Teaching Statement

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> Once we understand something, it is hard remembering how it was before we did.
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> When a student struggles understanding a concept, the teacher must find different ways to explain, identify what obstacles stand in the student's way, and find ways around them. It is not easy, but I find few things as satisfying as seeing the light in a student's eyes when, all of a sudden, they "get it!" Whatever I end up doing in my life, I want teaching to be part of it.

Philosophy

My teaching philosophy is based on three pillars: get students to practice, ask and react to feedback, and adapt to the students' needs.

Practice It is key that students get to practice the notions they aim to learn. This is a well-known concept in pedagogy: a good learning objective starts with an active verb describing what we want the students to be able to do after a session. In computer science, presenting concepts and protocols is not enough; students must implement these protocols and run them to really understand the algorithms and their limits.

Feedback Student feedback is essential. Exercises, quizzes, or other interactive classroom activities allow to track the students' progress towards the course learning objectives. If a key notion has been misunderstood by many, finding it out only at the final exam is the teacher's failure. In addition, asking students for their opinion about the course management, teaching style, and learning activities offers valuable feedback. In my opinion, a teacher's job is not to do what students like, it is to provide students with what they *need* in order to learn efficiently; which leads to my third pillar.

Adaptation It is the teacher's duty to adapt to the students' needs and capacity. Students are all different; some efficiently learn via textbooks and written materials, whereas others understand things mainly by applying them. It really struck me when I taught the Mechanics course in 2014. I focused on the lectures and theoretical exercises, during which most students had a hard time following. I dreaded the lab sessions, where the same students would have to spend four hours doing experiments that I personally found not-so-interesting. To my surprise, they were extremely engaged. I believe they understood much more from the labs than anything else. That was what *they* needed. A good teacher must understand this and adapt to the type of students they teach.

Lecturing

Past and current experiences

I studied in one of the French's École Normale Supérieure (ENS), which are schools specialized in training researchers and university teachers. In addition to my Bachelor's and Master's programs, I followed there a one-year training for a national teaching exam (the *Agrégation*) that is required for certain university positions in France. This training provided me with **solid pedagogic foundations**, such as defining learning objectives and designing a corresponding teaching sequence. In 2013, I ranked 1st at the Agrégation national exam in the *Engineering Sciences* category–Mechanics major.

The following semester, I had my first professional teaching experience. I taught a second year university-level Mechanics course on kinematics, kinetics, and dynamics at the Institute of Technology[1] of Tremblay-en-France (France) where I was responsible for lectures, exercises, and labs, amounting to an average of 4h/week of class time. It was a very intense experience for which I received great feedback from the students. It also convinced me that I want to spend more time in classrooms.

[1] These are comparable to the Swiss Universities of Applied Sciences.

When I joined ETH Zurich for my doctorate, I was happy to be a teaching assistant in several lectures.[2] I always started the exercise or lab sessions with a quick recap of the key notions, trying to present things from a slightly different angle than the professor had done in the lecture, thereby offering **effective redundancy**. In parallel, I attended courses to further improve my teaching skills.[3]

[2] Embedded Systems
Low-Power System Design
Discrete Event Systems

[3] Learning to Teach
Mobile voting and feedback systems
Speaker, audience, message – Making connections

As a postdoctoral researcher, I have been coordinating Prof. Vanbever's group M.Sc. level course and seminar. Over the past two years, I gradually took over some teaching responsibilities in our M.Sc. course, for which I created brand-new material to teach about my independent research topic: sustainable networking. I released and continuously update this material[4] which we extended last year with an online transcript.[5] The outstanding quality of those lectures led to invitations to deliver guest lectures at ETH (in Profs. Perrig's and Friedman's courses) and outside (see CV).

[4] doi.org/10.5281/zenodo.10527364

[5] Transcript: Part 1 – Part 2

Future activities

I want to focus primarily on extending my material on **sustainable networking** (potentially widening the scope to sustainability in other sectors as well) until I am able to offer an independent M.Sc. level course on the topic. I believe this would be a great addition to the D-ITET course catalog.

I believe it is also crucial for scientists to be able to present their work efficiently. Two core skills come to mind: **visualizing data** and **delivering presentations**. Unfortunately, existing university courses targeting those are scarce and often too abstract. Scientists are not designers; they benefit most from a concrete and rational approach to effective communication. That is something I work a lot on with the students I supervise, both at graduate and undergraduate levels. I would love to eventually scale this up and offer a seminar-style class on the topic. Such a class could also be an opportunity to present and discuss the ideas and principles of "**Open Science**," which is a topic very close to my heart.[6]

[6] romainjacob.net/pledge-to-open-science

Supervision and mentoring

Supervising students is hard and something doctoral students are often not trained for. Luckily, ETH does offer a number of courses on supervision, which helped me progress and feel confident as a supervisor.[7] During my time at ETH, I supervised many undergraduate projects.[8] I always tried to offer students a lot of feedback and advice, not only on the project per se, but also on *e.g.*, their final presentation—something they always appreciate a lot. Out of the 20+ students I supervised, a third came back for a second project and three carried on to pursue a doctorate in our group: this is the best recognition I can think of for my mentoring skills! Here are some quote excerpts[9] from students I supervised.

> During our time together, it always felt like his primary motivation was to enhance my skills and help me grow as an engineer and researcher—something I found incredibly meaningful. His ability to teach scientific methodology, foster critical thinking and guide me in presenting my findings will definitely remain beneficial beyond this project.
> —Maurice Béhanzin

> What really impressed me was Romain's ability to guide us while giving us the freedom to develop our ideas. He valued our input and suggestions, creating an atmosphere of collaboration that greatly enriched the project. Romain's support for independent thinking made the learning experience really enjoyable.
> —Simon Englert

> From the beginning, Romain demonstrated an outstanding dedication to his work as well as excellent organisational and pedagogic skills. While always keeping the bigger picture in mind, he enabled me to gather my own experiences while guiding me with his wealth of technical knowledge and strong personal commitment. His friendly appearance, structural approach and supporting advice enriched our meetings and made working with him a truly enjoyable experience.
> —Andreas Biri

> During the project, Romain proved to constant source of valuable input, strengthening my ideas and providing advice how to integrate them into the project as well as constructively guiding me when I was unsure on how to proceed.
> —Alexander Dietmüller

As a postdoctoral researcher, I co-advised three doctoral students together with Prof. Vanbever. I am currently the **primary advisor of one doctoral student** and recruiting a second one, both assigned to my independent research projects. Helping to nurture their research skills is one of the most satisfying part of my job at the moment.

To maximize chances of success, I believe it is paramount that mentor and mentee have **aligned expectations**. For example, some students are more independent, some need more close-looking over their shoulder; it's all okay, but what the mentee needs or wants must match my own supervision style to make our **collaboration** a success: as a team leader, I want my students to **work with me**, not for me.

I consider mentoring students a key part of an academic's job; after all, academia is about "higher education." We do have a lot of important work to do, but that should never be at the expense of people and their opportunities to learn and grow.[10]

[7] Supervising students – Dealing with roles and relationships; Facilitating meetings and workshops

[8] romainjacob.net/teaching

[9] Full quotes

[10] Paraphrased from Jen Heemstra.