

Teaching statement

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I have taught Mathematics as an instructor at Dartmouth College (2015-present) with a strong focus on undergraduate teaching. During that time I constantly reflected upon, refined and improved my teaching style. In doing so I drew from many resources like discussions with colleagues, workshops at the Dartmouth Center for the Advancement of Learning (DCAL) and class visits. During that time my evaluations improved continuously to a consistent high.

Evaluations and comments by colleagues and students about my teaching are available at:

www.math.dartmouth.edu/~muetzel/evaluations.php

Besides that I believe it is important to reach out and expose children to Mathematics at a very young age to overcome the common prejudices and disparities related to the subject. To this end I organize geometry exhibitions and events at nearby schools. In the framework of this program I have also been invited to events on a national level, like the National Math festival in Washington or for a presentation at the National Museum of Math in New York.

Teaching style

'Es gibt nichts Gutes, ausser man tut es' - There is no good, except if you do it.

This quote by Erich Kästner probably describes best my teaching philosophy. I think the goal of teaching should be to inspire the students for their subject and their research and to guide them to work independently and self-reflectively. To achieve this, the teacher should be a good example himself. He or she should be enthusiastic and committed and should

- help the students to develop strategies for problem solving
- encourage the students to cooperate
- create a pleasant work environment

To help the students to develop strategies for problem solving, I always try to motivate the problems through examples or pictures. This allows them to examine an instance of the problem and abstract a general solution. To foster geometric intuition I use MAPLE plots (see *Figure 1-3*) for visualization. I also encourage the students to use programs such as MAPLE or Mathematica to verify their solution and to find and reflect upon their errors.

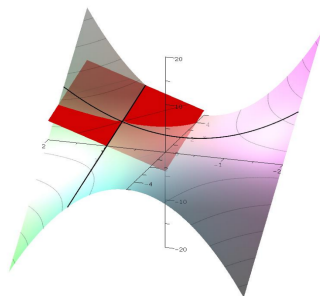


FIGURE 1. Tangent plane to a graph.

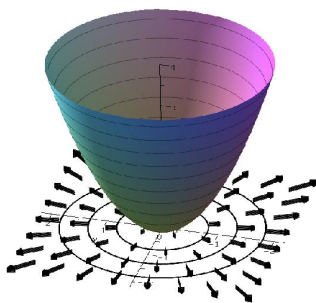


FIGURE 2. Level sets and gradients.

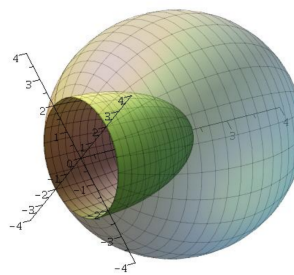


FIGURE 3. Domain enclosed by two surfaces.

During class I try to break down problems and solutions into a number of small, clear steps. I encourage the students to do the same and tell them to divide up methods in as many small steps as they need to.

To promote cooperation I let the students work in pairs or small groups. These groups are usually

formed by project assignments or before exercises during class. I always emphasize that both sides benefit if the students that have already solved the problem can explain it to the others.

In more specialized classes I usually assign projects. For example, in my abstract algebra class, I let the students investigate the connection between the Rubik's cube and group theory:

www.math.dartmouth.edu/~m31f16/project.php

Creating a pleasant work environment reduces the students' anxieties and fears. During short exercises in class I usually walk through the rows, talk to the students personally and ask them if they have understood everything. I think that no question is too simple and take everyone seriously. During office hours I try to create a friendly atmosphere by asking the students to introduce themselves and describe their goals for the course. Over time the students often confide in me and tell me personal stories and anecdotes which I enjoy very much.

In lower division courses, I often give short quizzes with prizes that do not count towards the grade. This is an efficient way to help students assess where they stand and prepare without the pressure of a graded assignment. In courses with high enrollment I like to provide practice exams, so that the students see what will be expected from them.

In upper division and graduate courses I strive to stimulate curiosity and independent work. In these classes I often let the students prove simple theorems or lemmas from the lecture by themselves. My greatest aim is to motivate them to use their knowledge in a playful and creative way. To this end I encourage them to try new things and to ask themselves their own questions, which they should also try to solve on their own.

Finally, I believe it is important to reach out and expose children to Mathematics at a very young age to overcome the common prejudices and disparities related to the subject. To this end I organize geometry exhibitions and events at nearby schools. During these events students engage in activities using geometric shapes and tiles. The aim is to let students enjoy and explore geometry in an open and encouraging setting. Students learn about geometric shapes, like the platonic solids, projections and tessellations. More details can be found here: www.math.dartmouth.edu/~mutzel/outreach.php

Summary of evaluations

The table below presents the overall ratings I have received in my courses from Spring 16 to Spring 18 at Dartmouth, in relation to the scores obtained on average by department members over the past years. The score range is 0 (lowest) to 5 (highest). More details as well as sample comments from students are available at: www.math.dartmouth.edu/~mutzel/evaluations.php

| Course | Rating | Dept. mean | Term |
|---|--------|------------|-----------|
| Math 22: Linear Algebra | 4.71 | 4.22 | Spring 19 |
| Math 8: Calculus of one and several variables | 4.42 | 4.15 | Winter 19 |
| Math 31: Abstract Algebra | 4.65 | 4.34 | Fall 18 |
| Math 103: Measure Theory & Complex Analysis | 4.29 | 4.43 | Fall 18 |
| Math 8: Calculus of one and several variables | 4.62 | 4.14 | Spring 18 |
| Math 35: Real Analysis | 4.89 | 4.17 | Winter 18 |
| Math 31: Abstract Algebra | 4.78 | 4.32 | Fall 17 |
| Math 8: Calculus of one and several variables | 4.71 | 4.12 | Spring 17 |
| Math 13: Multiple integrals and vector calculus | 4.21 | 4.06 | Winter 17 |
| Math 31: Abstract Algebra | 4.41 | 4.30 | Fall 16 |
| Math 22: Linear Algebra | 4.19 | 4.20 | Spring 16 |

Mentoring and undergraduate research

At Dartmouth I have mentored and engaged sixteen students in a variety of activities: In 2019 I lead two students in the undergraduate research project '*Harmonic functions on a certain planar domain*', which also helped one of the students to obtain a summer internship. Besides that I have

been leading a team of five students in my software project for games inspired by Linear Algebra - <http://math.dartmouth.edu/lineargames>.

Another team will probably be working with me on this project in Winter 2019. Additionally I have supervised and engaged five students in various activities in my outreach program. Finally I have given reading courses to two more students and successfully mentored two graduate students in their preparation for the qualifying exam.

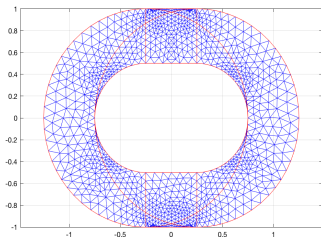


FIGURE 4. UG research.

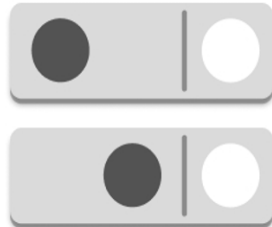


FIGURE 5. Linear Games.

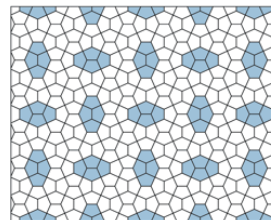


FIGURE 6. Outreach.

To promote exchange I have established a summer internship program for Dartmouth students in Europe and helped them to obtain grants for this program. In total eight students have participated in these exchanges in the following institutes:

- **INRA** Biostatistics and Spatial Processes, Avignon, *2019/20*.
- **British Antarctic Survey**, Cambridge, *2019*.
- **Wenner Gren Institute**, Department of Molecular Biosciences, Stockholm, *2019*.
- **Max Planck Institute** for Evolutionary Anthropology, Leipzig, *2018*.

The results produced during the internship in Sweden led the two students to be co-authors in three publications. More and upcoming projects of this kind can be found at:

www.math.dartmouth.edu/~mutzel/exchange.php