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## 1 Introduction

My first professional experience as a teacher was when I was still an undergraduate student at École Normale Supérieure de Cachan. Out of curiosity, I volunteered for a program that offered E.N.S. students the opportunity to teach mathematics at a local high school for six weeks, as a substitute for their regular teacher. It was a wonderful experience both for myself and the students and it really whet my appetite for professorship.

I have since had a very broad experience teaching mathematics at all levels, both in Europe and in the United States. In France, I taught in *classes préparatoires* (prep schools), at all undergraduate levels at the University of Toulouse III, and undergraduate and Masters level at the University of Paris XI. In the US I taught a variety of undergraduate and graduate courses while a postdoc at Rutgers University-Newark for three years. I am currently teaching at the Bachelor and Masters level in Germany, and supervising student research projects.

Teaching is a highly demanding job that requires a lot of dedication, energy, and time investment. It also comes with an important level of responsibility. On the other hand, it is incredibly rewarding. Over the years I have grown as a teacher, learned to be more efficient, and to meet the challenges of teaching students from all backgrounds. I take great pride in trying to show every one of my students what they are capable of if they build confidence and put their heart into learning. While I obviously enjoy teaching advanced courses that have ties to my research, I put even more enthusiasm into the introductory courses for first-year university students, because I feel that is where I can make the biggest difference.

I am a hardworking and conscientious person in general, and have always shown great professionalism in my teaching assignments, as my record shows. I do not count hours when it comes to preparing lectures, quizzes, meeting with students, and designing courses. I am also a teacher who deeply cares about my students and truly wants the best for them. My passion for sharing my knowledge of mathematics always has me looking forward to what exciting teaching opportunities are next in my academic career.

## 2 Learning to teach

Like many areas of expertise, teaching is an acquired skill: some may have a natural advantage related to their personality, social skills, or ease of clear expression, but everyone learns to improve their teaching abilities through specific training and teaching experience.

When I was a Ph.D. student at Université de Toulouse III, taking a series of teaching-related courses was part of my graduate curriculum. This comprised courses such as: *Pedagogy*, *Communication*, *Didactics*, *Public expression*, *Intellectual property*, and others. I successfully passed all these courses, which was a requirement at the time to validate my doctoral degree.

I have complemented my theoretical education to the topic of teaching with my own readings. Luckily, I work in a field, mathematics, that is rich in scholars who reflect on their own discipline, and in particular on the most efficient ways to transmit mathematical knowledge. This is still very active in educational research. As an example, I have recently enjoyed *Mathematical Mindsets* by Stanford Professor Jo Boaler in which, backed by neuroscientific research, she validates a lot of my own instincts regarding the teaching of mathematics.

## 3 Teaching philosophy with examples

I do not believe in a universal recipe for being a good teacher: every teacher must find their own way depending on their personality, their teaching assignments, and their students. Of course there are important strategic decisions to make, but these often depend on the specifics of the situation. In my experience, a good teacher is simply one that is dedicated and really cares about their students. As a direct consequence, being a good teacher implies investing a lot of time and energy in the job.

One teaching principle I especially value is to give extra attention to those who need it the most. On one hand, stimulating the strongest students with extra material is important, but even more so is helping the weakest students improve. I use this metric above all to measure my own performance.

Below are some specific examples that demonstrate my commitment to the aforementioned principles.

### **Dedication to teaching**

I take my teaching assignments very seriously and am willing to invest extra time, not only because of my professional ethics, but also because of how it affects my students.

- I carefully prepare my own original lectures from scratch. I also always design new original exercises.
- I curate a detailed web page for every course that I teach (see links in § 5). I create many resources available to the students: videos of the lectures, lecture notes, exercise sheets, extra homework, etc.
- I encourage students to stop by both during and outside of office hours. I offer to help students with homework in progress via video meetings.
- Last year I wrote a textbook, *Hyperbolic Geometry*, destined to students at the advanced undergraduate and graduate level.

### **Attentiveness to students**

Being attentive to the individual needs of my students is critical to my approach to teaching.

- I make it a point to quickly learn all my students' names and faces. I do a roll call the first week of class and look at the student photos while grading their first quizzes.
- I try and make students feel comfortable talking to me outside of class as I believe that a professor can be a useful alternative to a parent or a friend.
- On many occasions I have been asked to write letters of recommendations for students, which I always gladly accept. I make an effort to write thoughtful and personalized letters.
- I constantly seek feedback from my students to help me improve.

### **Strategic elements**

Below are a few examples of teaching strategies I rely upon in my classes, some of which I have inherited from my own experiences, and others I gleaned from exchanges with more seasoned professors.

- An effective but double-edged sword is to be extra demanding at the beginning of the semester by applying pressure on the students to bring up their level of involvement and studying. This typically involves making a tough first couple of quizzes. Later, I (secretly) ease my grading policy while they apply themselves to study more, and their grades improve as does their confidence.
- I train the students to have a lot of personal discipline, encouraging regular studying hours by giving weekly quizzes, graded homework assignments, and using socratic methods in class.
- I have learned that it is best to always be ahead of the syllabus, using the extra time for review sessions.

## **4 Teaching experience overview**

Below is an overview of my teaching experience with some relevant comments and examples. Please refer to the *Teaching* section of my CV for a precise list of my teaching assignments.

### **Teaching in the U.S. (2015-2018)**

I moved to the U.S. in 2015 for a postdoc at Rutgers University. The higher education systems in France and the U.S. are very different, which made the transition challenging. However I rose to the challenge and now benefit from having this dual perspective. Language was not an issue: having grown up in several English-speaking countries, I am perfectly bilingual. (Also, I am now married to an American, Benjamin Velez, a Broadway composer.)

My teaching assignment at Rutgers was 2+1: two 3-credit courses plus one 4-credit course per year, which amounts to about 132 hours of teaching service. I have taught a variety of undergraduate courses: Discrete Structures (twice), Foundations of Modern Mathematics (twice), Elementary Differential Equations (twice), Calculus III (three times), Complex Variables, and Abstract Algebra. I taught one graduate class, *Advanced topics in geometry*, where I was free to design the contents of the course.

For every course, I design and constantly update a web page containing all the material, including a course schedule with homework assignments, quizzes and solutions, etc. See § 5 for some examples.

At the end of each semester, Rutgers professors are anonymously evaluated by students (SIRS surveys). I am proud to say that my evaluations are usually well-above the average of the department. See § 5 for a link to my evaluations.

## Teaching in Europe (2008-2014 and 2018-2019)

- 2008-2011: As a holder of the *Agrégation de Mathématiques*, I was an oral examiner in *classes préparatoires*, a highly selective undergraduate two-year intensive. The *Agrégation* is the highest teaching degree in France; acquired through a nation-wide competitive exam. I passed it in 2007 with a ranking of 28/2801.
- 2008-2011: As a Ph.D. student from E.N.S. (*doctorant moniteur normalien*) at University of Toulouse III, I taught a variety of courses at the undergraduate level. As an example, I taught *Differential Geometry* for L3 MAPES, a curriculum preparing future high school teachers for the CAPES national exam.
- 2011-2014 : As a postdoc at University of Paris XI, I taught at both the undergraduate and Masters levels. One example was the L3 course *Holomorphic functions*, taught by Prof. Dominique Hulin in 2013-2014, for which I was a *chargé de TD* (teaching assistant). Prof. Hulin is one of my references for teaching.
- 2018-present : As a postdoc at TU Darmstadt and Heidelberg University (Germany), I am teaching at the graduate level. I have taught 3 Master courses: Riemann surfaces, General relativity, and Hyperbolic geometry, and 1 advanced undergraduate course: Manifolds.

## Supervising student research

- Summer 2019: I supervised the Master thesis of Darja Zierau's at TU Darmstadt. *Thesis title: Cross-ratios of torsion points on elliptic curves.*
- Spring 2020: I supervised the Master thesis of Maximilian Racky at TU Darmstadt. *Thesis title: Cross-ratios of torsion points on elliptic curves II.*
- Spring 2021: I supervise five research projects at the [HEGL](#): 1. Computing harmonic maps, 2. Graph embeddings in  $\mathbb{H}^2$ , 3. Limit sets in spheres, 4. Julia sets and Kleinian groups, 5. Can you hear the shape of a drum?

## Publishing a textbook: *Hyperbolic Geometry*

I wrote a textbook, *Hyperbolic Geometry*, aimed for students at the advanced undergraduate level with many figures, exercises, and solutions. I made a preprint available (see § 5 for the link) and it will be published by *Springer* in 2021. It has already been used by several professors in the U.S. for courses taught in the 2020 Spring and Summer semesters.

## Online teaching

Since April 2020, due to the COVID crisis, I have taught courses fully online: lectures, exercise sessions, oral exams. I have either used a tablet or prepared slides for each lecture, and made all the video recordings available online.

# 5 Additional documentation

## My teaching website

I recommend navigating to my website to see some of my teaching record: [brice.loustau.eu/teaching/](http://brice.loustau.eu/teaching/). For example:

- Most recent course taught at TU Darmstadt, including video recordings of the lectures: [brice.loustau.eu/teaching/TUDarmstadt/Manifolds2020/#video](http://brice.loustau.eu/teaching/TUDarmstadt/Manifolds2020/#video)
- Most recent course taught at Rutgers University: [brice.loustau.eu/teaching/Rutgers/235Spring2018/](http://brice.loustau.eu/teaching/Rutgers/235Spring2018/).

## Textbook: *Hyperbolic Geometry*

The preprint of my textbook *Hyperbolic Geometry* is available at [arxiv.org/abs/2003.11180](https://arxiv.org/abs/2003.11180)

## Heidelberg Experimental Geometry Lab (HEGL)

The website of HEGL, which I am responsible for, is available at [mathi.uni-heidelberg.de/geodyn/HEGL/](http://mathi.uni-heidelberg.de/geodyn/HEGL/). It contains in particular the list of student research projects, of which I am supervising five in the Spring 2021.

## Teaching evaluations

For transparency, I made all my teaching evaluations available at [brice.loustau.eu/teaching/Rutgers/SIRS/](http://brice.loustau.eu/teaching/Rutgers/SIRS/). Please have a look at the student's comments and evaluations, which I'm proud to say speak for themselves!

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