Teaching sabbatical
University of California, Berkeley
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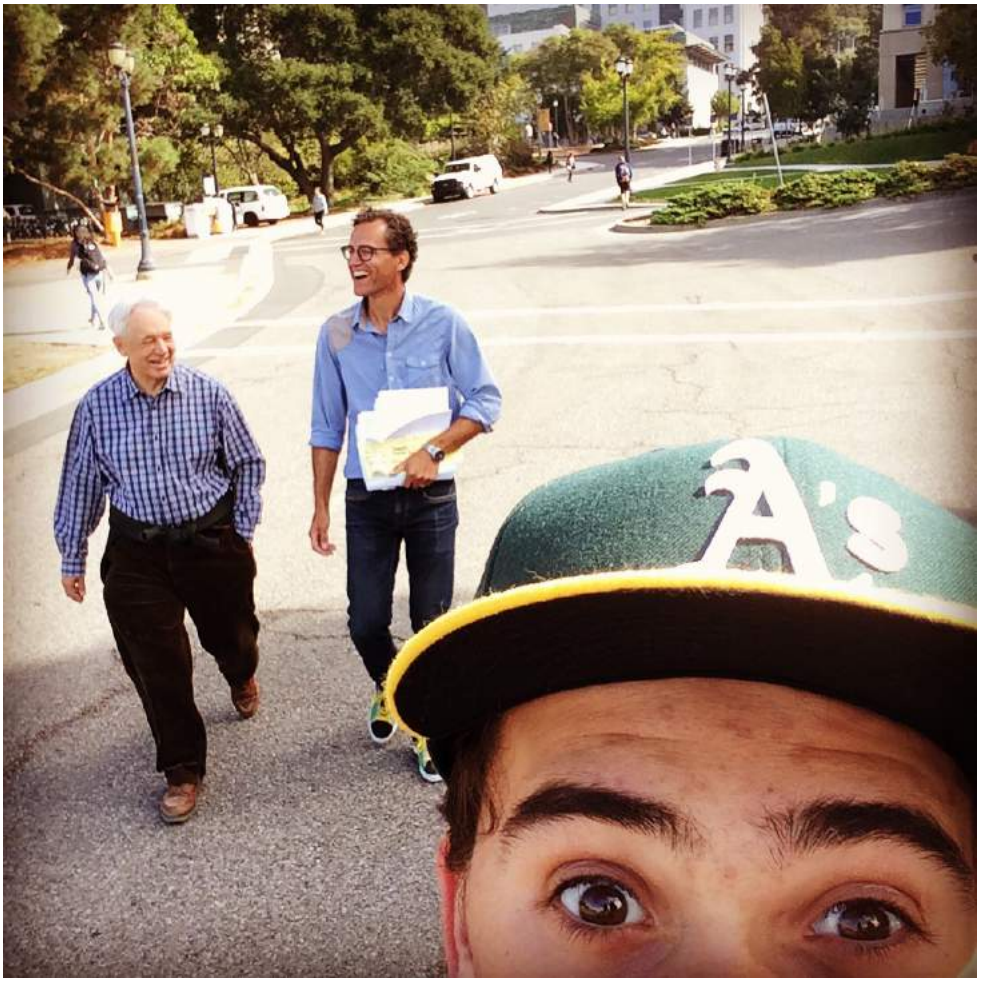


A student selfie capturing my mentor and collaborator Ole Hald and me on our way to give a lecture. Photo: Alec English.

I was very fortunate to be on STINT's Teaching Sabbatical Program at University of California Berkeley during the fall of 2015. If I would rate my experiences at the Department of Mathematics at UC Berkeley, an a scale from 1 to 10, it would get a rock solid 10. I have learnt a lot, gotten many ideas for the future and established contact that I hope to keep when I return to Sweden. Also for my family, wife and not least my three teenager, it has given broadened views that will impact their lives.

Unfortunately there is no system for sabbaticals for faculty in use at universities in Sweden. I think that is a great loss. I argue that letting faculty spend a semester or two at another institution, a few times during their career, will improve quality. Fortunately, for me and a few others, there is the STINT Teaching Sabbatical program.

This is my accounts of my experiences Teaching Sabbatical at UC Berkeley.

1 Preparation and planning

Teaching

My academic contact at Berkeley was Professor Ole Hald. He is a distinguished teacher and a wonderful person to collaborate with. He has a a genuine interest for teaching and has developed an active form of lecturing that he was keen to share with me. During my planning trip I visited one of his lectures in the big lecture hall we would teach ing and got an idea of what it would be like.

Ole was very positive to co-teaching. As he handles most of scheduling of teachers at the department he was able to set it up so that he and I could co-teach two courses in parallel. I got to know very early what we would teach one big calculus course and one small course for prospective mathematics teachers. I also got to know what literature would be used. I was very happy for for this as I am both very interested in learning more about teaching big courses and about teacher education. So this was a perfect mix for me.

Ole Hald lecturing in 155 Dwinelle.
Photo: Samuel Bengmark

Arrival

My family and I arrived to Berkeley August 3. I had our DS-2019 documents signed by the university, which was important. The first week was spent on getting the children registered at their schools, getting a bank account and buying a car and getting American sim-cards for our phones. In all these steps in was very important to be able to show not only our passports but also the DS2019 documents and not least the contract for the residential lease. With all these document everything went unexpectedly smooth, much more so than I think it would for a person without an identification number in Sweden. It was fantastic how we could get become part of the society, having bank accounts, owning a car and having planes for phoned within a few days. We had planned that I would start to work with my collaborator Ole August 19. So we took a few days off to go to the Grand Canyon to celebrate my 50th birthday.

2 Tasks and responsibilities

It co-taught two courses, a calculus course with about 500 students called Mathematics 1B, and one course with teaching concentration, Mathematics 152, with 8 students. Both courses had 50 minute lectures Mondays, Wednesdays and Fridays. My collaborator Ole taught both courses during the first week so that I could see and learn. From the second week and on we more or less shared the teaching equally, often trying to make sure that we took one lecture each per day.

We also had office hours three days a week, a form of individual interaction with students that we do not use in Sweden. I had suggested that I would lead one of the exercise session groups. As this was always done by Graduate Student Instructors (GSIs) at UC Berkeley, so that was not an option. But the office ours was a way for me to get insight int the students' thinking and their progress. Howevere since I shared my with another visitor at the department I could not always take part in the office hours and have students in my office.

My first lecture in Mathematcis 1B.
Photo: Samuel Bengmark

I was also involved in the examination. Ole involved me in the discussion when designing the exams. In Mathematics 1B I was also involved in the actual grading. The grading process was a team effort where we sat down with the GSIs, and did all the grading together. There where three exams in each course, two midterm exams and one final.

3 Other activities during the semester

I have also audited others lectures. I watch some lectures that really inspired me. On behalf of the department my collaborator Ole sometimes were sent to audit lecture by other faculty. At some occasions I went with. It was very interesting do share thoughts after lectures.

I also connected with the Centre for Teaching and Learning, CTL, at Berkeley. I met with their director Richard Freishtat and learned about their activities. Chalmers and University of Gothenburg can definitely learn from them. I have shared some of these ideas with my home institution.

At Berkeley there is a group called Coalition for Education and Outreach, CEO, which is a self-formed group of staff and students interested in education and outreach in STEM-subjects. I participated in several of their meetings to learn more about what was done at Berkeley to reach out to the surrounding community.

The Educational Technology Services, ETS, supports the UC Berkeley academic staff by providing essential and innovative technology services. I went to an information meeting about their services and learned about what they offer. I used one of their studios at a number of times to learn more about making film-clips to use in my teaching.

One superb channel for interesting information was the Teach-net email list. The director of CTL, Richard Freishtat, invited me to the list. It is a list where staff from all departments at Berkeley bring up their own questions about teaching. As an exmample of an interesting topics discusses in that forum I will mention the question about how we should use student evaluations and what they can inform us about. I found the dialog very interesting and there were some brilliant posts that changed my perspectives on the matters discussed.

I also reached out to Berkeley Graduate School of Education. I had one meeting with Dor Abrahamson and discussed innovative teaching designs. In november, when I had a colleague from Sweden visiting we met with Alan Shoenfeld to present a study by my Swedish colleague.

Furthermore I had contact with The Lawrence Hall of Science. First I went to an information meeting about their NRF-funded Faculty Learning Program, which is a program to help faculty improve their teaching. This lead to that I enrolled in the program, which runs over a full year. I will not be able to complete the course while in Berkeley I aim to complete the course from a distance. I think it will be a superb way for continue to be part of a dialog with colleagues at Berkeley after I have returned to Sweden. The program includes two on-site meeting. I hope to find finances to be able to attend one of them while the other seems to be okay to do from a distance according to the people in charge of the program. I am very happy for this.

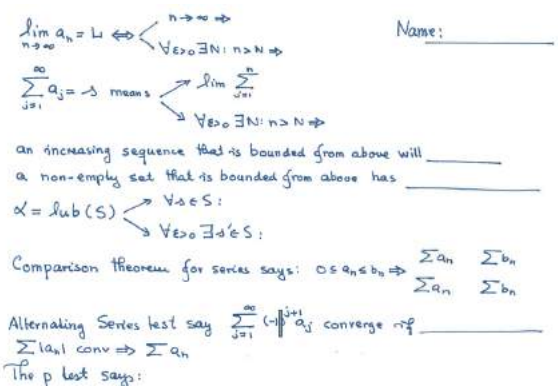
4 Important lessons

4.1 Teaching big courses

For me the most clear learning outcome from my time in Berkeley concerns the teaching big courses. I learnt about this in a very hands on way from Professor Ole Hald while teaching Mathematics 1B with 500 students. He has a way of running big courses that works very well. Most of all he has a developed a form of interactive lectures that is suitable also for lectures with several hundred students.

But before the course started I was involved in the planning of the syllabus. Ole always makes a detailed plan for the course with all the lectures, corresponding reading, exercises, midterms, and finals. I do believe that when giving a big course it is very important to share information in time and in a clear format. If anything is unclear, of if one changes the information, same portion of the student group will misunderstand.

When the course started the Ole gave the first lectures so that I could watch how he lectured. His idea is to change the form of activity that the students are involved in at about 4 times during a lecture. For each lecture he develops a worksheet with tasks or discussion point. It is always a single two sided paper with room for the students to write their solutions and remarks. On top of the worksheet he also puts a refresher with which the lecture starts. The refresher is about 4 short tasks that are chosen so that the students recapture material that will be used in the lecture. About 3 minutes are spent on the refresher before Ole very quickly discuss the things to remember on the board.



Example of refreasher on worksheet.

Then the actual lecture begins. The students are active in a non visible form, mostly listening and thinking. But he encourages questions and responds to them in a positive way. The students describe Oles lecturing as very engaging and humoristic. He lectures for about 10 minutes, and then he directs the students to one of the tasks on the worksheet. The task they are given is directly connected to what he just done. It could be to work out an example, it could be to complete a similar case in a proof or just to discuss their perceptions of a concept with a peer. The students are given about 3 minutes to work on it. During that time Ole walks around checking what difficulties that students have. Then Ole goes to the board and says something about the main idea in the solution. For many students it is not enough with 3 minutes to complete the task given. But it sets them in another mode of activity and it gives them something in their proximal zone of development to work with at the end of the day.

The lectures are 50 minutes long. Ole start exactly on time and never exceeds the

given time. The lecture has about 4 cycles of lecturing and worksheet. He thinks of the lectures as a way to help the students to read the book. He does over-emphasizing the learning that actually occurs at his lectures but see them as a way to help the students with their reading. Ole do not write extensively on the board. He discourages the students from taking notes. He does not want the notes from the lectures become a text that can be seen as a alternative to the course literature.

After having watched him during the first lectures we started to share the lectures evenly. I think that that kind of practically learning about teaching is effective, especially when you can discuss the ideas behind, the development and the outcome together with an expert. I learnt a lot by giving my lectures in same format. For each lecture I developed a worksheet. At first it seemed impossible that one could cover all the material intended in the lectures and still have time for students to work with the tasks. However I found that it worked extremely well. Sometimes I prepared a normal "oneway" lecture and then actively search for places were I could move some of the physical activity, such as writing and speaking, from me to the students. In the course evaluation the worksheets and the style of lecturing came out on top as the most appreciated parts of the course.

4.2 Mathematics for teacher students

I am head of Chalmers teacher education program, and also chairman of Svenska Kommittén för matematikutbildning, the Swedish Subcommision of the International Commission of Mathematical Instruction. Therefore it was very interesting got me to be able to co-teach a mathematics course with teaching concentration. There are a suite of three such courses at Berkeley and they specifically designed for students planning to become mathematics teachers. One very interesting part of that course was the literature written by Hung Hsi Wu. These books are written to give a systematic and grade-level appropriate exposition of the mathematics in High School. To cite the preface

Most of the students in Mathematics 152.
Photo by Samuel Bengmark.

What may distinguish these volumes from other books of the same genre is their unremitting emphasis on mathematical integrity while staying close to the progression of the school mathematics curriculum. We will explain presently why such an emphasis is important and why high school teachers need to know the mathematics of grades 6–8.

In the books the content is gradually built up. Everything is done meticulously. They never hide or skip any of the difficulties. The books only discuss and use mathematics that a good students could should be able to understand.

Working through the books we got many possibilities to discuss how one learns mathematics and how to best prepare teachers. Ole and I always wrote complete lecture notes that we shared with Professor Wu. For me it was very interesting to challenge my old ideas about what kind of mathematical knowledge a teacher should have, and how to attain it. The literature used at Berkeley displayed a very specific opinion about these areas that prompted questions in my head. I will take this discussion with me back home.

4.3 Teaching community

Teaching is often a one-person job. The feed back one gets is from students. But student response has some weaknesses and it is shown that i correlates poorly with actual learning. To co-teach with other professors is not common, not at Berkeley nor at Chalmers. For me it was very interested to co-teach, discuss and share ideas. I got very direct and constructive comments from Ole on all the work I did. To have a collaborator like that has encouraged me to try to develop my self. I did some things very differently to what I usually do when I teach. According to my collaborator Ole this process has effected him positively.

Trough the Teach-Net email list and meetings with CLT, CEO and the Lawrence Hall of Science I have also been part of a broader community of faculty/staff with a strong interest in questions related to teaching. Some of the discussions in these fora have given my concrete ideas that I sometimes hade shared directly with my home institution. One of these was ideas and articles that were spread in a discussion about student course evaluations and what they really give. I think is it motivating to be part of a community that shares the same interest and I do think we do not have a lively enough community about teaching in my proximity at Chalmers.

5 Comparison between Berkeley and Chalmers

5.1 Student population

UC Berkeley is a prestigious research university, always close to the top on world rankings, and therefore attracts good students from all over the world. Chalmers has a broader spectrum of students in the ability range. But also at Berkeley a great number of students struggle to understand the mathematics taught. More so than I at first had expected.

But I must say that I think there is a great difference is in the students resiliency. If the students at Berkeley get knocked of their feet, by a difficult lecture or exam, they seem to look at them selves and ask what they can do. In Sweden the students would look at the teacher and demand change. At some occasions in Berkeley I lectured at a speed that my students in Sweden would definitely not tolerate. I felt a bit embarrassed, but to my

surprise the Berkeley students gave me applause. It seems to me as students at Berkeley are expecting to be challenged in a greater extant the general student at Chalmers. The students still could complain if things went wrong but they did not do it as a first reflex. In discussions with students it was also clear to me that they did not talk about themselves as particulary clever, but rather as hard working. I do believe that when the students take responsibility for their own learning it makes a profound difference in their possibility to actually learn what is taught.

5.2 The relation between teacher and student

From my perspective it seems like there is greater respect for the professors at Berkeley. This respect was not least visible in one to one dialog with students. For example when students came and asked Ole for solutions and he replied that he will not distribute them and that they will have to discuss with each other there were never any one that tried to convince him. It was always the end of the discussion. No complaints.

Students wanted to take photos.
Photo: Unknown student.

The respect was also noticable in the way that most students address their teachers, as "Professor NN". In Sweden we are very informal and I am is always addressed by my first name by the students. In one of the discussion on Teach-Net some faculty expressed their thinking about how students should address them. Many of them preferred to be called Professor NN. Many argued that this keeps a good relationship and is simplest, not least for asian students. At the mathematics department it seemed as the faculty preferred to be called by their first name. Ole and I were eventually called Ole and Samuel by many of the students.

5.3 Views on teaching

The faculty at the mathematics department at Berkeley are all very successful researchers. It is amazing to look at the board with photos of the faculty. They are all very well known mathematicians, among which three are Field medalists, the most prestigious prize in mathematics. So, without a doubt, research is the main focus at that institution. The tenure track position that opened the spring of 2016 had the following formulation.

Tenure-track applicants are expected to have demonstrated outstanding research potential; tenured applicants should have well-established outstanding research accomplishments. Serious consideration will be given to the candidate's potential for success in mentoring PhD students, the candidate's record in teaching at both the undergraduate and graduate levels, and evidence of effective leadership. Professional service, including service promoting access to and diversity in higher education and the academic profession, will also be considered.

At research universities as Chalmers, and especially at prominent ones such as Berkeley, research comes first, and will continue to do. But teaching is still an important part of the professors daily work. They all teach, also at Berkeley. There is a big number of courses at the department that has to be taught. To cope with the situation they had employed two lecturers at Berkeley, which are non-tenure staff that are supposed to teach full-time and have haft the pay, or less, of the faculty. During my time at the department there was a conflict where one of the lecturers argued that his contract was not renewed because he was too progressive as a teacher, while the department said that he had not done what was told, such as giving homework to student. Eventually the lecturer sued UC Berkeley. This was very interesting for me to follow from the inside.

But most of the lecturing is done be the faculty. Some where more, and some where less, successful in their teaching. The student evaluations were considered important and engaged the head of department. During my time at Berkeley I could follow a discussion about the results from the evaluations of the big courses in mathematics and see that there was a great concern about these matters. And the people I got to know well all put a lot of effort into their teaching.

The quality of teaching effects very many students. So there is an important issue to discuss here. *How can a research institute also deliver top of the line teaching?* I think one has to look closely at the driving forces behind. What could make teaching be not just important, but important enough to actually put more time and effort into it? Considering finances as one driving force one can notice that, in contrast to research, the level of success in teaching does not substantially impact the finances of a department at Chalmers of Berkeley. Can one then hope for a also teaching will be prioritized? I understood that at Berkeley the personal incentive for the individual was that is is very difficult to get a salary raise if one was not do reasonably well in teaching.

5.4 Examination

One interesting differens with my home institution was how the examination is organised. At UC Berekely the mathematics courses had several parts in the examination. It often consisted of homework, two midterms and a final exam. The homework was counted as 15 % of the total score in the courses I was involved in. The student had to hand in their solutions to about 10 given questions three times a week. They were handed in at the exercise sessions to the GSI (Graduate Student Instructor, elsewhere called Teaching Assistant) who corrected them. This helps the students to continue to work continuously with the material. I also think that the individual feedback helps the students learn.

On the other side one would expect that students at university level should have a certain level of maturity in regulating their own work. The school system, at least in the Berkeley area seemed to use a finely granulated system for examinations. At the high school were my boys went they got grades every day, which was the sum of points gathered that day; some points for being on time and some for handing in the home work, and so forth. In at least one class there was more point to get from having a complete and ordered folder then from the final exam. The good side of that system is that helped my boys to get organized and motivated them to work. But I doubt that such a system actually measures ability. I think that the system only at Berkeley used the positive side of the system and was helpful for the students.

Another interesting difference is that in Sweden we have always use goal oriented grades. That means that as a teacher I am supposed to set the grade levels before a do the actual grading. Hence it can happen that all students get a high grade, or all students fail as it is hard to predict how difficult the tasks will be for the students. Minor changes in a formulation can have dramatic changes in the result. In case of emergency it does happen that we do change the grade levels afterwords. At Berkeley it is most common that you "grade by the curve" that is that you first do the grading of the examen and then, when you have the statistics, you set the grade levels. Much if the work, often all, is done by he GSIs themselves.

6 Action plan - topics to address and if possible introduce in Sweden

Whenever I heard something that I thought would be interesting for Chalmers I sent a mail directly to the relevant persons to tell them about it. For example I sent mails about good ideas about pedagogical course, about student evaluation and more. My hope was that shared ideas continuously, rather than in a one batch in the end, have made them easier to digest and act on.

I have also collected lecture notes and worksheets from both courses I have been involved in. I want to use them as a way to show how the form of interactive lectures we used at Berekely actually looks. I have also started to write a text that argues for that way of teaching. Together with the lecture notes I hope to be able to give the reader a good idea of why and how to teach in that way. My intention is to share this document with my colleagues at mathematics departments in Sweden. I also intend to share this idea at Chalmers' annual conference KUL, and at Utvecklingskonferens för Sveriges ingenjörsutbildningar next autumn.

During this semester I have also become even more convinced that being part of a teaching community is important. So I want to try to find ways to strengthen the community at Chalmers. To introduce an equivalent to Teach-Net email list is one option. To revitalize the department meetings about teach is another. I will also look for the possibility to co-teach with some younger colleague so to practically share my teaching experiences from Berkeley.

I want to keep in contact with mathematics department at Berkeley. I am very happy to have made such good friends. Ole Hald has become a friend for life. The people I have gotten to know the best including the head of department, Craig Evans, and Hung Hsi Wu will unfortunately all retire in a few years. After that it will be much more difficult to keep in contact. I am happy that during the first semester back in Sweden I will continue to keep contact with a broader community at Berkeley trough the Faculty Learning Program.

7 For future STINTonians at UC Berkeley

7.1 Visa

The organisational contact at UC Berkeley retired from her job during the spring but it did not take long till I got connected with the right persons. Among the most important thing to handle before leaving Sweden the visa and the housing.

The help with the visa I got from the UC Berkeley was very good. I got the necessary document early and with out problem and I was invites as a Visiting Scholar. There was a 428 USD dollar charge for this good service to pay when I arrived at UC Berkeley. A slightly challenging part was to fill in the visa applications for my whole family. It toke me several day to get in straight. The trip for the interview at the US Embassy in Stockholm was planned far a head so to find an available time that worked for all family members.

7.2 Housing

To find a house was to rent was maybe the biggest challenge during the planning process. The university invited me to sign up for Cal Rentals. For a small monthly few I got access to a listing of offers by mostly private persons looking for tenants. I also searched for housing at Craigslist and Airbnb. I had been told to try to find something to rent as quickly as possible. But my impression was that there was almost no forward planning among the landlords that advertised their houses. They where all looking for tenants that could move in within a few week. Many of the offers were unfurnished houses with leases for a minimum of one year. We quickly realized that it would be impossible to find a house with four bedrooms, so that our three teenagers could have one each. During the spring months we found a handful of offers that had three bedroom for the period we would be in Berkeley, and with a price we could afford, but we did not manage to close a deal with any of them. It was not until the beginning of July that we finally found a place to rent. It was smaller than planned, just two bedroom, but was within walking distance to campus and Berkeley High School. It turned out to work very well for us.

7.3 School

In the US you can only go to the schools in the area of your house. Once we had organised where to live we could contacted the right school, in our case Berkeley High School. They

had a smooth process for children of visitors to UC Berkeley. The only thing we had to prepare was records to show that our children had sufficient immunization. We contacted a medical center in Sweden, took the missing vaccines and compiled documentation for the ones already taken.

8 Acknowledgement

The person that I am most grateful to is Professor Ole Hald. I can not thank you enough Ole. It has been an extraordinary experience to walk by your side. You have corrected me and encouraged me in a way that only a master can do. You are my idol.

I would also like to express my greatest gratitude to Hans Pohl, Andreas Götheborg and Lelav Zandi at STINT for the grant and UC Berkeley for accepting me. I understand there must have been many other good candidates. I feel lucky to have been given this chance. I am also very thankful the head of department in Göteborg, Bernt Wennberg, and vice dean, Maria Knutson Wedel, for nominating me.

The view from my office on ninth floor of Evans Hall. Photo by Samuel Bengmark.

Furthermore I am also very grateful to the head of department at UC Berkeley, Craig Evans. Thank you Craig. I have enjoyed our small chats and that you have come into my office now and then. Then I would like to thank both my wonderful room mate Ibrahim Ly for many laughs, and Kathy Santos for letting Ibrahim and me sit in such a wonderful office with a view of the campus through the window and the department trough our open door. Luckily this had a prequel.