experience students react very well to demonstrations on Desmos; I think especially the simple user interface of Desmos makes it an ideal teaching tool. Sometimes I prepare Desmos pages in advance, and at times I also produce the Desmos demonstration in class, and in class I also discuss how I prepared the page. See e.g. https://www.desmos.com/calculator/yw307wyo7d for the solution of a certain separable ODE and https://www.desmos.com/calculator/2ruvgbpwzz for a graphing calculator for the solution of a general second order linear constant coefficient homogeneous ODE.

[9] Presumably the culture around mathematics classes at different universities vary somewhat, which means that a teacher ought to be able to adapt to these globalized variations accordingly.

[10] What "the average" is is to be determined on a case by case basis.

[11] One example of this is as follows: When I was teaching multivariable calculus in Spring 2020, as a tangent I made an adjustment to the standard volume maximization problem for rectangular boxes; where now the box is still "cylindrical" but the base need not be a rectangle. Despite the fact that this is a hard question, there were two legitimate attempts, where both students independently discovered the isoperimetric inequality (neither were mathematics majors). This is still not enough to answer the question, still during our discussions the sense of accomplishment and wonder was apparent. Needless to say these students were already at the top of the class and they both got the best grades at the end of the semester.

a little bit of guidance from me they were able to pick up the pace and get the best grades. Such cases, although perhaps not very important in the grand scheme of things, are certainly highlights of my teaching experiences.

DRP Turkey 2022 In Summer 2022 I had the opportunity to serve as a mentor in DRP Turkey[12], where I was matched with an undergraduate studying at the university I obtained my B.Sc. and B.A. from, and like myself he is also double majoring in mathematics and philosophy. During the program we studied an advanced topic in dynamics, namely the Hiraide-Lewowicz Theorem[13]. At the end of the program my mentee had to prepare a report and make a presentation. Despite the fact that, based on his background, the topic was somewhat advanced for him my mentee was able to rise to the occasion. Indeed, in about two months he went from being somewhat shaky about the classification of surfaces to being familiar with significantly more subtle topologico-dynamical arguments. The whole experience of guiding someone through advanced mathematics was very challenging and rewarding to me.

Mathematics Stack Exchange I am also very interested in mathematical knowledge being open, and I actively participate in the site Mathematics Stack Exchange[14]. My role there is not clearly delineated as a teacher; indeed I had started using this website when I was an undergraduate; however in recent years my activities on the site were mostly answering questions on advanced topics. For the uninitiated a big issue in mathematics communication is that often being able to even ask what their problem is requires a certain level of understanding and clarity, which may be lacking at the time. Hence for a mathematics teacher it is an important skill to be able to read into a question and meet the asker (or student) along the way. Often it is challenging to read into ill-posed questions and answer them coherently in such a way that all possible interpretations of the question are addressed, along with indications regarding which interpretations are more sensible. Thus I think my participation in this webpage has been very useful for me to develop mathematics teaching and communication skills. At the same time I really enjoy the fact that I am able to help other people in their mathematical journey.

References

[UNG48] United Nations General Assembly UNGA, *Universal declaration of human rights*, Online, 1948, https://www.ohchr.org/en/human-rights/universal-declaration/translations/english. 1

[12] https://sites.google.com/view/drp-turkey/

[13] This theorem states that a homeomorphism of a closed connected orientable surface is expansive iff it's topologically conjugate to a pseudo-Anosov homeomorphism.

[14] https://math.stackexchange.com/users/169085/alp-uzman