Portfolio of Pedagogical Qualifications

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The following is a summary of my teaching experience and qualifications.

1   Teaching at undergraduate and graduate level

In short my main teaching experience is as follows.

- I have been course leader and course responsible during five years in three courses, see sections 1.1, 1.2 and 1.3.

- I have developed one course and its material, see section 1.1, revised the material in another course heavily, see section 1.2, and contributed to the course material in various other courses, see mainly 1.6. I have developed many lectures as well as numerous laboratory and hand-in exercises.

- I have experience from various forms of teaching including project and problem based courses, master project guidance, lectures, laboratory and recitation sessions. I'm also familiar with various forms of examination including projects, written and oral reports, hand-in exercises, and written and oral exams.

- I have experience of developing new courses and revising old courses as well as organizing, and administrating courses. I have also led fairly large course staffs.

- I have experience teaching students ranging from first year students to graduate students in both Swedish and English. I have also experience teaching very large groups of students as well as small project groups. I have experience from teaching student groups with a large difference in previous knowledge. I have advised nine master students several of which have won awards for best master thesis of the year. I currently supervise two master students and one bachelor student.

- I have over twelve years of experience teaching courses at university level from a wide area of topics ranging from advanced VLSI courses to basic programming courses. I have experience from teaching at two major universities in Sweden and one university in Greece. In total, I have spent over 1600 hours in class teaching at university level. In addition, I have been teaching high school students, held public seminars and written articles in computer magazines.

Below is a more in depth summary, with comments, of my teaching experience at university level. My teaching experience in other settings is summarized in sections 3 and 9. I have teaching experience predominantly from the M.Sc. in Engineering programs at Swedish universities. I have taught several undergraduate courses, and one graduate course, since 1994 and have experience from various forms of courses, teaching methods, and examination forms. The items are ordered with the, in my opinion, most important items listed first. Course credits are listed with each course when applicable. A Swedish "civilingenjör" (M.Sc. in Engineering) program is 180 credits. Courses have normally been taught in periods of seven weeks and there has been one course instance per study year unless stated otherwise below. Some courses have been bundled together in the list. Such courses share related subjects or are the same course

that with smaller revisions are taught to different programs yielding several course instances per year. More detailed information on each course and my participation in the teaching is available on request. Most of the courses mentioned below are electable to external students and exchange students.

1.1 Course leader for the course: Internet Inside

From 1997 to 2000 I was course leader and responsible for the course EDT120 Internet Inside (Swedish: Internet Inuti) (3 course credits) electable to fourth year students and graduate students at Lund Institute of Technology, Lund University, Sweden. The course is a problem based learning course where the students are to implement a fully functional web server in seven weeks. At the start of the course the students are given access to an experimental setup based on an actual commercial embedded computer system, a very basic real-time kernel, and an embryo to a network device driver. The students utilize the course staff, the course material and various other information resources to gain the information needed for them to develop, on their own, a fully working TCP/IP network protocol stack, network device drivers, application interface layers and the actual web server. The course was given to 35-45 students a year, the number of students being limited by the laboratory space available and the number of experimental setups available. This required a selection system for admitting students to the course as many more students wanted to take the course and elected the course than could be admitted. The selection process was based on the number of passed courses among a set of computer organization, computer architecture, operating system, real-time programming and embedded system programming courses.

I also developed the course and its course material in 1997 together with Per Flock at Axis Communication AB and then later updated the material based on student input. Axis Communication AB is a company which develops various network attached devices and provided hardware, experience and know-how to the course. The course is loosely based on a set of introductionary exercises used at Axis Communication to help newly employed engineers.

The course also has a set of guest lectures, organized by me, each illustrating a topic related to the course. The lectures were held by industry professionals and was very well received by the students.

The project was specified in a set of a six milestones. Each milestone had its own specification associated to it which described a part of the final system and provided a set of acceptance tests. The specifications were written so that the focus was on the functionality of the system enabling the students to make their own design decisions. I made it clear from the start that the students were free to deviate from the specifications as long as the overall functionality were left intact and all acceptance tests were successful. The course was laid out so that the students were able to interact with the course staff for at least twelve hours per week. I recommended the students to finish one milestone per week but the students were free to do their own time planning. The student passed the course if all milestones were completed. The examination rate of the course was excellent and almost all students passed the course on time.

I led a course staff consisting of myself and two course assistants. I organized and administrated the course and was from 1998 and on responsible for all parts of the course including administration, examination and selecting the students to admit. In 1997 I performed similar duties but under supervision from a senior lecturer. I held 12 hours of various sessions per week and also stepped in as lecturer on the few occasions when a guest lecturer was ill and couldn't produce a replacement.

The course was very well received by students and several companies recommended their employees to follow the course. The course was also instantiated at other universities.

1.2 Course leader and lecturer for the course: Computer Communication and Computer Networks

In 2001 I was course leader and responsible for the course 2G1316/2G1317 Computer communication and computer networks (4 course credits) at the Royal Institute of Technology, KTH, Sweden. The course is a basic course in computer communication and was in 2001 given to, in total, over 290 students. The course is electable for students in the first, second, and third year in the Electrical Engineering, Computer Science and Engineering, Industrial Engineering and Management, and Media Technology programs. Students from all these programs were taking the course in 2001. I led a course staff consisting of myself and six course assistants. The course consisted of twelve lectures, nine recitation sessions, one laboratory session, one hand-in exercise and one written exam. I organized and administrated the course, revised the course material heavily, held the lectures as well as a few recitation and laboratory sessions, graded the hand-in exercises, and wrote and graded the written exams. I was responsible for all parts of the course. To organize the day to day activities in the course I held staff meetings every week and was in frequent contact with the course assistants. I also held an extra course evaluation in the middle of the course so as to be able to react to comments from the students.

The course had been held without changes for a few years when I became course leader and the lecture material was somewhat outdated. I heavily revised the lectures and rewrote approximately half of the material from scratch, removed outdated contents and added material reflecting recent developments in the area. The overall lecture material was reduced by removing unnecessary details and instead short summaries were added to the start and end of each lecture. These summaries summarized the previous lectures and the present lecture respectively and were very much appreciated by the students.

I wanted to make more revisions to the course but unfortunately I only had two months from when I joined KTH to the course start. Most of that time was spent putting the course organization in place as there was absolutely no existing course organization and very little material left from previous instances of the course.

The course received good reviews from the students.

1.3 Course leader and lecturer for the course: Computer architecture

During fall 2005, I held two thirds of a course in computer architecture for third and fourth year students at the department of Computer Science, University of Crete, Greece. The course was split into three separate modules and I held two of the modules while another teacher held the third. The modules were approximately equally sized. The course had 21 lectures, one project, one mid-term exam and one final exam. This year roughly 20 students followed the course which was given in English by me while the third module was given in Greek.

Before the course started, I defined a set of elaborate goals for the course and I pointed out to the students that these goals defined the course. The goals were used when the examination of the course was put together.

I wanted students to discuss their own ideas and questions in class. The Greek students were not used to this kind of interaction and were very quiet at first. There were also some language barrier problems since the students were not used to lectures in English. However, after having several discussion exercises in the first few lectures the lectures became gradually more interactive, the students gave increasingly more input and the end of the course they started giving suggestions on topics to discuss in class. Throughout the course, I used lecture notes that I had received from Prof. Mats Brorsson to quickly put together lecture material based on student input.

The course was very well received by the students and it received extremely good reviews.

1.4 Advisor of M.Sc. projects

I have advised the following master students:

1. Peter Gustavsson and Fredrik Wendel, *Parallel Processing in an Embedded Environment*, December 1998, Recipient of the Axis Award 1999 for the best M.Sc. thesis project of the year.
2. Fredrik Bjorne and Mats Fridén, *A Software Implementation of The Baseband In Bluetooth*, September 1999, Recipient of the Axis Award 2000 for the best M.Sc. thesis project of the year.
3. Örjan Friberg, *Visual OpenMP - A Tool Prototype for Developing Parallel C-programs with OpenMP*, February 2000
4. Johan Königslehner, *SimCell*, June 2001
5. Claes Rosenberg, *Development and evaluation of secure communication over GPRS*, April 2002
6. Thomas Holmberg, *Implementation of a hybrid simulator*, February 2003
7. Charlotta Bååth, *sim-kernel - a Processor Simulator with the Ability to Run an Operating System*, August 2003

The students graduated at Lund University, Sweden, or the Royal Institute of Technology, KTH, Sweden. Each project corresponds to 20 course credits. Two of the projects have received awards for best M.Sc. thesis project of the year.

The subjects of the master projects include computer architecture, VLSI design, simulation technology, celluar networks and network planning, operating systems and computer security.

Current master students include Stavros Passas and George Kotsis at ICS-FORTH, Crete. Greece. These two students work on cluster communication and programming infrastructures.

Reference persons are available on request.

1.5 Project coach in advanced VLSI course

From 1996 to 1998, I was project coach in an advanced VLSI course, EDT050 VLSI architecture (five course credits), at Lund Institute of Technology, Lund University, Sweden. The course was electable for fourth year students and utilized problem based learning. The students formed small groups of two students each. Each group was to carry out a large real-life VLSI project. In this course I worked as project coach for three instances of the course. The project coach was normally from the industry, presents the student with a task, guided the students and gave advice, and evaluated the students after the task is completed. The course spanned two seven week periods and I was part of the project portion which started at the end of the first period and ran during the second period.

The course was taught to 16-20 students per year and I was coach to one group of two students each year.

1.6 Course assistant in network programming course

During 2002 and 2003, I was course assistant in 2G1118/2G4058: Network Programming with Java (four course credits) an elective fourth year course at the Royal Institute of Technology, KTH, Sweden. The course was given to approximately 100 students per instance. The course is a project course based on problem based learning with lectures, laboratory and recitation sessions supporting the students while they are working individually on their projects. The projects were all aiming at developing entire network based applications in Java. None of the sessions were obligatory and examination was completely based on the project. I held one recitation/exercise session and two laboratory sessions per week. The recitation session attracted a group of 20-30 students and the lab sessions attracted 30-40 students. Each lab session was four hours and each recitation session two hours. I also graded the projects and prepared project specifications. The project specifications were devised so that they described what was expected from the student to achieve a certain grade but did not impose any limitations on the student's design. The students found information to use in their projects at various sources and utilized the course staff as a resource. The course attracted a fair amount of exchange students and so I held several sessions in English.

I got a high degree of freedom to organize the recitation sessions the way I saw fit and I changed them into being more student centric. I made it clear to the students that I expected them to actively participate in the sessions and asked them to provide questions and issues to discuss in class as well as topics for entire sessions. I often used discussion exercises where the students formed small groups and discussed a question arisen in class or prepared by me on input from the students. The groups were then asked to present their findings to the entire session group. This worked very well and was appreciated by the students as it provided them a way to discuss various design aspects in a relaxed atmosphere. I regularly got questions from

students that I turned into topics that were either discussed during the recitation session or presented in short mini lectures of 5-10 minutes. The students were very active during these mini lectures in particular and also in general and asked plenty of questions. I also asked the students to make name tags for themselves so that they could be addressed by name. This led to a more relaxed and informal touch to the sessions which in turn led to more active students who asked more questions and also presented their own reflections, views, and opinions.

During the recitation sessions I assumed the role of guide to the students helping them find the information they required and also provided answers to questions. I also assumed the role of moderator of the discussions.

1.7   Course assistant in computer architecture course

I was recitation session assistant in the EDT030 Computer architecture (three course credits) course from 1996 to 1999. The course was held at Lund Institute of Technology, Lund University, Sweden. The course is electable for third and fourth year students in the Engineering Physics, Electrical Engineering, and Computer Engineering programs. The course was given to approximately 50-60 students and I held one or two recitation sessions of two hours each per week. Each session attracted a group of 15-25 students. I also graded exams and contributed exam questions.

1.8   Course assistant in basic computer organization courses

From January 1994 to May 1996, I was course assistant in the basic computer organization courses, EDT011 Inledande datorteknik (two course credits), EDT091 Datorteknik för F (four course credits), EDT025 Datorteknik (four course credits), at Lund Institute of Technology, Lund University, Sweden. The courses were taught to second, third, and fourth year students in the Engineering Physics, Electrical Engineering, and Computer Engineering programs and are either compulsory or electable depending on program. In these courses I worked as recitation session assistant, laboratory assistant, and I also graded hand-in exercises. I regularly contributed exam questions to the written exam and also graded exams.

Per week I had up to twelve sessions of up to four hours each. Each session group consisted of ten to 30 students depending on session type. I taught the courses while still being an undergraduate student and was supervised by the course leader. A work certificate is available on request.

I was also course assistant in the mentioned courses from May 1996 to 2000 while being a graduate student at the department of Information Technology at Lund Institute of Technology, Lund University, Sweden.

1.9   Course assistant in parallel computer system course

In 2002, I was course assistant in 2G1114 Parallel computer systems (five course credits), an elective third or fourth year course at the Royal Institute of Technology, KTH, Sweden. The course was given to 26 students. I advised and graded the course project. I also wrote, prepared, and graded the written exam.

1.10 Course assistant in basic programming courses

From November 1993 to February 1995 I worked as course assistant in the two basic programming courses EDA010 Programmering 1 (five course credits), and EDA500 Programmering (four course credits), at Lund Institute of Technology, Lund University, Sweden. The courses were compulsory and taught to first year students in the Engineering Physics, Electrical Engineering, and Mechanical Engineering programs and were given to all the students in the mentioned programs. I worked as recitation session assistant, laboratory assistant, and I also graded projects and hand-in exercises.

Per week I had between one and four sessions of two hours each. Each session group consisted of ten to 30 students depending on session type. I taught the courses while still being an undergraduate student and was supervised by the course leader. A work certificate is available on request.

1.11 Other teaching experience

I have held several guest lectures and sessions in various courses including computer architecture and computer organization courses as well as programming courses. I have also contributed to various written exams. Further information available on request.

2 Pedagogical studies and development projects

I have developed parts of three courses. I have also passed one course in university teaching.

2.1 Development of the course: Internet Inside

I have developed and organized the course mentioned in section 1.1. The development of the course was done with very few resources, essentially some of my time, and was conducted in large part during the first instance of the course.

2.2 Revision of the course: Computer Communication and Computer Networks

The lecture material in the course was revised in 2001 by me as outlined in section 1.2. Again no funds were set aside for the course development.

2.3 Project specification and development of recitation sessions

I wrote one project specification and developed the form of my own recitation sessions as outlined in section 1.6.

2.4 Course in university teaching

I have passed the course "Högskolepedagogik 1" (in English roughly University teaching 1) which was held at the KTH Learning Labs, the Royal Institute of Technology, KTH, Sweden. The course gives 2 course credits. Certificate is available on request.

3 Teaching activity outside the university

I have:

Table 1: Statistics from course evaluation forms

Question	Mean average
How well were the goals of the course conveyed at the course start?	4.5
How did you perceive the information from the course staff during the run of the course?	4.8
How was the organization and administration of the course?	4.6
How was the lecturer's pedagogical skills?	4.6

- led, together with Daniel Elvin, from 1999 to 2000 a project that installed a local area network in a residential area in Lund, Sweden. Through this network over 250 apartments were connected to the Internet. Daniel and I acted as the apartment owners' representatives. This involved informing the owners about the progress of the project orally and in writing. We furthermore prepared contracts, supervised the installation, and after the installation, we administrated the network. The project was very successful, attracted media attention, and has generated several spin-off projects in other residential areas. Daniel and I prepared information material for those interested in recreating the project. Daniel Elvin can be contacted for further reference.

- also presented tutorials at conferences, workshops and when visiting companies. The tutorials are listed in the publication list.

- presented, at conferences and workshops, all papers in the publication list to which I'm the main author. I have also held various invited talks at workshops, companies and universities.

- given public seminars.

- held courses for high school students while I attended high school.

- written tutorials on computer programming for computer magazines.

4   Assessment of teaching contributions from the student perspective

I have generally received good reviews from the students. Course evaluation forms backing these statements are available on request. Below in table1 is a more objective summary of the evaluation form handed in by students following the course mentioned in section 1.2. The forms were handed in after the course. Each question was a multiple choice question with the following options: 1 - very poor, 2 - poor, 3 - fairly poor, 4 - fairly good, 5 - good, 6 - very good. The mean average found by taken the average of all the answers to the particular question is listed. The questions in the questionnaire which are the most related to my work within the course is listed in the table. The other questions have, however, roughly the same distribution and the same averages. As basis for the statistics were 122 evaluation forms which corresponds to roughly 40% of the students taking the course.

As can be seen the students opinions were somewhere in-between fairly good and good. This is in line with other courses at the department. I won't comment more on the figures as

they are more than three years old. The reference persons listed in section 10 can provide more input. Also available, on request, is more complete statistics and examples of filled-in evaluation forms.

5   Reflection on pedagogical activity

I started teaching in the final year of high school (Swedish: gymnasiet) and immediately realized that I very much enjoyed the teacher role. During the second year of my university studies I approached a few departments and became course assistant. At first, I was teaching recitation sessions and laboratory sessions for students on the same or slightly lower level than myself. This helped me tremendously. The atmosphere in class was very relaxed. The students could relate to me and I believe I understood their needs and could relate to them. The importance of this in learning is something I did not fully realize until much later. Granted, I was not a very good teacher at first but I would say I gradually improved by testing different techniques. As I was a student and attended courses, I could pick up a few tricks that I noticed the lecturers and assistants were using. This was of course no formal teaching education but it still helped me. In the beginning, I was very much concerned with the course matter and how to present it clearly. However, about one year after starting teaching I gradually started to realize that, no matter what I did, I could not in any way do the learning for the students. The student has to learn him or herself. Again, I did not appreciate the importance of that until much later.

I did, however, start to reflect on how I should change my teaching to help the students learn. I was greatly helped by the senior lecturers who were supervising me. They gave me suggestions such as to introduce discussion questions and to let the students take a more active part of the sessions. Yet again, I didn't appreciate this fully until much later. However, I would say that I continued reflecting on my teaching skills and how I would present the matter so as to help the students learn better. I started focusing on the underlaying concepts and methods in the course matter. Later, I started to focus on trying to help the students see how concepts fit together and how they relate. I got more and more teaching responsibility as time progressed and after becoming a graduate student I almost immediately became course responsible for a project course, see section 1.1. I was still progressing as a teacher and often discussed teaching and learning with two of the lecturers at the department who were also interested in teaching.

It was not, however, until I took the course mentioned in section 2.4 that I started to reflect more formally on teaching. I got exposed to Fox' ideas on teaching theories and realized I had started out using a transfer theory and progressed into having somewhat of a shaping theory and later a building theory variant [1]. I want to believe that I was also progressing into having a view on teaching resembling more of a travelling theory. I also got exposed in the course, amongst other things, to the importance of goals, the importance of judging what the students anticipates from a course and to plan for different student learning strategies, and the importance of letting the students be part of the course planning. Since then, I have reflected quite a bit on how to make my teaching more student centric and focused on the student's learning and their reflection on the course matter. I still use lectures, recitation sessions, etc., but I am pay-

ing more attention to the students learning and have tried out various approaches. I have let the students be part of the planning process by suggesting topics to discuss at lectures and recitation sessions. I have also used discussion exercises and sessions so that students are working more actively with the course matter. I have paid more attention to the organization of sessions so that students could more easily concentrate and be active. I see myself as a guide to the students and also a moderator of discussions.

It is my experience that these techniques can be used without negative influence on course budget, course cost, or examination rate. They can be used within the context of an already scheduled course and do not, in my experience, affect my work load. I also feel that the students become more active and judging from exam answers they also get a more deep understanding of the matter.

All this is very much an ongoing process but I would like to believe that I am changing my view of teaching to be a travelling theory, using Fox' notion again. I tend to view myself as someone who helps the student learn and that the focus of teaching should be on the student's learning. I must admit that I do have a lot to learn myself and I am by far not an excellent teacher but I believe I am making progress. I very much enjoy teaching and I am also very much interested in learning more about teaching.

To conclude, I will now list, with comments, a few items that I consider important to teaching and learning. These are some of the rules I try to live by.

- It is very important to have clear goals in a course. The goals should be stated in such a way that they can be used as a basis for the examination. The students should be able to use the goals as a form of self-assessment prior to an examination. The goals provide the framework which defines the course.

- Students must be informed at the start of a course of what the requirements on them are and what is being expected of them. They must also be informed about the organization of the course and the kind of teaching methods used. This is especially important if methods are used that might not be familiar to the students.

- Students learn better if they actively use the matter and reflect on it. It is important to use discussion exercises and other exercises such as hand-in exercises to help the students work with the matter early in the course.

- It is vital to get to know the prior knowledge of the students and adjust the teaching and the course accordingly. In my experience, the prior knowledge of the students can change dramatically from one year to another.

- Ideally, the students should be using the course and its staff as a tool to learn more. If the students wants to have, e.g. a lecture on a certain part of the matter, it might be a good idea to have such a lecture. I always ask students to give me questions and topics to use as a foundation for upcoming lectures and recitation sessions.

- In lectures, students should be allowed time to ask questions and questions should be encouraged.

- It is important to devise a course so that students are not overloaded. It is also important to be careful so that students do not perceive the course as easy which could lead them to underestimate the amount of effort they need to put into the course.

- Course evaluation should be performed regularly during the course so that any problems with the course could be attempted to be rectified before the end of the course. Course evaluations and student opinions are also important when revising the course organization.
- The examination should, in my opinion, always have a focus on the deep understanding of matter instead of shallow knowledge. This is, in my experience, not easy to successfully achieve with a good examination rate. However, I think it is possible with enough information to the students about the examination and what is expected from them.

Reference used in the text above:

[1]   Dennis Fox, Personal Theories of Teaching, in *Studies in Higher Education*, vol 8, no 2, 1983

6   Production of teaching material

I have made teaching material in numerous courses. Below is a brief description of the most important efforts. I have also contributed to one text book in computer organization.

6.1   Course material in the course: Internet Inside

I have developed the course material for the course as outlined in section 1.1.

6.2   Lecture material in the course: Computer Communication and Computer Networks

I have revised the lecture and teaching material for the course as outlined in section 1.2.

6.3   Lecture material in the course: Computer Architecture

I have revised the lecture and teaching material for the course as outlined in section 1.3.

6.4   Project specification in the course: Network programming with Java

I have created one project specification for the course as outlined in section 1.6.

6.5   Contributions to text book in computer organization

I have audited and given comments to chapter seven in the text book: "Datorsystem - Program- och maskinvara" by Mats Brorsson. The book has ISBN number 91-44-01137-7.

6.6   Other contributions

I have contributed to and revised exercise collections, laboratory instructions and other teaching materials in numerous courses and on many subjects. I'm regularly asked by colleagues to give advice on teaching material and to provide input.

7   Administration and leadership of curriculum planning

I have neither performed any direct administration of curriculum planning nor have led any part of curriculum planning.

8 Current knowledge

The extent of my knowledge of various areas is described or outlined in my CV. I have prepared teaching material, taught and designed courses on a wide range of topics from electronics and VLSI, telecommunication, embedded systems, computer organization and architecture, programming, distributed systems and to computer science. I feel confident teaching any of the mentioned subjects and have first hand research or engineering experience in all aforementioned subjects. I am also confident teaching subject not previously known to me and have done so several times. I can very quickly read up on a subject an prepare teaching material.

9 Other pedagogical qualifications

I have written some popular science articles for a computer magazine. In addition, I have written manuals for software packages.

10 References and documents

The following is a list of references and documents certifying the correctness of the statements in this document.

1. Document from the department of Information Technology, Lund University, certifying the work mentioned in sections 1.7, and 1.8.
2. Document from the department of Computer Science, Lund University, certifying the work mentioned in section 1.10.
3. Letter from Thomas Sjöland, former director of undergraduate studies.
4. Letter from Mats Brorsson, former director of undergraduate studies.

Further documents, including teaching material, are also available on request.