



Feliene Hermans

TEACHING VISION

INTRODUCTION

Transferring my love for programming is one of the big passions in my life, both inside and outside of the university. Every Saturday, I teach children in Rotterdam programming in Scratch, Arduino and Python. I am also one of the founders of the annual 'Joy of Coding' conference in Rotterdam that celebrates the love for programming, and aims to increase communication between academics and programmers.

An important part of my vision is *open education*: sharing my passion and teaching materials with the world, and helping students in doing same. Learning via internet is having a profound impact on how people learn and I think as a university we should be leading in that area rather than following.

TEACHING VISION

Flipping the classroom is the way to go

I am a strong believer in the "flipped classroom" approach, where students watch videos and read materials at home, and make homework and discuss it in class. Nowadays, students can learn about many of the topics of our curriculum online. In the future, the role of the university will be more and support students in learning, and not teaching with lectures. This will mean a quickly changing role for professors into tutors that make great homework assignments and projects, but lecture less in real life, and more online. In academic year 2015-2016 I have "flipped" my MSc course IN4400 to validate my approach. Read more on my [blog](#).

Real projects as homework, for the world to see

When I applied for my tenure track position, I wrote "*by complementing courses with realistic assignments, students will be more involved in the course*" and have put this statement to practice. As end projects of IN4400, students create a data analysis of any dataset of their choice, helping many of them perform data analysis for their graduation projects or jobs. I believe this increased motivation among students and helped them put lessons learned in context. Secondly, students have a huge potential to contribute to the real world. Why have them make homework just to be graded? Inspired by Arie van Deursen's [approach](#) where students contribute to open source students taking IN4400 made videos explaining data concepts on YouTube.

Research and (online) teaching go together

Over the last few years I developed 5 [online courses](#), which have been followed by over 250.000 people. And this is not an extra thing I do on top of teaching and research; it is a core part of it. My research helps my teaching and the other way around. I use my MOOCs to spread the word about my research; through my MOOC thousands of people have learned about our scientific work. Secondly, MOOCs are a great way to gather data about learners, and recruit participants for studies. Not just for my own research [27, 35], but also for others within TU Delft.¹

¹ Guanliang Chen, Dan Davis, Markus Krause, Efthimia Aivaloglou, Claudia Hauff and Geert-Jan Houben. Can Learners be Earners? Investigating a Design to Enable MOOC Learners to Apply their Skills and Earn Money in an Online Market Place, accepted as regular article (12 pages) at the IEEE Transactions on Learning Technologies.

TEACHING INNOVATIONS

Since I started my tenure track in March '13, I have been responsible for two on-campus courses, the Bachelor End Project and a newly developed MSc course: Programming and Data Science for the 99%. In 17-18 I will be teaching another new course: Introduction to Python for minor students.

BSc project (TI3806)

In the Bachelor End Project, I introduced two innovations: a new software system and a closing symposium. The **new software system (BEPsys)** allows all students (about 100 per year) to select projects that companies submit, make teams and invite a supervisor and ask for permission to start. This system replaces lots of emails and professionalizes communication with students and companies. Secondly, I introduced **the BSc symposium**. This serves as nice celebratory day for students not (immediately) continuing with their MSc in Delft. It also hugely reduces the workload of scheduling the presentations, and increases the efficiency of the grading meeting (as we were on a schedule). I estimate a reduction in workload of the end-presentations to be about 50%.

Programming and Data Science for the 99% (IN4400)

In academic year '14-'15 I started a new MSc course: Programming and Data Science for the 99%. This is an elective MSc course aimed at teaching basic programming and data analysis skills to all non-CS MSc students.

When I proposed this course, my section head was worried whether enough students would take the course. So I put a considerable amount of effort into attracting students, by making posters and putting them up all over the campus, and reaching out to directors of education to get the course on the list of pre-approved elective courses. My efforts paid off: in '14-'15 about 70 students registered of which 50 handed in their homework assignments and 37 passed the assignment and exam. In 15-16, without additional marketing effort, 170 students registered for the course and about 100 finished the course, and in '16-17 262 students enrolled of which 161 finished the course.

Introduction to Python Programming (TI3105TU)

This year I will be teaching a new course which will be designed as a flipped course from the start. Students will work on small programming exercises called Koans to practice programming while we discuss the results in class. I can follow students' progress through edX and address common issues in the lectures. Students can gain extra credit by describing their learnings and assignments in the lectures. This way of teaching fits with contemporary research on how students learn programming pioneered by Raymond Lister² that described that students first need to practice programming concepts on concrete situations before they can demonstrate more formal logical reasoning.

² Toward a Developmental Epistemology of Computer Programming - Raymond Lister Publication In Proceedings of WIPSC '16