Self-assessment

CENTRE FOR ENGINEERING EDUCATION | LTH | LUND UNIVERSITY

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Preface

This self-evaluation will serve as input to the external evaluation of The Centre for Engineering Education (CEE) that will take place in 2019. The self-evaluation has been compiled by the staff of CEE, in cooperation with administrative staff at the faculty office at The Faculty of Engineering (LTH) at Lund University. The self-evaluation has also been discussed and approved by the board members of CEE.

The self-evaluation is extensive. However, it is meant to be a stand-alone document that could be used for both internal and external documentation and communication of CEE's strategies, activities and impact.

21 November 2018

Per Warfvinge
Director of the CEE

Introduction to The Centre for Engineering Education – CEE

The Centre for Engineering Education (CEE) was formed on 1 January 2016 in order to gather existing pedagogically oriented activities, previously organized within the faculty administration, into a single unit directly under the faculty board. The instructions for the CEE were set out by the Board of LTH on 2 November 2015.

According to the instructions, the aim of the CEE is to "strengthen the Faculty of Engineering's (LTH) activities in education, research and outreach, through critically reviewed and scientifically based development work, skills development, and management support". The Centre for Engineering Education will also undertake education, research, and outreach of a faculty-wide nature.

While the aim of the CEE is very broad, the specific mission of the CEE is restricted to:
- Delivering pre-university courses for recruitment to LTH's education program.
- Running the Supplemental Instruction program at LTH.
- Conducting training, with a special emphasis on the degree outcomes not included in the dissertation work, for all doctoral education disciplines at LTH, as well as education and training for docent candidates, and assessments in support of doctoral education.
- Conducting competence development activities with the focus on education and research, especially regarding the qualifications of university staff.
- Carrying out academic development work within the framework of Genombrottet, as decided by the faculty board (26 May 2005).
- Developing and performing other activities that are consistent with the purpose of the Center for Engineering Education.

All activities are to be aimed at strengthening and supporting LTH as a whole, as well as contributing to the development of knowledge in learning and academic development at Lund University. The mission includes maintaining a close dialogue with faculty management, committees, departments, individual teachers, the faculty office, the student union, and other stakeholders, with the purpose of capturing and meeting the needs of LTH. A priority area is to cooperate with and create conditions for enhanced collaboration with other academic development initiatives at Lund University.

Governance

The CEE board has responsibility for the activities, the setting out of detailed guidelines, budget proposals and the annual activity plan, and decides on the forms of quality assurance. The board submits an annual report to the faculty board. The board consists of eight members as follows:

- Chair:
  - Associate professor Lena Eskilsson, Deputy dean of the Faculty of Social Sciences.

- Four members from LTH:
  - Professor Fredrik Nilsson, Department of Design Sciences,
  - Professor Marie Wahlgren, Department of Food Technology, Engineering and Nutrition
  - Associate professor Erik Lind, Department of Electrical and Information Technology
  - Associate professor Elisabeth Nilsson, Department of Physics

- One member from outside LTH;
  - Professor Anders Persson, Head of Department of Educational Sciences, Faculty of Humanities.

- Two student representatives appointed by the student union Teknologkåren.

The Centre for Engineering Education has a director who is also the head of the centre. The director works in pursuit of high-quality research, education and other activities, which includes seeking external cooperation projects and external funding. The current director is Professor Per Warfvinge, Department of Chemical Engineering. The deputy director is Associate Professor Thomas Olsson.

The director carries out all administrative tasks that fall to a department head, including human resources (personnel planning, recruitment, wages, workplace environment, rehabilitation), economy (budget control, confirmation of payments and expenses) and negotiations with other departments and the Faculty Office.

Organization

The organization of the CEE, shown in Figure 1, mirrors the mission with five economic entities:
- CEE joint level
- Tekniskt basår – Pre-University Course
- Supplemental Instruction
- PhD and staff training
- Genombrottet – Academic development

The percentages included in the chart indicate how much of the individual's cost is carried by the CEE. The organization has no substructure.

The academic tasks are carried out by teachers employed either at the CEE, or in a department of Lund University, typically from LTH. The CEE currently has six employees, all teachers: four associate professors (docent), one senior lecturer (universitetslektor) and one lecturer (universitetsadjunkt).

Five teachers, including the director, are employed by a department at LTH and work part time for the CEE. The CEE has no formal agreements with these departments. Instead, informal emails are exchanged between the CEE, the teacher and the his/her department before each new year, to verify that there is a mutual understanding of what has been agreed.

According to the instructions, the CEE does not build its own administrative functions, hence administrative tasks are carried out by staff at the Faculty Office. The CEE has two full-time administrative staff members. This means that questions regarding career development, setting of wages and other HR-related issues fall to the head of the division in question at the Faculty Office. The CEE director provides relevant input to the Faculty Office on such issues. Services indicated 0% are provided in kind to the CEE.

The Centre for Languages and Literature at Lund University (SOL) provides one almost full-time staff member to the CEE, in the field of academic writing in English (indicated as English LN on the chart). Although SOL reserves the right to supply any teacher for the task, there is an open dialogue between the CEE and SOL ensuring that the CEE is satisfied with whom SOL selects to serve on a certain course.
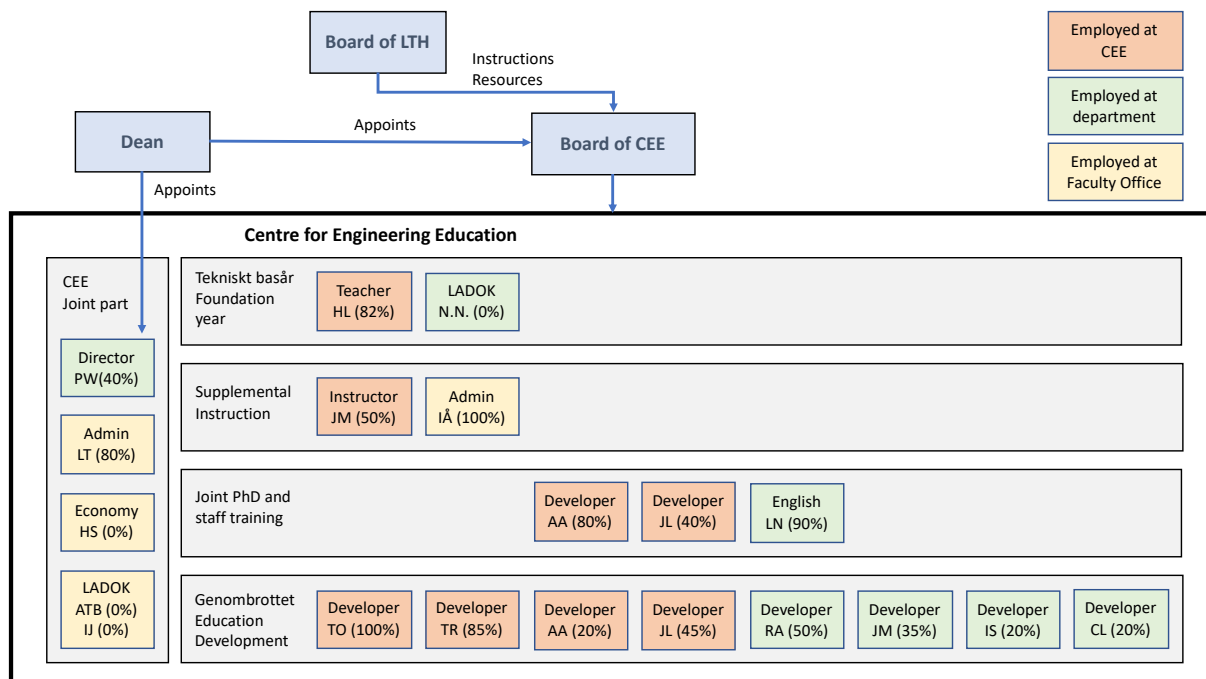
Figure 1. Organization of the CEE as of 2018.

Economy

In terms of economy, the CEE functions like a regular department. That means that the CEE carries its own direct and indirect costs, in addition to overheads (OH) debited to the faculty and to the university levels. But it is also clearly stated in the instructions that all resources invested in the CEE by the faculty should strengthen and support LTH as a whole.

The CEE is mainly financed by internal state funding for either education, or research and doctoral training. The external funding is limited to commissioned education (KSEK 70 per annum), EU funding (KSEK 200 per annum) and income from external seminars and workshops. The CEE also exchanges services with other academic development units within Lund University, but charges course fees from other faculties and universities. In addition, a fair share of operating costs, such as travel, are met by external clients.

With the exception of the Pre-University Course, Tekniskt basår, which has direct funding like any other course in any department of LTH, the services of the CEE are a common good within the faculty. Consequently, courses for PhD-students and staff, consulting services to teachers, departments and the management, as well as Supplemental Instruction, are all supplied free of charge. Nevertheless, most resources originate from overheads drawn from departmental level at LTH.

In order to avoid excessive administration, the Faculty Office provides basic services on an annual flat rate basis. These services include internet access, copying and printing, regular mail services, desktop accessories etcetera. Hardware such as telephones, projectors and computers are procured by the Faculty Office, but paid for by the CEE. Services related to HR and economy are also provided by the Faculty Office.

Table 1 gives a broad overview of the budget for the CEE. The ambition is to have a balanced budget, and not to build reserves over time.

Table 1. Summary of costs 2018 and capital (SEK).

Entity	Sources	Wages	Operating costs	Facilities	Overhead	Capital end of 2017
CEE joint level	Internal OH Commissioned education	628	100	0	-728	1460
Pre-University Course – Teknisk basår	State grants for education	2687	149	267	530	761
Supplemental Instruction – SI	State grants for education	2072	176	584	1548	557
PhD & Staff	State grants for research	917	10	550	759	2034
Genombrottet	State grants for research EU project	3764	520	280	1020	806
Total (SEK)		**10068**	**955**	**1681**	**3129**	**5618**

The CEE annual budget is prepared by the teachers, consolidated by the Director, discussed by the CEE Board and proposed to the Dean, the Deputy Dean and the Head of the Faculty Office. From that point, the Faculty Office is responsible for including the CEE in the overall budget for LTH.

Communication

Since early 2018, the CEE has had a minimalistic website, www.lth.se/cee. One purpose of the site is to provide basic information on the CEE for the sake of transparency, but the main purpose is to redirect website visitors to the pages relevant for the core activities of the CEE.

Since March 2018, the CEE has also been issuing an electronic newsletter, planned for distribution five times during the spring semester and four times during the autumn semester. The purpose is to create awareness of the activities of the CEE, and to inspire staff to participate in seminars, workshops and courses. The newsletter is sent to circa 350 employees including the LTH management group, program directors, departmental study directors, individual teachers and administrators involved in education.

The current staff has limited time to devote to the web and to the newsletter. Therefore, the CEE is in the process of engaging a student (amanuens), part-time, who will have the task of communication.

Cooperation within Lund University

According to the instructions, a priority area is to cooperate with, and create conditions for enhanced collaboration with other academic development initiatives at Lund University. The CEE interacts with several other entities within Lund University. For example:
- The CEE is heavily involved in the activities concerning Supplemental Instruction at LU level.
- One academic developer, associate professor Torgny Roxå, has long been engaged part-time by The Division for Higher Education Development at Lund University, AHU. The engagement has varied over time and is now 15%. Until June 2018, lecturer Jennifer Löfgreen was engaged at AHU to develop and run a MOOC entitled Develop as an Academic Teacher.
- The CEE meets with other academic developers in meetings organized by AHU. The aim of the meetings is to coordinate activities.

- The CEE represents LTH in PedSamIT, a university-wide group for exchange of experience in digitally supported learning.
- The CEE engages academic staff from the Centre of Languages and Literature, the Division of Medical Ethics and others in pedagogical and staff training courses.
- The CEE is a co-founder of the Lund University Case Academy (LUCA) a collaboration between LTH, the School of Economics and Management and the Faculty of Medicine, on the application and scholarship of case methodology. LUCA has, since 2015, arranged the annual Lund University Case Day, for LU teachers and invited keynote speakers.
- The CEE Board has taken the initiative of coordinating activities in doctoral education in the field of education and higher education within LU.
- CEE staff and doctoral students participate in groups and seminars organized by the Department of Educational Sciences at LU.
- CEE staff undertake research together with staff from AHU and other faculties within LU.
- CEE staff serve as assessors, and consultants regarding assessors of pedagogical competence at other faculties within LU, in particular the Faculty of Social Sciences.
- LTH teachers participate in pedagogical training offered by AHU.
- Teachers from other faculties participate in pedagogical and staff training offered by the CEE, notably The Good Lecture (*Swe: Den goda föreläsningen*) and the Readership course (*Swe: Docentkursen*).

The Pre-University Course – Tekniskt basår

Introduction

The Pre-University Course in Technical Sciences (*Swe. Teknisk basår)* is a one-year pre-education program located at Campus Helsingborg. The purpose of the education is to broaden the competence of students who have left upper secondary school without the special eligibility requirements for studies in engineering and science. The student is also well prepared for university level engineering by conducting their studies in an environment, and in a way, that corresponds to higher education. The program is aimed at increasing and broadening the recruitment base for the engineering programs at LTH.

The Pre-University Course thus generates added value for both the individual student and for LTH.

The program has been offered since 1997. The number of places on the program has varied from 32 to 96 over time, but is now 64. Although it is formally one single course (LTH, 2018), it consists of several parts included in the national student record system LADOK. From the students' point of view, however, the Pre-University Course is perceived as an education program comprising several courses. The Pre-University Course requires full-time study and generates 60 pre-university credits (*Swe: Förutbildningspoäng, fup*) when all parts are completed.

An approved Pre-University Course provides the student with a guaranteed place on any 3-year program at LTH's Campus Helsingborg, leading to a BSc in Engineering. An approved Pre-University Course also means that the special eligibility requirements are met for the MSc in Engineering and Fire Safety Engineering programs at LTH, as well as nationally.

The Pre-University Course can be said to be the bridge between upper secondary school and university. It does not provide any higher education credits but follows a university education structure – it is not formally upper secondary education but is at upper secondary level. This education is offered at approximately 20 universities and colleges in Sweden with a total of almost 4000 students (Teknikföretagen and KTH, 2018).

The Pre-University Course is governed by a special ordinance (2007:432) on qualifying pre-education at universities and colleges. From 1 January 2019, this is replaced by ordinance 2018:1519 (Förordning 2018) on pre-university education (*Swe: Förordning 2018:1519 om behörighetsgivande och högskoleintroducerande utbildning)*. The Pre-University Course thus plays a considerable political role in the field of broadened participation, and effectively encourages young people to take up engineering education.

The content of the education

The Pre-University Course contains some parts that correspond entirely to courses in upper secondary schools and other parts that introduce higher education. The former includes 55 credits, and the latter 5 credits. Table 2 shows the layout and extent of the parts during the two semesters of an academic year.

The former parts are designed, and named, in accordance with the national guidelines of the Swedish National Agency for Education and are adjusted in cases where the Agency for Education makes changes. The parts are:
- Mathematics 3c: Algebra and functions, derivatives and integrals, basic trigonometric concepts, triangle theorems.
- Mathematics 4: More about derivatives and integrals, trigonometric formulas, equations and graphs, complex numbers.
- Chemistry 1: The atom, chemical bonds, stoichiometry, acid/base-chemistry, redox chemistry, thermochemistry.

- Physics 1: Velocity, momentum, acceleration, forces, pressure, work, power, the first law of thermodynamics; charge, fields, potential, current, resistance; the atomic nucleus, radioactivity, ionizing radiation.
- Physics 2: Circular motion, harmonic waves; reflection, diffraction, interference; electrical and magnetic fields; electromagnetic radiation, the photon; atomic structures.

The parts, Technical Orientation and Applied Chemistry, are included in the Pre-University Course with the aim of creating added value for students planning to enroll in further engineering studies, and have the following content:
- Technical Orientation: Study skills, inspirational lectures, introduction to project methodology, an optional introduction to Excel.
- Applied chemistry: Environmental chemistry, food chemistry, materials.

These two parts are completely unconnected with upper secondary education syllabi, unlike mathematics, physics and chemistry, and imply a limited freedom for the program to determine the content. The guest lecturers engaged in Technical Orientation are active at LTH and are very positive in their participation. In Applied Chemistry, the student is given the opportunity to deepen and apply the knowledge acquired in Chemistry 1, in areas that are included in several engineering programs at LTH:

Table 2. Layout and extent of the parts during an academic year.

Autumn semester	Spring semester, 1st quarter	Spring semester, 2nd quarter
Mathematics 3c (12 fup)	Mathematics 4, sub-part a (5fup)	Mathematics 4, sub-part b (4 fup)
Physics 1-2, sub-part a (9 fup)	Physics 1-2, sub-part b (7 fup)	Physics 1-2, sub-part c (8 fup)
Chemistry 1, sub-part a (7 fup)	Chemistry 1, sub-part b (3 fup)	Applied Chemistry (2 fup)
Technical Orientation (1 fup)	Technical Orientation (1 fup)	Technical Orientation (1 fup)

Implementation

As mentioned above, the Pre-University Course comprises a single course. Hence formally, it is the responsibility of a single department, which is the CEE. However, the responsibility for the different parts of the semester is divided between three departments:
- The CEE is responsible for Mathematics and Technical Orientation.
- The Department of Food Technology, Engineering and Nutrition is responsible for Chemistry and Applied Chemistry,
- The Department of Physics is responsible for Physics.

Teaching in Mathematics is undertaken by one (1) teacher, Chemistry and Applied Chemistry is taught by one (1) teacher, while the subject Physics with its broad range of topics engages six teachers. The financial allocation is divided between the CEE, Food Technology and Physics departments in the proportions 40/20/40. Technical Orientation is based on the participation of several teachers, in particular from the Department of Design Sciences, who invoice the CEE.

The program management consists of a program director (lecturer Håkan Linder, teacher in mathematics) and an administrator who combines the roles of program planner and student counsellor.

All teaching is conducted at Campus Helsingborg with the exception of work in the chemistry labs, which is carried out at Kemicentrum in Lund.

The pedagogical idea is to give the student an opportunity to study during the Pre-University Course in the same way as in engineering education. The forms of instruction are thus lectures, exercises and laboratory sessions. The written exams are scheduled during certain exam periods.

Regarding quality assurance, formative evaluation is carried out in the form of ongoing communication between teachers and students during the courses. For summative evaluation, the program management conducts two meetings per academic year with teachers, the student union's student council and other student representatives. LTH's common course evaluation system CEQ has so far not been used for the Pre-University Course.

The students

Table 3 shows data for the last three academic years. In each academic year, 64 students were registered as beginners on the Pre-University Course.

The Pre-University Course has many applicants, which over time has meant 3-4 first-hand applicants per place. The number of applicants has decreased somewhat in recent years, which is in line with the trends at Chalmers and KTH.

The level of grade points required for admission is high. The number for 2018, 18.04 (group BI, max. 22.50) compares favourably with 15.49 at Chalmers (group BITB, max. 20.00) while KTH reaches 18.80 at Campus KTH and 17.00 at Campus Flemingsberg (group BI, max. 22.50). In the most recent admissions round, students admitted based on their SAT (*Swe: Högskoleprovet*) needed a score of 1.1 to make it into the Pre-University Course. The student with the lowest grade accepted to the Pre-University Course in each group had not been accepted onto any of the MSc in Engineering programs at LTH, with the exception of MSc in Surveying and Land Management (*Swe: Lantmäteri*).

The number of female students in the years 2016 to 2018 has been 24 (38%), 16 (25%) and 20 (31%) respectively. This can be compared to the national average for 2018, which is 36% (UHR, 2018). The vast majority (60-70%) of the students come from the region, Skåne.

The Pre-University Course is intended for applicants who do not fulfill the special eligibility requirements for engineering education, and their study background from upper secondary school is given in Table 3. The proportions are roughly the same as for the country as a whole. The proportion of "over-qualified" students, i.e. those who have followed the science or technology tracks in upper secondary school is in the range of 10%, which is somewhat lower than the national average (KTH and Teknikföretagen, 2018).

Table 3. Key data of the student population. The students' background from upper secondary school was taken from the national application system NyA.

Year	Students	Applicants		Grade BI	Female %	Background from upper secondary school			
		Total	First hand			Social Sciences %	Business Economics %	Science Technology %	Others %
2016/17	64	1385	268	18,39	38	30	30	8	32
2017/18	64	1170	216	17,81	25	51	22	7	19
2018/19	64	1001	181	18,04	31	36	23	12	28

Social environment

Students on the Pre-University Course, like other LTH students, have access to LU's and LTH's various support functions, such as pedagogical support, Studieverkstaden, student health services, LTH's social support (*Swe: kuratorer*) and Supplemental Instruction activities. There are study councillors at Campus Helsingborg who offer follow-up interviews. It may be noted that since students on the Pre-University Course are not fully regarded as university students in a legal sense, the above-mentioned services have not been required by law. This will however change as the new ordinance comes into effect on 1 January 2019.

Disciplinary actions do not apply to the Pre-University Course students (per.comm. Legal Department, LU, 2017), which has been further confirmed by the government in the memos that formed the basis for the new ordinance.

During the Pre-University Course, students receive information about various study possibilities at LTH. The BSc programs located at Campus Helsingborg distribute information on two different occasions. The study counseling at LTH in Lund organizes a full day of introductions to the various MSc in Engineering programs. There is also the possibility to obtain information about the programs in architecture and in industrial design, as well as on the opportunities for study abroad. The day is highly appreciated and gives the students a comprehensive picture of which programs LTH offers.

There are many study locations at Campus Helsingborg, in group rooms and halls as well as in the library. The students also have full access to all seminar rooms, even outside class hours.

Evidence of quality and impact

As shown in Table 4, most of the students pass the Pre-University Course. The academic year 2016/17 generated 49 (77%) approved students of the 64 admitted. For 2017/18 the corresponding number was 45 (70%) approved.

The purpose of the Pre-University Course is, as mentioned above, to provide special eligibility requirements and thus increase the recruitment base for engineering education. The direct transfer to LTH's engineering programs is approximately 60% of those approved. This is in line with the direct transfer at Chalmers and KTH (KTH and Teknikföretagen, 2018). The transfer from the Pre-University Course to further studies in engineering among women has varied over the years, but is usually in line with the direct transfer among men.

A summary of the outcomes from the Pre-University Course is given in Table 4.

The majority of those who pass the Pre-University Course transfer to MSc in Engineering programs at LTH, and they get admitted based on their grades from upper secondary education. A minority transfer to BSc in Engineering programs at LTH. They have guaranteed places for the two years following the Pre-University Course, but because of their grades from upper secondary education they would have been admitted in any case.

The Pre-University Course not only confers eligibility for LTH's programs, but the eligibility is recognized nationally. This has two consequences. On one hand, those who have passed the Pre-University Course at LTH may apply to other universities, and LTH may also receive students who have obtained their qualifications elsewhere. A review shows that of the 18 students who passed the 2017/18 course and who did not transfer to LTH, six students were admitted to programs elsewhere that required the eligibility provided by the Pre-University Course. Hence, close to ¾ of the students reaped the benefit of their studies as early as the same year they completed the Pre-University Course.

Table 4: Pass rates and future studies. Source: LADOK.

Year	Number of students	Number that passed		Transfer of students				
				To LTH				To other universities
		Total	Continue to LTH	MSc Eng	BSc Eng	Fire Eng	Archit. Design	
2016/17	64	49 (77%)	31 (63%)	23	7	1	0	No data
2017/18	64	45 (70%)	27 (60%)	18	8	1	0	6

Reflection

<u>The purpose of the Pre-University Course year and transfer to engineering studies</u>

The CEE believes that the purpose of the Pre-University Course is fulfilled. The throughput is high and the transfer to LTH is in line with what is achieved at Chalmers and KTH.

Table 3 shows that on the whole, the Pre-University Course definitely reaches those with the greatest need to supplement their competence in mathematics, physics and chemistry. Nevertheless, some students have already studied major parts (or all) of the program's core content even before they start in the Pre-University Course. These students reduce the number of study places for those with a greater need to supplement their competence, by some 10%. This proportion is relatively low in comparison with the national average, which is about 15% (KTH and Teknikföretagen, 2018). Consequently, this is a relatively small problem at LTH.

Table 4 shows that the majority of the approved students continue in the following semester to a program at LTH. In order for an even higher proportion of students to choose to continue in LTH, special efforts at a strategic overall level are required. The most radical measure would be to also offer a guaranteed place on one or more MSc in Engineering programs. Both Chalmers and KTH provide such a guarantee today. Chalmers (2018) formulates this as "completed Pre-University Course provides a guaranteed place (on an approved project course) for further studies at one of Chalmers' Maritime, MSc in Engineering and BSc in Engineering programs. After completing the Pre-University Course, a majority of students can be offered a place on their first or second choice of program." The information from KTH (2018) translates to "If you pass the Pre-University Course, you are guaranteed a place at one of KTH's MSc or BSc in Engineering programs, through a so-called guaranteed place. However, you are not guaranteed a place on your first choice of program, since the transition to an MSc or BSc in Engineering degree program is by selection and is dependent on your study results from the Pre-University Course."

Such a guarantee may, of course, be perceived as a backdoor into MSc in Engineer programs, and this policy balancing is not a matter for the CEE but for the Faculty Education Board, LG GU. The CEE nevertheless wishes to raise the issue for active consideration.

<u>Student perspective</u>

The students are generally very satisfied with the education (layout, organization, parts, teachers), which is clearly evident from the summative evaluation meetings. During these, the students offer constructive criticism of the teaching elements they consider in need of adjustment. Teachers are responsive and, where possible, modify current or add relevant elements of instruction. Some examples of such modifications are:
- The introduction of an optional introductory course in Excel.
- As the students wanted more online material on the subject Chemistry, the teacher linked to recorded lectures from the secondary school Spyken, Lund, and added more written material to the LMS Live@Lund.
- The limitation of written exams to two regular exams per week.

When newly admitted students answer the question as to why they chose the Pre-University Course, the answer is that they need to complete their eligibility to study what they want. They have their target set and see themselves as future engineers. LTH thus gives these students the opportunity to realize their dreams and goals.

Teachers of LTH's BSc in Engineering programs testify that students with a Pre-University Course background show well developed study skills, and generally take significant responsibility for their studies and their learning.

<u>Organizational perspective</u>

The responsibility for the implementation of the Pre-University Course rests with the CEE. There is constant contact between the program director and the CEE director. It is the program director's experience that the director of the CEE is responsive and shows great interest in the education. Likewise, collaboration with the Department of Physics and the Department of Food Technology, Engineering and Nutrition, is excellent.

Within LTH, all programs are sorted into areas of study, with a responsible study area director (*Swe: områdesansvarig*). The study area director is part of LG GU and is responsible for keeping in touch with the program directors, organizing planning meetings with the departments, while carrying the responsibility for the psycho-social working environment of the students. The program management believes that the Pre-University Course does not necessarily need to be part of this matrix organization LTH has implemented. Instead, all questions could be dealt with directly in dialogue between the deputy dean and the director of the CEE. It would be more natural if the Pre-University Course were within one of the two areas that already include programs at Campus Helsingborg, since those area directors already carry responsibility for the psycho-social working environment on campus.

In this text we have made several references to a report, published in January 2018, from a cooperative project centering on pre-university courses in Sweden and carried out by KTH and Teknikföretagen. The report stems from The Association of Swedish Engineering Industries. Although LTH chose not to participate in the study, most of the conclusions in the report may still be relevant to LTH:
- The Pre-University Course works very well as a recruitment method.
- Students with a Pre-University Course background who continue to BSc or MSc in Engineering programs, have lower drop-out rates, take more credits and show higher graduation rates than other students.
- The existence of the Pre-University Course means that a somewhat smaller number of students with low grades are recruited applicants to engineering programs.

Challenges and outlook

The CEE fully believes that the Pre-University Course has for long been a well-functioning concept and that the current number of places (64) is optimal. The availability of large lecture halls at Campus Helsingborg is very limited and is a contributing reason for not accepting more than 72 students, which we see as a maximum limit. The marginal cost of going beyond this limit would be high.

As mentioned above, a new ordinance on qualification and university education is valid from 1 January 2019. The ordinance presents opportunities to combine modules to form pre-university courses that provide special eligibility such as mathematics, physics and chemistry, and also to supplement general eligibility (e.g. Swedish) within the framework of one education. It will also be possible to combine the Pre-University Course with modules that introduce academic studies, for example academic writing. The CEE estimates that the Pre-University Course's current structure is in line with the new regulation, but the new ordinance opens possibilities regarding broadened participation that deserve to be considered.

A necessary change, however, is that the forms of summative evaluation must be adjusted to better match the requirements of the new ordinance. The CEE will enter into discussions with the faculty, the teachers and the students regarding how the evaluation process should be designed.

The CEE calls on the LTH management to further investigate consequences of the ordinance for LTH.

The CEE is aware that the Pre-University Course relies heavily on the efforts of the program director and the program management. We have open discussions about how a gradual transition to additional staff should be implemented within a five-year period, to secure a high-quality Pre-University Course at LTH for the future.

Supplemental Instruction – SI

What is Supplemental Instruction - SI?

Supplemental Instruction (SI) is a method of improving student performance in "difficult" courses, combining "how to learn" with "what to learn". SI sessions are scheduled parallel to the regular education and are guided and facilitated by a "senior" student, the SI leader. The sessions are based on collaborative learning activities to improve understanding of difficult parts of the course material. Examples of collaborative activities used (UMKC 2014) include:

- Group discussions to process difficult parts of the course material.
- Problem solving in small groups.
- "Think/pair/share". In this activity, the group members first work individually for a few minutes to think about a problem or question or to go through a smaller piece of the course literature/lecture notes on a difficult topic. The second step is to discuss ideas/reflections/thoughts regarding the topic with a partner. The final step is to share the outcomes from the pair discussions in a larger group.
- "Jigsaw". Here, group members are broken into subgroups. Each subgroup works on a different aspect of the same problem or is tasked with different questions on the course material or course related issues. They then share/present their part of the "puzzle" with the large group.

What differences then exist between SI and other collaborative learning methods used by teachers? It obviously depends on the method, but some of the most common are:

- SI is a complement to regular education.
    - SI does not replace lectures, seminars, exercises, etc.
- The SI leader does not act as a teacher.
    - The SI leader does not present new material in the course or "reteach" already presented material.
    - The SI leader acts solely as a facilitator of learning activities and helps the participants to structure and process difficult material covered by the teacher.
    - The SI leader is not involved in assessing the participants work on the course in any way.
- The agenda of the SI session is determined by the participants together with the SI leader and is based on what the participants find difficult in the course.
- Study strategies, e.g. problem solving, learning strategies, help-seeking, and note-taking, are integrated into the processing of course material.

SI was created at the University of Missouri, Kansas City, in the early 1970s in order to come to terms with declining retention numbers (Hurley, Jacobs and Gilbert, 2006). Since then the use of SI has spread widely, and staff at more than 1500 universities in some 30 countries have been trained in the method (Martin, 2008). In Europe, SI programs exist at some 70 Higher Education Institutes in nine countries involving more than 5000 SI leaders who facilitate learning activities for some 70.000 students annually (European Centre for SI-PASS, 2018). The European Centre for SI, responsible for training of supervisors and information about SI, is located at Lund University.

Much of the use of SI has been geared towards improving results and retention of students in courses. Here, numerous studies have shown successful results (e.g. Coe, McDougall and McKeown 1999; Congos and Schoeps 1993; Hensen and Shelley 2003; McCarthy, Smuts and Cosser 1997; Ogden et al. 2003). However, the method should also have a positive impact on the whole critical first year experience for new students (Martin and Arendale, 1992) if applied to introductory courses, as SI combines, as mentioned above, how to learn with what to learn. The trained and developed study skills and strategies attained by attending SI are transferrable to other non-SI supported courses the student may be taking. SI provides an opportunity for social integration by forming friendships and networks with fellow students in the academic environment. The SI leader, being an older student with the same study choices, can provide a link to studies in coming years and put the first basic courses in perspective. SI also enables the student to see fellow students as learning resources and to combine

self-study with group studies to make the study experience more enjoyable and fruitful. Thus SI addresses several of the reasons, as pointed out by Tinto (1993), for leaving higher education studies.

Objectives of SI at LTH and in upper secondary schools

SI was introduced at LTH in 1994 as an experimental project to increase student retention and improve performance in "difficult" courses (Bruzell-Nilsson and Bryngfors, 1996). Recently the overall objective of SI at LTH has changed slightly, and is today aimed at bridging the gap between secondary school and university, in addition to supporting students in "difficult" initial compulsory courses. The underlying objectives of the SI program at LTH include:
- Letting first year students take greater responsibility for their own learning in an informal collaborative learning environment.
- Stimulating critical thinking and helping students clarify ideas through discussion.
- Moving students away from considering teachers the sole source of knowledge and understanding, and seeing fellow students as learning resources.
- Being in a network of students with whom you feel comfortable studying and interacting socially.
- Getting acquainted with a senior "model" student's view on successful study strategies.
- Developing study strategies to process course material and study skills such as note-taking, problem-solving and preparation for sitting tests.

In order to promote widening participation and studies at LTH, a new SI initiative was launched in 2007. It is a cooperation with some upper secondary schools in the region, Skåne, where LTH students visit the schools and hold SI meetings for students there. The main objectives of the initiative are recruitment of new students and reaching out to students without an academic background in the family. However, there are several underlying objectives of the initiative, which are to:
- Improve cooperation with upper secondary schools in the region.
- Establish SI as a complementary pedagogical method in the schools.
- Increase interest for STEM among upper secondary school students by using LTH students as SI mentors.
- Increase learning in STEM courses.
- Improve students' study strategies.
- Give students a better picture of studies at university and in STEM courses in particular.

The SI program at LTH as well as in upper secondary schools is supported centrally by one full-time administrator and one part-time academic supervisor responsible for training, supervision, and evaluation. SI also carries the costs for SI leaders and for facilities.
Below we will discuss the SI program at LTH and the SI initiative in upper secondary schools separately.

The SI program at LTH

SI is used in introductory courses in all 3-year BSc and 5-year MSc engineering programs, as well as in most 2-year international MSc programs. In total more than 75 SI leaders are employed in the academic year 2018/19, facilitating 2-hour weekly SI sessions in "difficult" initial courses over one semester. Some programs have also decided to offer SI in other courses during the second semester, covering the additional costs from their own budget. The SI-leaders receive a 2-day training prior to the start of their job, focussing on the idea of SI, group management and learning activity strategies as well as some practical training. Once the leaders start working, they are supervised continuously through supervisor meetings every other week as well as through feedback from personal coaches.

Example of courses supported by SI within the MSc in Engineering programs are:
- Calculus in one variable,
- Linear algebra,

- Mechanics,
- General chemistry,
- Introductory physics,

Examples of courses within two-year master programs are:
- Urban Water,
- Food Chemistry and Nutrition,
- Foundations of Risk Assessments,
- Warehousing and Materials Handling,

The Pre-University Course also benefits from SI.

Evidence of quality and impact

The SI participation during the academic year 2017/18 was on average 45 % at LTH, with almost 90 % of all students with access to SI participating on at least one occasion. The average attendance differs a bit between programs with the highest being 67 % in MSc in Engineering Mathematics, and the lowest being 25 % in MSc in Computer Science and Engineering. The participation in SI in 2-year international MSc programs is comparatively high, on average approximately 50 %. Thus, SI is a well-used learning resource for many students at LTH.

Student grades and passing rates

Two of the main objectives with SI at LTH are to increase student performance and increase student retention. Can we find support for this in the evaluation data? The latest compiled and reported data is from the academic year 2016/17 (see Malm et al. 2017 for details). In Table 5, course results in terms of percent of passing grades from some of the larger courses are compared with levels of SI attendance. The numbers indicate quite clearly that SI seems to make a difference regarding student performance. The same type of results have also been shown repeatedly for earlier years at LTH, cf. Malm, Bryngfors and Mörner (2010, 2011 and 2016).

Table 5. Percent of students with passing grades in courses vs. SI attendance.

Course		SI attendance			
		None/one	Low	Average	High
Linear algebra	No of Students	83	47	77	63
	% with passing grade	60 %	68 %	82 %	86 %
Calculus in One Variable	No of Students	143	119	156	142
	% with passing grade	23 %	24 %	43 %	60 %
General and Organic chemistry	No of Students	14	16	26	29
	% with passing grade	36 %	44 %	81 %	72 %

However, since attendance at SI is based on self-selection, the results above can serve only as an indication and not as proof. It may be that the students attending SI have different characteristics than those not attending. One common hypothesis is that those attending SI are the high achievers. In order to test that hypothesis, the students may be divided with respect to prior academic achievements. Malm (2009) has shown that the average grade in mathematics in upper secondary school is a good prognosticator in engineering studies and clearly correlated to general achievements, and those in mathematics in particular. Table 6 compares the grades in math in upper secondary school and the passing rates in math at LTH, as related to SI attendance. The results show that student performance increases with increasing SI attendance for all students, independent of prior achievements. Thus, all students seem to benefit from attending SI. However, numerous other factors may cause SI participants to perform better than non-participants. With respect to students at LTH, Malm, Bryngfors and Mörner (2011b, 2015, 2016) have controlled for factors like gender, motivation, concentration, time management, anxiety, study strategies, and self-estimated general ability, and did not find any of

these factors to have a substantial impact on the results showing better student performance with increasing SI participation.

Table 6. Results in the course Calculus in one variable vs SI attendance and average grade in mathematics in high school. Weak, Average and Strong refer to average grades 10.0-15.0, 15.1-18.0 and 18,1-20.0 respectively.

SI attendance	% of students that passed the course after one year		
	"Weak" students	"Average" students	"Strong" students
None/one	4 %	25 %	50 %
Low	7 %	29 %	44 %
Average	19 %	35 %	72 %
High	37 %	55 %	86 %

Student retention and graduation rates

As mentioned above, SI should ideally enhance the students' first year experience as well as provide better study strategies. Is this the case? Malm, Bryngfors and Mörner (2012, 2015) have shown that students attending SI perform better (with respect to the number of credits taken), and drop out to a lesser extent during the first year of their engineering studies. Thus, the academic and social context in SI presumably provides students with a sense of belonging and inclusion that prevents them from dropping out. Furthermore, the study strategies and study networks obtained from SI most probably spill over to other courses making student success more likely overall. Success in the even longer term, for students participating in SI early in their education, have been found by Martin and Arendale (1992) and Bowles et al. (2008). In both cases timely graduation and graduation rates were significantly higher for students participating in SI. Higher graduation rates for SI attendees at LTH have also been found by Malm, Bryngfors and Fredriksson (2018), as shown in Figure 2. The increased graduation rates for SI attendees is largely due to a lower number of dropouts (Table 7).
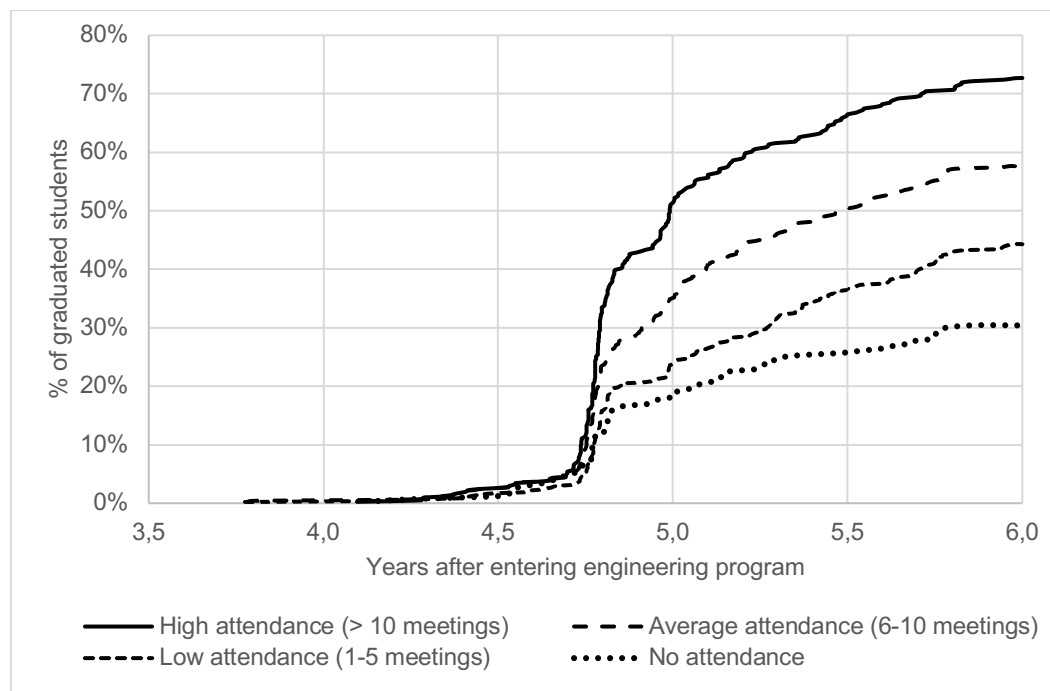

Figure 2. Percentage of students graduating from 5-year MSc engineering programs at LTH vs. SI attendance and time. Based on 1617 students from ten different programs from the 2009 and 2010 cohorts.

Table 7. Student dropouts (% of all students) from ten engineering programs (students from the 2009 and 2010 cohorts) during the first six years vs. SI attendance. Dropouts after 3.5 months – the period of first semester SI meetings – are also given for a more unbiased effect of SI attendance on the dropout rate.

	SI attendance, Number of meetings			
	None 0	Low 1-5	Average 6-10	High >10
Dropouts after 3.5 months	31 %	23 %	18 %	6 %
Dropouts after 6 years	44 %	29 %	18 %	6 %

Process evaluation

The data above relates to the quantitative goals with SI, such as increasing student performance and reducing student dropouts. However, some underlying qualitative goals with SI are continuously evaluated as well, using questionnaires handed out to SI attendees and SI leaders. Responses to some of the questions regarding the general impact of SI from frequent SI attendees on 2-year master programs, are given in Figures 3 and 4. From the data presented in Figures 3 and 4 it is evident that a substantial proportion of the students feel that SI has a positive influence on several aspects of the course, and a positive general impact in several ways. Underlying SI goals such as improved critical thinking, building a network of study partners and improved self-confidence in studies, seem to be met by many students attending SI. In free text answers to the question "What are the best aspects of SI?" two main themes emerge: deeper understanding of the course subject, and friendly atmosphere. A few comments to illustrate this are:

- *"Collaborative, questions very welcomed and detailed answers given, personal feedback given, very effective at developing deeper understanding of and confidence with the course material"*
- *"Being able to bring up questions in a relaxed atmosphere with your peers"*
- *"To see things from another perspective and learn from others"*

The responses are similar to those typically given by SI attendees in 5-year MSc programs and 3-year BSc engineering programs.
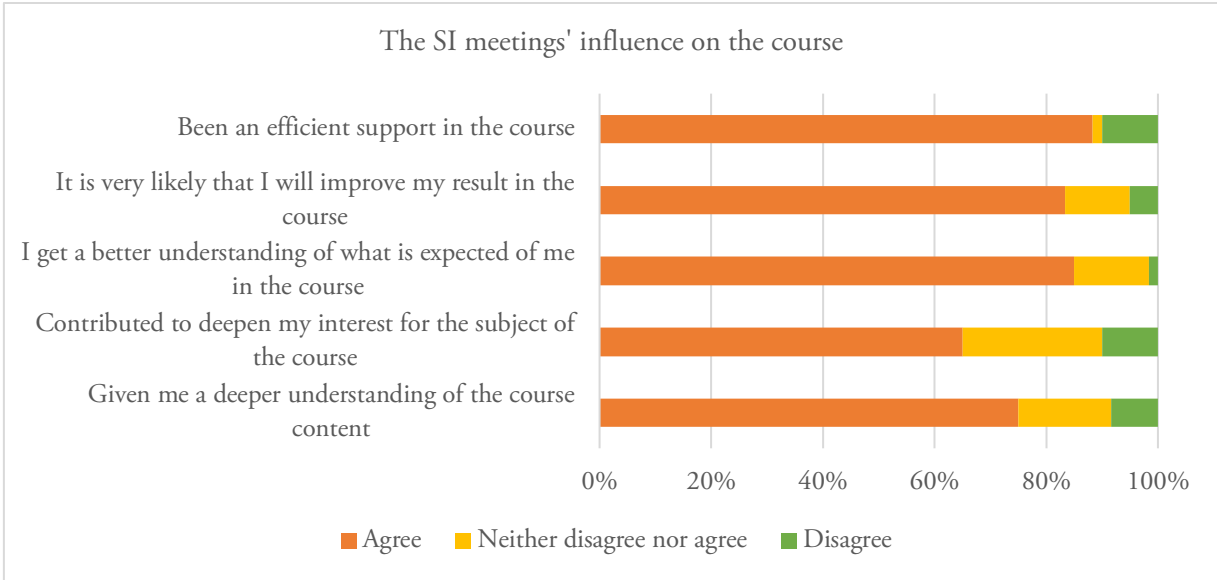

Figure 3. Master students' opinions on the academic characteristics of their SI experience.
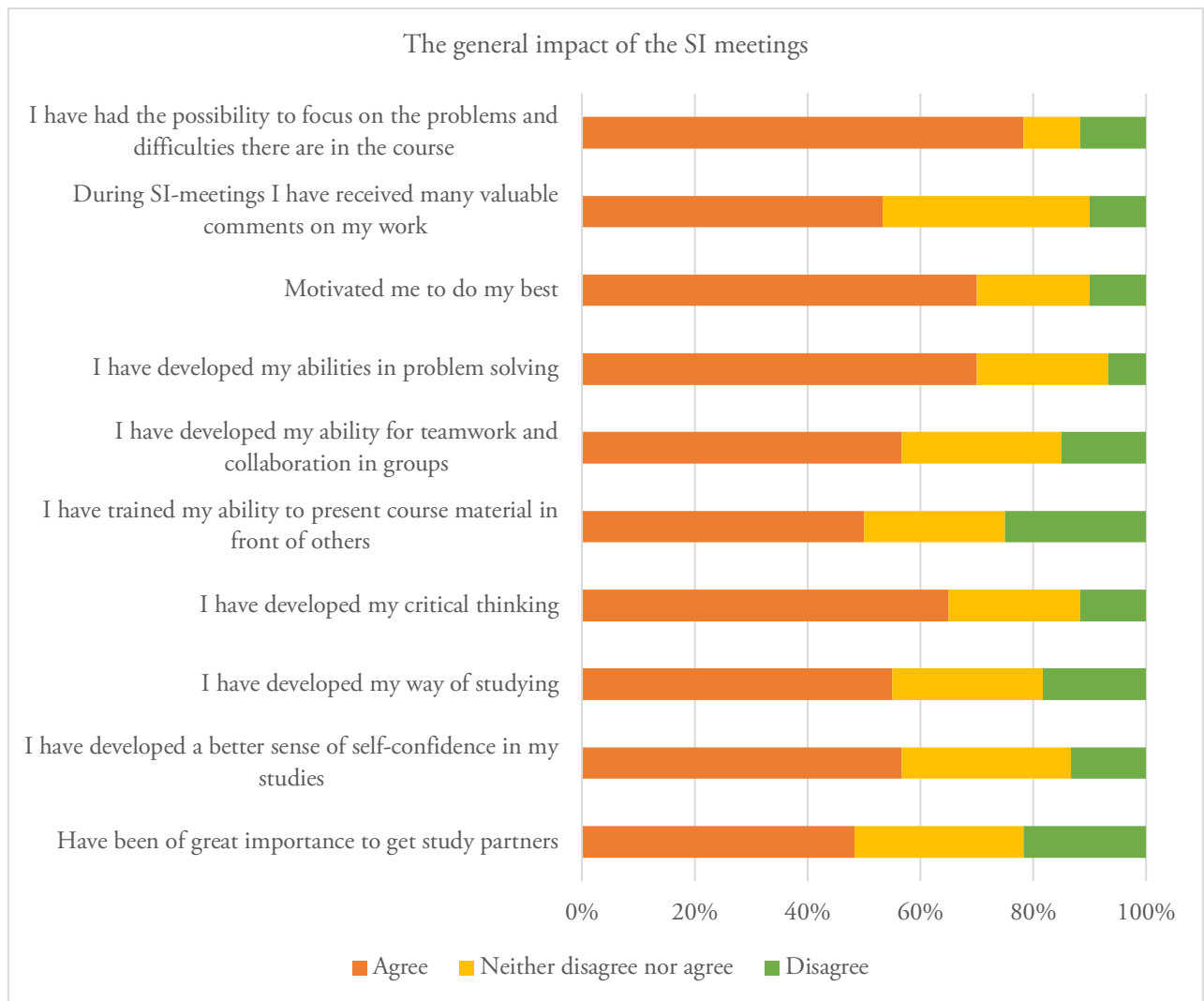
Figure 4. Master students' opinions on the academic and social effects of their SI experience.

Benefits for social and academic integration of international students

The program directors of the 2-year masters students were asked to comment on how SI works on their program.

The program director of Disaster Risk Management and Climate Change Adaptation expresses that "Our view is that SI eases the stress and worry it means to study a relatively quantitative course when you have a social science background. This allows us as teachers to put more focus on discussions in our three seminars (that earlier had to focus more on calculations). The advantage with having second year students as SI leaders is that it creates a bond between first- and second-year students. The SI leaders supports the new students in their studies and can share their experiences of the master programme."

The program director of Water Resources Engineering, who is also course coordinator, states that the students mean that they get a lot out of SI, both as a help to get started with the course, but also that it gives the opportunity to meet among the master students where they can discuss things that are not course-specific, such as study technique and how to solve practical issues that arise when you come to Sweden. The SI sessions relieve the teachers a lot by answering some questions and solving some problems without the teachers having to spend time on the issues. It helps to give a good start on the education.

Interestingly, the program Supply Change Management argues that the Swedish student on the course enrolled in the 5-year integrated express that it is unfair that international students are given support by SI. The program director argues that the transition from year 3 to year 4 regarding pace, complexity and pedagogy, creates a challenge for all students. Therefore, other students think that treatment of the international community is "unfair" as many [Swedish] students have problems to adapt to the higher demands and the higher complexity. The course coordinator would rather either let all students enjoy SI leaders, or have it removed.

We conclude that SI contributes to the social and the academic integration for international students, which is perfectly in line with why SI was introduced on these programs.

Benefits for SI leaders

Another group that benefit from SI in terms of obtaining leadership and group management skills, are the senior students facilitating the sessions, i.e. the SI leaders. Within the international SI community, the leaders are often considered the "big winners" within the SI programs, but very little has been published to substantiate this. Responses to questionnaires handed out to SI leaders at LTH seem to indicate that they do develop different types of skills. One typical example is shown in Figure 5, based on questionnaire responses from 37 leaders in 2011 (see Malm, Mörner and Bryngfors 2012 for details).

A clear majority of the leaders agree that they have developed several capabilities through the SI leadership: the ability to communicate with, and talk in front of others, to listen to their thoughts and reasoning and to meet and inspire different individuals; the ability to get students to help each other and improve the students' enthusiasm for tackling a job, the ability to organize the work for a group. Furthermore, a clear majority of the students felt that their SI leadership made them more secure in their role as leader of a group and in leading a discussion. In addition, a majority felt that they got a deeper understanding of the course as well as improved self-confidence. Many of these results confirm earlier findings by Congos and Stout (2003), Couchman (2009), and Lockie and Van Lanen (2008) from other universities and in other subject areas.

The results in Figure 5 are supported and expanded by the answers to the open-ended question "Name and explain briefly three skills you improved upon by being an SI leader". Some examples are:
- *Leadership – you learn a lot by organizing a group. Social competence – you learn to work with and help all kinds of students. Mathematics – I definitely got better in calculus* ☺*.*
- *To study and inspire large groups and to talk in front of others. To plan and take responsibility. To reflect on my own studies.*
- *Encouragement – by trying to get people to talk although they do not possess the complete answer to a problem. Planning – explanation superfluous! Flexibility – to try to adapt and not fear the unexpected.*
- *To talk in front of a group and be able to do it in a simple, relevant and relaxed way. To see other people's problems, i.e., understand what others are thinking and need help with. To be able to pass on questions and thoughts and give others the opportunity of expressing their thoughts.*
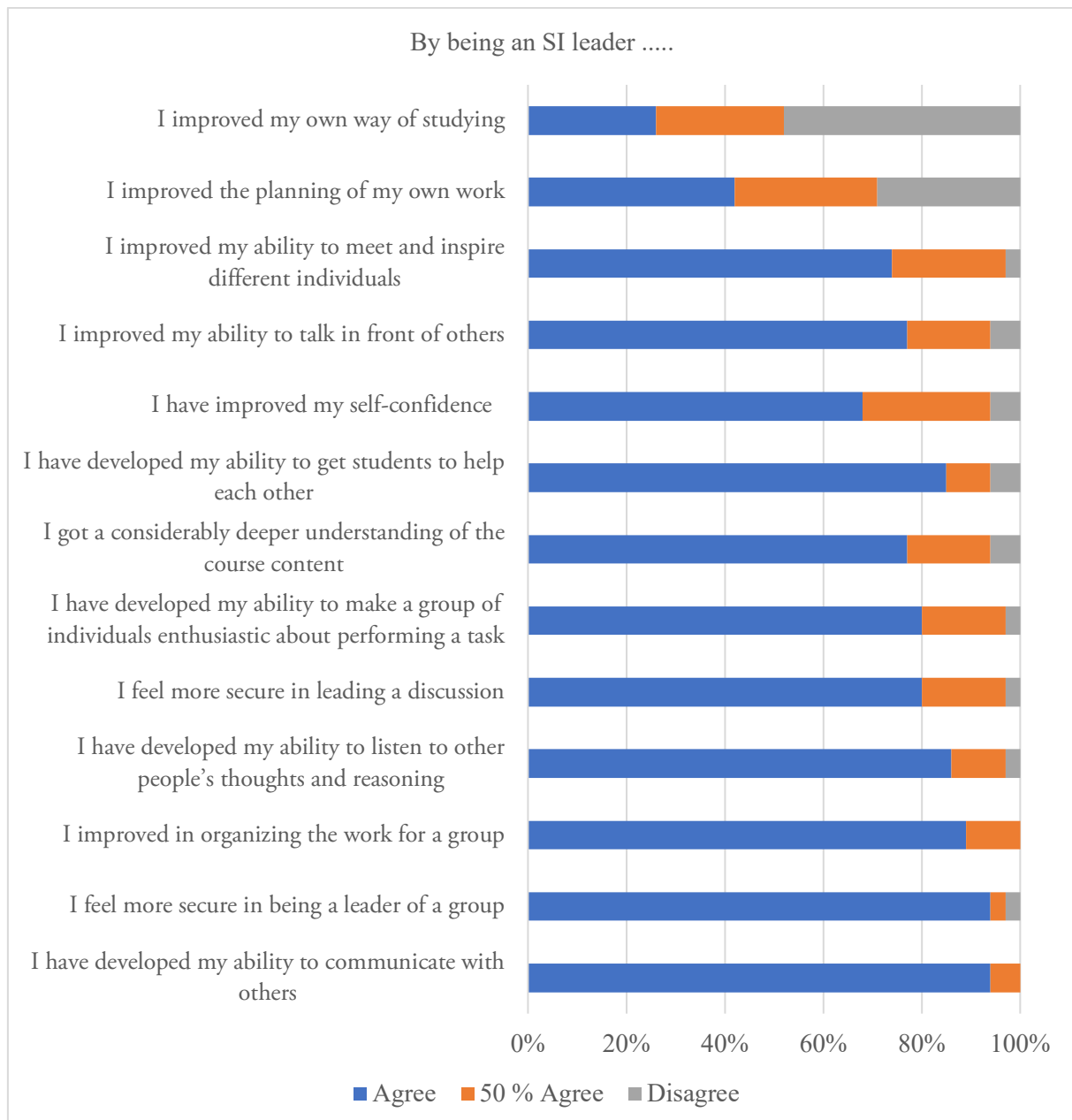
Figure 5. SI leaders' opinions about some characteristics of their SI experience.

Support for some of the results in Figure 5 can also be found in the answers to the open-ended question put to 20 former SI leaders who have graduated and are currently working, "Seen in hindsight – What skills did you develop during your SI leadership?". A few examples are:

- *Communication. The ability to explain in different ways. Leadership in a group. Optimism. The ability to see/feel if people understood a certain message.*
- *Knowledge sharing, planning and responsibility. Besides, my confidence grew regarding my ability to handle problems that were new for me within unknown areas. To handle different kinds of people and understand their problems and difficulties.*
- *I am more secure in supporting others both in working and private life. I am also more comfortable in a leadership role.*
- *I have improved my leadership abilities, seen the value of involving and engaging those who participate in projects by promoting active participation and own initiatives*
- *Not to stress for answers. To let people explain their way of thinking a second time. Not to be afraid of silence!*

The 20 former graduated leaders also reported that having been an SI leader was seen as something positive if it came up at job interviews, and many feel that they have had good use of developed leadership and group management skills from SI in their current jobs (see Malm, Mörner and Bryngfors 2012).

<u>Challenges and outlook</u>

The LTH goals with SI seem to be met for many of the attending students. Although the attendance is presumably quite good for an activity that is added to a rather heavy schedule for new students of education mixed with social introductory activities, it is something that can be improved upon. The idea in the near future is to do research on the reasons why students do not attend SI and create an action plan to address these reasons. Another plan is to involve the students even more in the running of the SI program at LTH. Today, we employ students to be leaders, personal coaches, have lead roles at supervisor meetings, and to assist in the training of new leaders. The idea we have is to also employ students in other aspects of running the SI program. This would be funded by reducing the work of regular employees. The goal is to further provide the students with a sense that SI is something that is "owned" by them and that they can come with ideas to develop the program further.

The SI program in upper secondary schools

As mentioned above, LTH has been a pioneer with SI in upper secondary schools since 2007. Information about the initiative has been presented in reports (Malm, Bryngfors and Mörner 2008; 2011c; Malm, Mörner and Bryngfors 2014), journal articles (Malm et al. 2012), at conferences (Malm et al. 2012b) and at supervisor training in Europe for HEI employees wanting to start an SI program. The academic supervisor of the LTH SI team – Associate Professor Joakim Malm - is also one of five certified trainers at the European Centre for SI-PASS. In short, the initiative involves students from LTH going out to selected upper secondary schools in the region, to facilitate SI sessions where the prior week's course material in physics, maths or chemistry is processed. The selected upper secondary schools are at present Ystads Gymnasieskola, Söderslättsgymnasiet in Trelleborg, Idrottsgymnasiet in Malmö, Spyken in Lund, Bastionskolan in Eslöv, and Hässleholms tekniska skola. The idea is to have most of the SI sessions in the upper secondary schools where many of the students do not have academic traditions at home, i.e. to promote a widening participation in higher education besides providing collaborative learning opportunities in the subjects at hand. In order to do this, leaders are encouraged, when natural opportunities arise, to talk about studying at university and share their experiences. Furthermore, each leader is encouraged to bring their students to Lund once a year for an SI meeting combined with a walkabout at the university campus.

Another way LTH reaches out to high schools, is by promoting 3rd year upper secondary school students to be SI leaders to 1st year students. Several upper secondary schools have started such activities, where the SI leadership is undertaken within the frame of the upper secondary school thesis work. The SI leaders are trained by the SI team at LTH at the beginning of the autumn semester – in total 31 students in 2018.

<u>Evidence of quality and impact</u>

Since SI is usually mandatory in upper secondary schools, quantitative studies on student performance are hard to carry out due to lack of comparable reference groups. Therefore, the evaluations made in the LTH initiative are mainly qualitative. Upper secondary school student responses to questionnaires have been similar to those of LTH SI attendees although not as pronounced; see for instance Malm et al 2012. Thus, many upper secondary school students attending SI feel that they improved in areas like teamwork, problem solving, critical thinking and presenting course material in front of others, besides the benefits to their course work.

A targeted study, on attitudes on how to learn mathematics by a teacher at the school Spyken in Lund, compared one class that had SI with one that did not. The comparison showed that students attending

SI were on average more positive to present in front of others, work collaboratively, and explain to others.

Some comments on positive aspects of SI expressed by upper secondary school students were:

- *"The best thing is that you can understand how other people think and that you can use it."*
- *"You get more explanations than just from the teacher, … different people have different views and may think in a different way than yourself. It is more fun than just going on solving problems."*

Examples of other comments on how upper secondary school students found that SI sessions differ from teacher-led lessons are as follows:

- *"You can discuss problems in a group and thereafter present them in front of others. In lessons you normally just listen to the teacher."*
- *"There are very few similarities. SI is almost just discussion and always group work, while lessons are the opposite."*
- *"More discussions and the good feeling of being a part of a group. Everything is discussed and all students develop independent of how much they know."*

What then are the upper secondary school teachers' views on the SI sessions' contribution for their students? Data has been collected through yearly surveys where teachers have responded to open-ended questions such as "What do you see as the main influence that the SI sessions have had on your students?". Some examples of responses:

- *"The students who regularly attend SI sessions during their time in upper secondary school have developed substantially, not just knowledge wise but also in their confidence in their own ability. I have also noticed that the students help each other more often. I see this as an effect of the SI sessions, where they see that explaining to a fellow student helps their own understanding."*
- *"They see different kinds of questions and problems. They enjoy the sessions and find them helpful in their understanding. SI has also broadened their view on mathematics."*
- *"They have learned how to work together."*
- *"The SI leader provided them with a different point of view, which stimulated their curiosity and sense of enjoyment of the subject."*

Thus, it appears that SI in upper secondary schools really benefits student learning in the supported subjects. Another evaluation topic of interest is whether LTH gains from providing SI in upper secondary schools in terms of an increased recruitment of students from these schools. Unfortunately, there is no easily accessible statistical data on this. A smaller study from one school in Hässleholm, comparing further studies for graduated students from classes with and without SI, indicates that students attending SI tend to pursue higher studies to a higher degree, and that Lund University, and LTH in particular, seem to be the main beneficiaries. However, one has to be aware that the student number is small in this study, thus the results may be coincidental.

The internal SI programs in upper secondary schools where 3rd year students facilitate sessions for 1st year students, are often evaluated within the frame of the upper secondary school thesis work. In general, the experiences are positive or very positive and examples of thesis reports can be obtained from the SI team at LTH upon request.

Challenges and outlook

The idea of SI in upper secondary schools has generated quite an interest both nationally and internationally. The national interest has manifested itself in the initiation of a south Swedish SI project in secondary schools. Here, the three southern Swedish regions Skåne, Blekinge and Halland collaborate with Lund University, Malmö University, the Swedish University of Agricultural Sciences at Alnarp, Kristianstad University College, Blekinge Institute of Technology, and Halmstad University College, as well as numerous upper secondary schools in the regions. The objectives are to promote

(collaborative) learning activities in the schools, develop transferrable skills such as teamwork, critical thinking and problem solving as well as to improve widening participation in higher education. The south Swedish regional project also complements the LTH initiative and means that more LTH students have the opportunity to be SI leaders. Future plans regarding the LTH initiative of SI in upper secondary schools, is to reach out to more schools in the region that have high percentages of students who come from families without academic traditions.

Academic development – Genombrottet

Approach

Genombrottet strengthens LTH and contributes to the expansion of knowledge on how to develop teaching and student learning in higher education organisations through a) pedagogical courses for teaching staff, through b) the reward system for excellent teachers (ETP), through c) consultation and participation in development projects, and through d) research and supervision.

The approach is to influence teaching cultures at LTH so that teaching is taken more seriously, i.e. is talked about more and in more scholarly ways on all levels in the organisation. The rationale for this approach can be summarised through Caldwell's (2006) review of organisational change literature, where he focuses on the question: Why do things change (or not) in organisations? He answers this question by focusing on who can initiate change (who has agency) in an organisation. He suggests four levels of agency: individuals, workgroups, the line organisation, and external discourses. If these levels were aligned with each other, change would happen almost automatically. If one or more levels oppose the others, conflicting agencies can become deadlocked. Change will not happen. Thus, the four levels of agency should be treated as one system.

Genombrottet teaches, supports and consults on three levels within LTH: individuals, workgroups, and management, and addresses the wider discourses through participating in national and international conversations. Following a cultural perspective based on Caldwell's account and the fact that most organisational learning happens outside activities organised by academic developers, it is assumed that if teachers and others at LTH engage in *more and more informed conversations about teaching and learning* with colleagues during everyday activities, then Genombrottet has influenced exiting teaching cultures at LTH. In short, *Genombrottet supports an emerging culture of scholarship of teaching and learning at LTH.*

The following summarises why things are done as they are, what is being done, and what evidence of achievements exists. The section ends with an overall reflection on risks and weaknesses in the practice described.

Pedagogical courses

The pedagogical courses follow the recommendations formulated by The Association of Swedish Higher Education Institutions (SUHF): The overarching objective of HE teaching qualifications [pedagogical training], is that after completing the education, the participant shall demonstrate the knowledge, skills, and approaches required for professional teaching in higher education in HE, in the participant's subject area, and for taking part in the development of higher education. (SUHF, 2016) SUHF goes on to formulate additional outcomes relating to participants' ability to, for example problematize student learning, collaboratively plan and carry out teaching and assessment, make use of digital resources, interact with students in an inclusive manner, apply relevant national rules and policies, adhere to values of gender equality and internationalisation, and participate in a wider discussion on pedagogical development.

For every 40 hours of working time within the pedagogical courses, participants fulfilling course requirements are granted 1 week of Qualifying Higher Education Teacher Training (*Swe: BHU (Behörighetsgivande Pedagogisk Utbildning, BHU),* in accordance with the recommendations formulated by SUHF.

At LTH the pedagogical courses are regulated through the Program Syllabus for Qualifying Program in Teaching and Learning in Higher Education (BHU) at the Faculty of Engineering, LTH. (LTH, 2012). Here it is stated that pedagogical courses:

- Should adhere to SUHF's recommendations.
- Are organised into a) general courses in teaching and learning in higher Education, b) subject-specific courses in teaching and learning in higher education, and c) specialisation courses in teaching and learning in higher education.
- Meet the 10-weeks requirement, 2 weeks each from categories b) and c) are required.
- Have all syllabi formulated using the same template regulating regular courses at LTH and have approval by the Dean.

A summary of the courses given is presented in Table 8.

Teaching and education does not improve because of pedagogical courses. Improvement happens because individual (and groups of) teachers decide to do things differently. Improvement happens in the midst of everyday events when those who are in a position to influence students consider teaching and student learning critically. Among these, teachers are central. Therefore, pedagogical courses at LTH aim to influence everyday practices where academic developers are not present.

The link between pedagogical courses and teachers' everyday experiences therefore is of utmost importance. The courses have been designed with this in mind. The content taught in the courses is chosen foremost with two aspects in mind: relevance and usefulness. It is relevant if educational concepts and perspectives help teachers to perceive more authentic aspects within their respective teaching situations, and through this, are able to understand more of what is going on, i.e. what students are doing as a response to the courses and teaching in which teachers are engaged. It is useful if teachers, as a result of the above, are able to alter the design of courses and their own teaching behaviour so that students engage in improved learning. Furthermore, concepts and perspectives are useful if teachers' capacity to explain why they teach the way they do, and what impact it has on students, is enhanced. The loop of individual observations, understanding, planning, and teaching is fulfilled when teachers start to talk and to write, in collaboration with colleagues, about their teaching.

In the pedagogical courses, the course participants (university teachers) reflect upon their own teaching experience and work on self-chosen development projects directly related to their practice. These projects are reported in a scholarly way, incorporating the use of educational literature and peer review by colleagues within the same course, or within the faculty where the teacher is active. To promote scholarly conversations about teaching and learning, the development projects produced by teachers in our courses are made available in a database currently holding approximately 600 items.

The pedagogical courses at LTH are organised in modules with various themes that teachers weave into their regular practice. This lessens the transfer threshold for integrating material from larger professional development activities into their regular practice. After all, it is the regular practice that is in focus, not the pedagogical course.

Regarding the learning outcomes for pedagogic training formulated by SUHF, the basic course Introduction to Teaching and Learning in Higher Education focuses on two learning outcomes:
- To be able to discuss students' learning in the subject area based on relevant pedagogical and didactic research.
- To be able to independently, and with others, discuss, plan, implement and assess teaching and examination on a scientific or artistic basis within the subject area.

Other courses address additional learning outcomes. For example, The Good Lecture addresses:
- The ability to use and develop the development of physical and digital study environments to support learning of groups and individuals.

By means of the project mandatory in all courses they also address:
- The ability to use, analyze and communicate personal and others' experiences and relevant aspects of research that act as a basis for development of education and the professional role.

*Table 8. Pedagogical courses that have been offered by Genombrottet on a regular basis and aspects of design, www.lth.se/genombrottet. Courses with an English name only are always taught in English. A * denotes courses also part of the program organised by PhD Education support and Development.*

Pedagogical courses offered by Genombrottet	Number of BHU weeks	Times per year	Number of participants per cohort	Peer reviewed projects
General courses in teaching and learning				
Högskolepedagogisk introduktionskurs Introduction to Teaching and Learning in Higher Education	3*	4	25	In groups of 5 and individually
To Manage, Lead and Develop Courses at LTH	3	1	NEW	In groups of 2-3
Teaching, Learning, and Supervision in Higher Education for Adjunct Professors	1	1	4 - 12	Individual
Specialisation courses in teaching and learning in higher education				
Communicating Science	1*	2	20	Individual
Den goda föreläsningen "The Good Lecture"	2 or 3	2	16	Individual optional
Handledning i teori och praktik Supervision in theory and practice	2	1	6 - 12	Individually or smaller groups
Projektbaserad kollegiekurs Project Based Collegial Course	2	On demand	10-12	In groups
Docentkurs Readership course	3	2	30	In groups of 2-5
Sceniskt framförande i föreläsningar Performing in front of students	0 or 1	1	12	Individual optional
Kultur, normer och makt – hur behandlar vi varandra på LTH? Gender in engineering education	3	1	12	In groups of 2 - 3
Video in Education and Research Communication	3	1	NEW	In groups of 2 - 3
Courses for individual specialisation				
Examination	3	Every other year	5 - 12	Individual
Workshop - how to write a teaching portfolio	1	1	12 - 24	Individual
Ämnesdidaktik Subject Didactics in Science and Engineering	3	Every other year	5 - 12	Individual

Examples of pedagogical courses – Description and evaluation

In order to present the way these courses are designed and their link to the general purpose of supporting more and better conversation about teaching within departments during every-day

activities, three courses will be described in more detail: Introduction to Teaching and Learning in Higher Education, The Good Lecture (*Swe: Den goda föreläsningen)* and The Collegial Course (*Swe: Kollegiekursen).* These courses are chosen because the first is offered four times per year and is next to mandatory for all PhD students at LTH, the second because it is offered mainly to experienced teachers and is also more skills oriented than the other two. The last course represents, through its design, an interesting format for professional development that seeks to be as integrated into the daily practice of teachers as possible.

Introduction to Teaching and Learning in Higher Education

This course, mandatory to all PhD students who teach, consists of three parts. The first part is a full week in class where various educational topics are introduced. These include deep and surface approaches to learning, constructive alignment and the SOLO-taxonomy, communication in and outside the classroom, assessment and examination, evaluating teaching, and teaching careers including ways to convey pedagogical competence through a teaching portfolio. During this first week, the participants work in groups of four or five centred around one disciplinary area, such as chemistry, mechanics or computer science. This discipline-embracing design of the groups is explicitly explained to participants as a way of allowing them to assess educational concepts against the needs of their respective disciplines. Teaching throughout this week is a mix of methods, such as workshops, peer teaching, seminars, and reading.

The second part is an individual reflective text where an authentic personal teaching and/or learning experience is analysed using (but not limited to) concepts presented in the course. This text is peer reviewed by other participants and also discussed with a critical friend within the department.

The third part of the course is a project carried out in groups and reported through a scholarly report, which is peer-reviewed by other groups within the course.

Regarding evaluation, it has been shown from a published report (Andersson et al., 2013) that this course develops participants significantly in a student/learning-centred approach, even though they, at the outset of the course, hold more teacher/teaching-centred conceptions of teaching and learning.

There is a huge debate on how to evaluate professional development activities for academic teachers. The critique of so called "happy sheet evaluations", collected end-of-course experience questionnaires, if used as the only measure for evaluation, is massive. Below we present what participants thought about their course experience simply because we think it is fair to ask professionals about their experience of professional development activities.

In ten cohorts (from 2016) of Introduction to Teaching and Learning in Higher Education, we had none who were dissatisfied with the experience, while 199 out of 2013 responses were either satisfied or very satisfied (Figure 6). We interpret this as a sign that the course is experienced as worthwhile and meaningful.
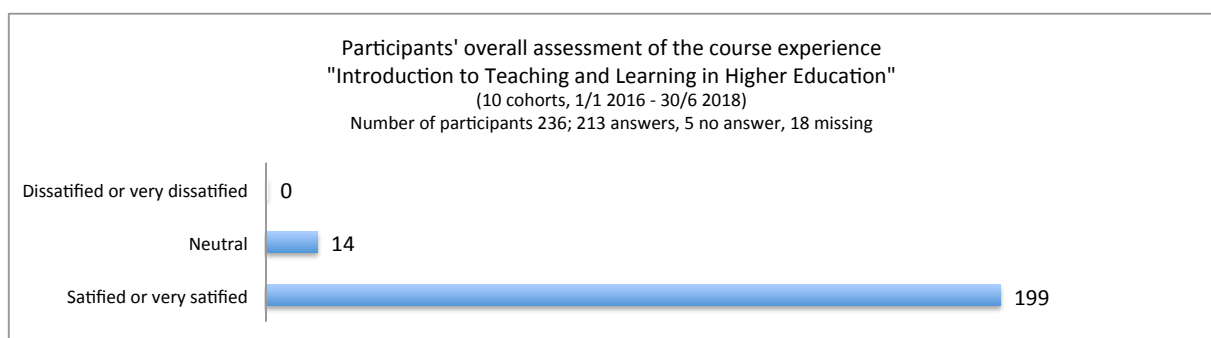
Figure 6. Course evaluation results regarding Introduction to Teaching and Learning.

The Good Lecture – Den goda föreläsningen

This course is optional within the category *Specialisation courses in teaching and learning in higher education,* and recruits experienced teachers. It contains three mandatory parts a) peer teaching, b) auscultation (attending classes as an observer) and c) video recordings. In the peer teaching exercises, groups of participants study research material on lecturing, design, and teach the other participants about the material. These sessions are peer reviewed within the group. The auscultation part requires participants in groups to visit each other in authentic teaching situations. They then analyse the observations made and write a joint reflective text on the experience. The video recording part is about producing shorter video clips to be used in authentic teaching situations. There is also an optional forth task to write an individual reflective and scholarly paper on lecturing that gives an extra 1 week BHU.

The course can be evaluated based on the five cohorts of the course The Good Lecture. So far we have had no participant dissatisfied with the experience, while 35 out of 39 responses were either satisfied or very satisfied (Figure 7). We interpret this as a sign that the course is experienced as worthwhile and meaningful for the individual participants.
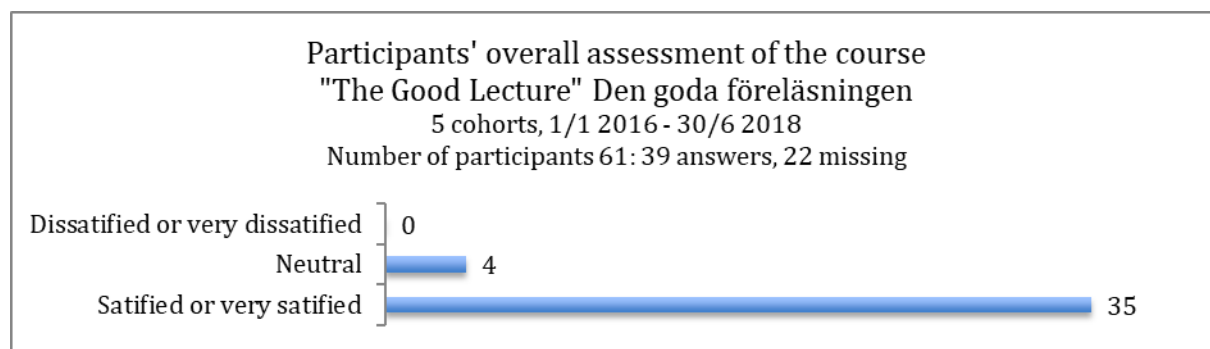

Participants' overall assessment of the course "The Good Lecture" Den goda föreläsningen
5 cohorts, 1/1 2016 - 30/6 2018
Number of participants 61: 39 answers, 22 missing

Dissatified or very dissatified	0
Neutral	4
Satified or very satified	35

Figure 7. Course evaluation results regarding The Good Lecture.

The collegial course – Kollegiekursen

This course is specially designed to organise professional development within the context of the everyday working life of academic teachers. It is offered on demand when a group of teachers, or a disciplinary community, seek to develop skills or understanding within a specific teaching area. So far, examples of such areas are: development of criteria to assess artistic projects, development of lab-skills in chemistry and biotechnology, as well as developing, using and evaluating video in teaching students, in teaching.

Genombrottet co-teaches the course within the premises used by the participants while teaching students. Seminars on literature are interwoven with project work on the specific theme chosen for the course. The aim of this course design is to support academic teachers in negotiating the meaning of professional training as closely as possible to authentic situations. The aim is to limit the transfer threshold and to support a local conversation on teaching and student learning that lasts beyond the course.

Even though this course format has been offered several times and the demand is increasing, the format has not yet been evaluated. Despite this, the design of the collegial course itself is worth evaluating. Since the overall purpose is to influence conversations in the workplace, we intend that this course design should cross the border from being organised professional development, into an activity more organically fused with everyday practice, where the rooms being used, the collegial character of the discussions, even the ownership of the course content support an authentic experience. It remains to be shown though whether this design will deliver what is intended. So far, experiences at

LTH, but also in Norway, where a similar collegial course building on the LTH model is offered as basic training for academic teachers, are promising.

<u>Evidence of quality and impact</u>

Evaluations and studies

Independent evaluators have externally evaluated pedagogical courses organised by Genombrottet on at least four occasions: 2006, 2011, 2016, and 2018.

Gran (2006) surveyed 1100 participants at six Swedish institutions regarding their experiences of mandatory pedagogical courses. Overall participants were satisfied but described problems when returning from courses. Colleagues were not always encouraging. LTH is described as an exception. At LTH participants felt they were part of a systematic strategy for developing teaching and learning, and did not experience this return-from-a-course-problem.

Wendel (2011) analysed 231 responses from academic teachers with LTH. 87% of them had attended at least one pedagogical course. Almost 70% of the respondents claim that the pedagogical courses have contributed to educational development at LTH. Thereby, Wendel notes, pedagogical courses organised by Genombrottet are more highly appreciated by teachers at LTH than courses organised by others.

Kottman et al. (2016) from the Centre for Higher Education Policy Studies (CHEPS) at the University of Twente, the Netherlands, commissioned by NOKUT, the Norwegian Agency for Quality Assurance in Education, studied five nominated European centres for excellence in teaching and learning. LTH was one of these. The aim was to identify critical aspects for an emerging quality culture in relation to education. LTH defends its position well among the five centres studied. In addition, the report quotes several research articles authored by personnel from Genombrottet while discussing quality cultures in higher education.

Ödalen et al. (2018) surveys 459 academic teachers from five of the largest higher education institutions in Sweden. Their aim is to study the impact of these courses and they conclude that this is an extremely difficult endeavour. However, one clear indication reported, concerns the participant's experience of the relevance of these courses. From Lund University (note, not only LTH), 85% of the respondents report experiencing great or very great relevance. Lund thereby distinguishes itself as the best institution within the sample, in this regard.

Even though these reports claim quality in the pedagogical courses, they do not address the stated purpose of the courses: to contribute to a more frequent and improved conversation about teaching and learning within departments and disciplinary communities. In order to find this out and to pursue the issue of whether students note the impact from courses, Genombrottet participates in two international projects investigating this.

Genombrottet took part as one of 22 institutions in a now classic study of impact from pedagogical courses (Gibbs and Coffey, 2004). In this study impact from pedagogical courses is detected both as measured in student evaluations of teaching, and as an increase in those students taking on a deep-approach to their studies.

Impact on teachers' pedagogical practice

Genombrottet is currently part of an Erasmus+ project coordinated from Bratislava (Pleschova 2016), with the specific task of formulating a research methodology where this kind of impact can be researched. It includes interviewing participants six months after they participated in a course. The interviews focus on whether they use the concepts and perspectives presented in the course while discussing teaching and learning in their everyday interaction within the disciplinary community. So

far, a smaller number of interviews confirm a hypothesis that the pedagogical course in question does contribute to quality in conversations. But most of all, the interviews confirm that teaching and learning are being talked about, and supported by the local cultures where the participants are active.

This result mirrors the result by Gran (2006), summarised above, that LTH participants in pedagogical courses not only find them relevant and interesting, but also report that conversations about teaching and learning are encouraged by local cultures. It is not a proof, but it corroborates a claim that at LTH the pedagogical courses do support quality conversations within teaching and learning practices outside the courses and outside the direct reach of Genombrottet.

One significant impact from the pedagogical courses is that concepts and perspectives from the courses appear in the pedagogical portfolios submitted to the Pedagogical Academy. A recent study by Warfvinge, Roxå, and Löfgreen (2018) shows that successful applicants to LTH's Pedagogical Academy, to a much higher degree than non-successful ones, integrate elements from their pedagogical training in their own pedagogical practice in a deliberate way. This is also true of the texts submitted to the LTH campus conference in teaching and learning, Inspirationskonferensen (Larsson, Anderberg, and Olsson, 2015).

National leadership

Together with three other experienced academic developers in Sweden (Katarina Mårtensson, Maja Elmgren, and Mona Fjellström), Torgny Roxå designed and taught the national professional development course for Swedish academic developers, *Working strategically with academic development*, 2016-2017.This course was supported by the Swedish Network for Educational Development in Higher Education (SWEDNET). This course is the third round of national initiatives of this sort, the first was offered 2004/2005 and 2005/2006, both times with Torgny Roxå on the course team.

Challenges and outlook

Pedagogical courses today appear to have a different function to that which they had a decade or two ago. Today, in most contexts within the organisation, the courses are seen as a natural part of the training of early career academics and doctoral students, while earlier they had a more direct impact on how individual teachers decided to teach. One reason for this is, arguably, that the conversation on teaching and learning in departments and disciplinary communities is more evolved than previously. There has been a shift from "tips-and-tricks" to empowerment based on pedagogical understanding.

However, the development described above does not necessarily include all disciplinary communities within the faculty. Some of them may remain more or less independent of the general development at LTH. To reach these contexts is a challenge for LTH, a challenge that can be resolved only if the pedagogical courses remain relevant and meaningful in nature, but more importantly if the rest of the faculty embrace a strategy to allow for varied teaching methods, but demand reflective and informed arguments for chosen teaching methods. If so, all contexts may develop at LTH.

One specific challenge is in regard to the number of participants in Genombrottet's pedagogical courses. As can be seen in Figure 8., 81 senior teachers participated in our courses in 2017, and 120 PhD students. These participants were awarded 191 and 259 weeks of BHU respectively. It is worth noting that this does not comprise the total number of BHUs for LTH teachers. Some teachers participate in courses organised by others, such as AHU (Lund University central educational development unit). For example, 20 LTH teachers participated in the AHU organised course "Blended learning" during 2017 and were awarded 60 weeks BHU in total. These weeks are not included in Figure 8.

Even so, since 2011 we see a decrease in the number of academic teachers participating in the courses (Figure 8). There are probably several reasons for this. One can be that teachers today at LTH to a

large extent already have pedagogical courses on their CVs. For example, we see an increase in the number of applications to the Pedagogical Academy, so it is most likely not a general decrease in interest in pedagogical issues. As we report later in this self-evaluation, we see a steady development in quality of teaching within LTH as a whole. Again, this indicates that the decrease in the number of participants in courses does not mirror a general lack of interest.

To counter this development, Genombrottet has initiated a reorientation of courses from being targeted at individual teachers and their personal interests, toward the various roles played by academics: course leader, study director, program coordinator etcetera. We believe this mirrors the developed culture within the faculty. Courses are no longer an extra or a speciality; they are a part of the daily routine, at least in most environments.
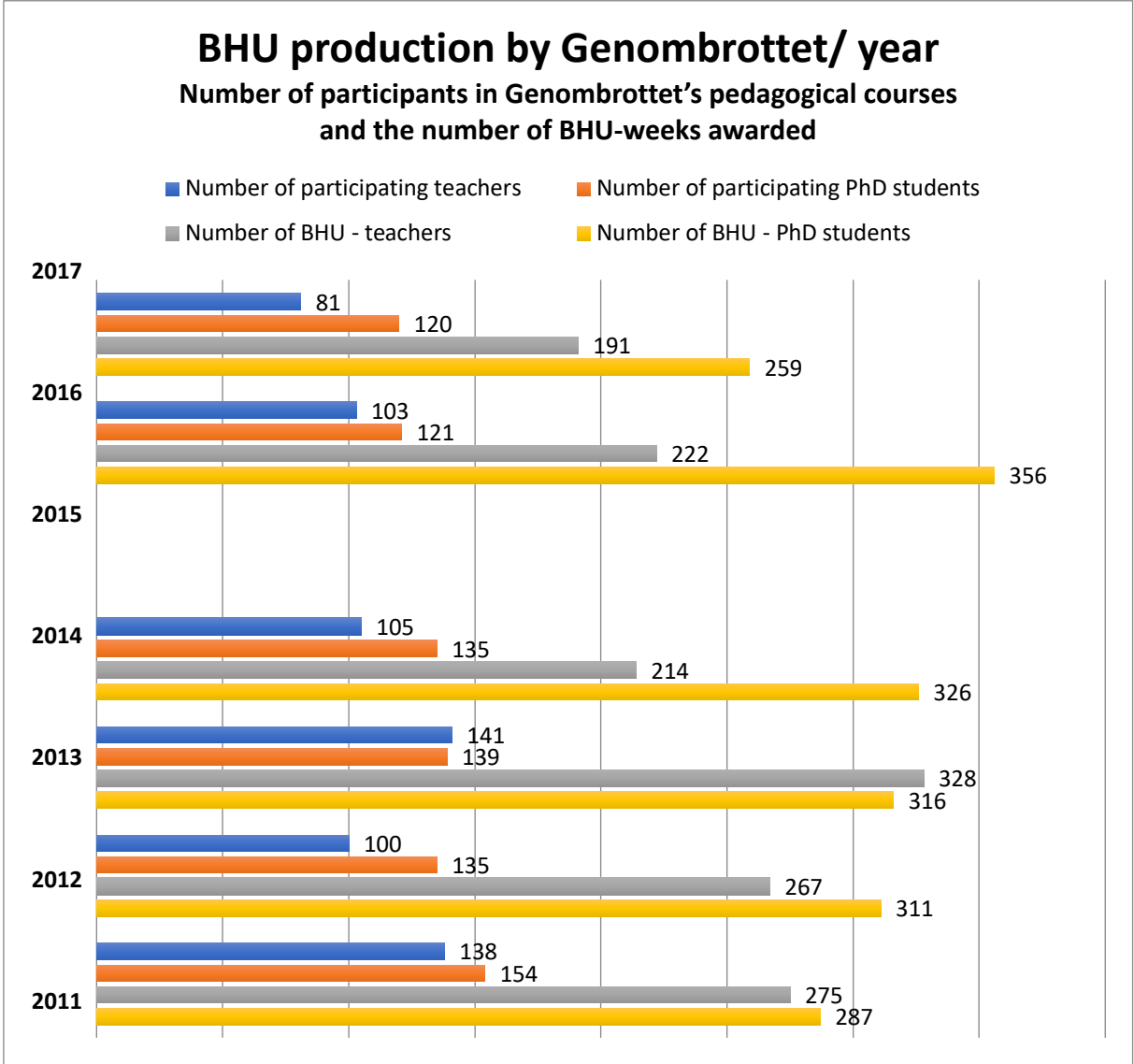

Figure 8. BHU production by Genombrottet 2011-2017..

LTH's campus conference on teaching and learning – Inspirationskonferensen

In December 2018 the 10th campus conference on teaching and learning is offered at LTH, organised by Genombrottet[1]. It typically attracts about 100 participants and some 25 – 30 presentations, round table discussions and seminars using other formats. The conference is documented in a printed proceedings available on the day of the conference. About a third of the papers are in English and the length is stipulated to 1300 words each.

Six months ahead of the conference a call for papers is sent out resulting in a little more than 30 contributions. From among these a panel of experienced LTH teachers select 25 – 30 contributions where the authors are invited to write for the proceedings and to present at the conference. In 2018, 35 abstracts have been submitted, more than ever before.

The conference is an important part of what Genombrottet does. Since the ideology is to support better and more frequent conversations within the organisation, the conference is a perfect venue for training. The writing process, the element of peer-review as well as the presentations and question and answers that follow, support the overarching strategy fully.

Conference contributions have been researched (Larsson et al. 2015) and found to have evolved over time. In a comparison of texts in the proceedings over a period of ten years the later contributions have a clearer focus on student learning, they were more coherently written and used references from educational research more productively.

The LTH conference has also inspired many similar conferences in Lund and nationally. For example, the Joint Faculties of Humanities and Theology at Lund University makes explicit reference to LTH.

LTH's Pedagogical Academy

Objectives and context

LTH's Pedagogical Academy is a reward-system that has been developed to bring increased status to teaching and learning, and to improve the overall pedagogical competence at the faculty of engineering. Scholarly approaches to teaching are rewarded by monetary incentives to both individuals and departments for their efforts to increase the quality of teaching and student learning. The idea, from an organizational perspective, is that an intensified and informed pedagogical discussion among teachers will foster educational development at all levels within the faculty, and an increased engagement in the scholarship of teaching and learning.

Description

The Pedagogical Academy is scholarly, research based, and aligned with basic academic values within the organization. Applicants wishing to be admitted to the Pedagogical Academy must show how they have, over a period of time, consciously and systematically endeavoured to develop means of enhancing students' learning *in their discipline*, and how they have made their own experience in teaching available to others in the academic community (especially LTH and Lund University). Applicants must also be able to analyse and reflect on their teaching practices using the higher education literature and other sources of information and show how they have used these to develop their understanding and their practice concerning teaching and the learning process.

The Pedagogical Academy was developed in 2000-01 and the first teachers were accepted in 2002. After a few years the entire process was researched and evaluated, together with researchers from the research centre Learning Lund and the Department of Education, which resulted in partly new criteria and an improved admission and assessment process from 2006. This process was further developed

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[1] http://www.lth.se/genombrottet/lths-pedagogiska-inspirationskonferens/

with new criteria related to the discipline and external participation in the assessment group from 2018. The total number of submitted applications between 2002 and 2018 is 186, and the number of accepted applications is 128. The number of applications per year has increased during the last three years.

In order for assessment on qualitative bases, aspects that the applicant wishes to bring forward should be made visible in the application submitted for assessment. Applicants should describe, analyze, discuss and submit evidence in relation to four overall assessment areas comprising a total of ten criteria.

The following ten criteria must be met in order for a teacher to be admitted to LTH's Pedagogical Academy and obtain the distinction *Excellent Teaching Practitioner (ETP)*:

1. A clear focus on undergraduate and graduate students' learning
   - The applicant's teaching practice is based on a learning perspective.
   - The applicant's teaching and learning philosophy and teaching activities constitute an integrated whole.
   - The applicant's teaching practice is based on a sound relation to students.
2. Subject knowledge – a developed ability to incorporate the discipline in a teaching and learning context
   - The applicant uses developed strategies to support students' work toward increasingly complex and useful knowledge.
   - The subject content and teaching methods are related to the courses and objectives of the curriculum.
3. Clear professional development as a teacher over time
   - The applicant shows an effort has been made over time to consciously and systematically develop students' learning.
   - The applicant has credible ideas and concrete plans for continued development.
4. A scholarly approach to teaching and learning
   - The applicant reflects on the teaching practice based on educational theory relevant to the discipline.
   - The applicant searches for and creates knowledge about student learning in the discipline.
   - The applicant goes public and collaborates and interacts with others and shares pedagogical experiences – e.g. in discussions, working groups, conferences and in publications.

The most important document in the assessment process is the applicant's teaching portfolio, which forms the framework of the description and analysis of the applicant's pedagogical practice. The portfolio should be related to the assessment criteria, and examples of activities should be supported by certificates, testimonials, references or other documentation. The application also includes a CV, a written recommendation from the head of department, and testimonials of discussions with two critical friends (with the distinction of ETP).

The assessment process consists of a number of steps described in detail below. To ensure a comprehensive and professional assessment, recommendations and assessments by heads of departments, students and assessors are summarized in the assessment group's formal assessment submitted to the teacher appointment committee.

- *The teacher appointment committee*
  The teacher appointment committee has the overall responsibility for the assessment process and assigns assessors and duties to the assessment group. The committee proposes the dean of LTH to accept or decline applications based on the recommendations of the assessment group.

- *Assessment group*
  The assessment group comprises ETP teachers who evaluate the applicant's qualifications. The assessment group also includes an external assessor from another university, and an internal pedagogical expert who supports the process.
- *Comments from the student union*
  The student union is given the opportunity to comment on the applicants. This should not include an assessment of pedagogical qualifications but should focus on the applicant's teaching practice, especially how he or she works in relation to the students.
- *Interview*
  An interview with the applicant is conducted by three assessors together with the internal pedagogical expert. The interview is a complement to the recommendations of the head of department and the student union, and the applicant's portfolio. It is especially important that the interview confirms that the applicant's teaching and learning philosophy and actual practice form an integrated whole.

Evidence of quality and impact

External assessment and benchmarking

Associate Professor Maja Elmgren, Uppsala University, was the external assessor in the 2018 assessment process of the applications to the Pedagogical Academy. She is frequently used as an assessor of pedagogical competence at major Swedish universities. Her assessment is strongly supportive of the model used by LTH, a primarily collegial assessment complemented with an external assessor. She also suggests that LTH might consider criteria in respect of pedagogical leadership and also more explicit outreach requirements.

Maja Elmgren summarizes her assessment with the following paragraphs (translated from Swedish):

> "My overall impression is that the process is of high quality and that the applicants can feel confident that they get a fair assessment. There was also significant agreement between my preliminary assessments of the applications and the assessments made by the assessment group before our joint meeting. After the discussion, I had no hesitation in supporting the final assessments.
> LTH's process of appointing ETP teachers should in itself contribute to a good dialogue on pedagogically important issues. The applicants' conversations with critical friends give not only the applicants, but also the critical friends, an opportunity to reflect on the actual practice. The assessors' (previously appointed ETP teachers) interviews with the applicants provide opportunities for mutual development. The assessment meeting, bringing together many ETP teachers for continued dialogue regarding pedagogical competence, with concrete evidence in the form of applications, is also likely to contribute to continued renewal. For further influence on the faculty's overall pedagogical development, criteria that more strongly emphasize impact on colleagues', and students' learning beyond the applicants own teaching efforts, may be considered. Collegial assessment requires insights into the profession and the context in which those to be assessed work. It is therefore a strength that the process is well integrated with colleagues who have a good knowledge of the practice and the conditions for educational activities. At the same time, academic peer-review assessment should not be too internal. Therefore, I very much welcome the fact that LTH has chosen to invite an external assessor, and recommend that this initiative be followed up by new external assessors who can give their views on individual assessments and perspectives on the process, in coming years.
>
> I am grateful for the opportunity to get an insight into a well-developed assessment practice."

ETP-teachers in important positions within the faculty

An important indicator of institutional development in relation to excellence in teaching, is that teachers appointed to the Pedagogical Academy are significantly overrepresented in important positions within the faculty (Table 9). This includes the program board, program leaders, research boards, the postgraduate education board, and teacher appointment committees, as well as heads of departments, faculty leadership, and the faculty board. The fact that rewarded teachers are seriously involved in policy and decision making is important for the institutional development of teaching and student learning.

Table 9: Proportion of ETP teachers on boards and committees at LTH.

Boards and committees	Proportion of teachers (%) with ETP related to all teacher representatives
Program board	43
Program leaders and assistant program leaders	25
Postgraduate education board	25
Research boards	22
Recruitment committee	25
Career committee	25
Heads of departments	39
Dean, deputy dean and vice-deans	40
Faculty board	56
All academic teachers at LTH	*18-20*

Course evaluations of rewarded teachers

The question concerning whether or not the rewarded teachers organise and conduct high quality teaching is paramount. LTH uses the Course Experience Questionnaire (CEQ) by Ramsden (1991), to evaluate most undergraduate courses. The questions are clustered around good teaching, clear goals and standards, experience of workload, assessment oriented towards understanding, and overall satisfaction. CEQ scores for courses in which rewarded teachers are heavily involved were compared with all other courses at LTH for four different years (Olsson and Roxå 2008; Borell and Andersson 2014). The results show courses led by ETP teachers receive significantly ($p<<0.001$) better CEQ results than others, especially regarding overall satisfaction and good teaching. The conclusion is that on the whole, ETP teachers lead courses that support high quality learning and a deep approach to learning, as measured by the CEQ.

Assessment group members

The assessment group for 2018 consisted of 20 ETP teachers and one external member, Maja Elmgren. Over the years it has always been very easy to get competent teachers to be part of the assessment group and also to continue to be active for several consecutive years. Even without monetary incentives the assessors consider the assessment process as an interesting and rewarding task, and all but two of the assessors are willing to participate in 2019 as well, which is a very good indication.

The assessors are essential for pedagogical development as they carry important assessment experiences that enrich the pedagogical conversation at LTH.

Reward systems – Swedish development

LTH pioneered the concept of pedagogical academies when our system was introduced in 2001. Since then LTH's ETP system has been an inspiration to many institutions of higher education in Sweden (Figure 9). The Faculty of Science at LU followed in 2003, and between 2007 and 2017 another 25 reward systems have been introduced (Winka 2017).
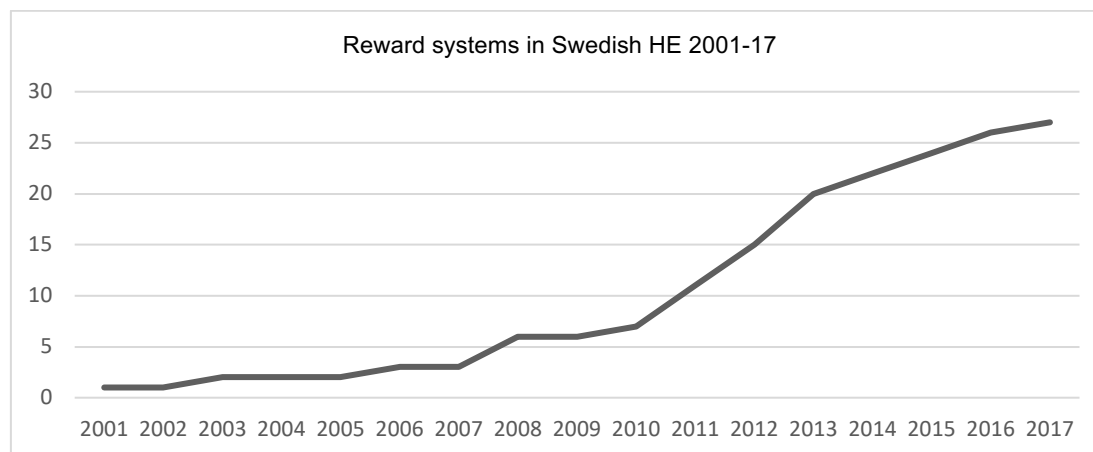

Reward systems in Swedish HE 2001-17

Figure 9: Number of pedagogic reward systems at Swedish HEI (Winka 2017). The first was the ETP system at LTH.

LTH's ETP system is also a model for all similar systems introduced in Norway (in particular at the University of Bergen and at NTNU), and it was presented as an example in a report to the Norwegian Parliament in 2017 (Meld. St. 16, 2017).

In Denmark, our reward system was highlighted in a report from 2014 (Danmarks Akkrediteringsinstitution 2014) and they write (translated from Danish): "…at Lund University where, during the last 15 years, a Pedagogical Academy has been developed that admits the best teachers. All Danish universities are inspired by this work - and by other countries in general - but the concrete implementation still remains."

Teaching portfolios

The quality of teaching portfolios has increased in relation to the complexity of reflections on disciplinary teaching practices, the scholarly approach, effects of teaching on student learning, and sharing/dissemination of expertise and best practice (Larsson, Anderberg and Olsson 2015).

National leadership

Together with other experienced assessors from Umeå University, Uppsala University, Stockholm University and Lund University, Thomas Olsson at the CEE has developed and been instructor on a national course for presumptive assessors of pedagogical competence (*Swe: Nationell kurs för pedagogiskt sakkunniga: Att bedöma pedagogisk skicklighet*). The course is supported by the Swedish Network for Educational Development in Higher Education (SWEDNET) and has been given on six occasions (2010, 2011, 2012, 2013, 2015, and 2017) at different host universities in Sweden. The aim of the course is to drive quality enhancement by enhancing the capacity to assess pedagogical qualifications at universities locally, though support and education at a national level. The course corresponds to one week of full-time work and to date 125 participants from 24 different universities and university colleges have passed the course. The course will be given again in 2019.

Visits to Genombrottet LTH

Over the years a number of academics from Sweden and abroad have visited LTH with the purpose of learning and exchanging ideas about rewarding excellence in university teaching and academic development. A few examples are the University of Helsinki (which has introduced a reward system inspired by LTH), the University of Twente (a group of 12 academics headed by the rector), the universities of Baden Württemberg, and several Swedish and Nordic universities.

Invited keynotes and workshops

Numerous invitations to present, discuss and analyze important aspects of excellence in university teaching, are clear indicators of the importance that other universities and organisations of higher education consider LTH's Pedagogical Academy to have.

Examples of invited keynotes include: Vaal University of Technology (2018); South African Society for Engineering Education (2017); International Society for the Scholarship of Teaching and Learning (2016); China Association on Higher Education (2015 and 2016); Stellenbosch University (2015); NOKUT, Norway (2015); NORDTEK, the Nordic Dean´s and Rector´s conference (2014); Deutsche Gesellschaft für Hochschuldidaktik (2013); University of Glasgow (2013); South East European University, Macedonia (2012).

Examples of invited workshops include: South African Society for Engineering Education (2017); Council on Higher Education, South Africa (two days 2017 and one week 2015); National University of Singapore (10 days 2017); China-Sweden Excellence Seminar (2015); T H Cologne, Germany (2015); Universities in Baden-Württemberg (2015); Nanyang Technological University, Singapore (one week 2014); Virginia Tech (2012); University of Technology Sydney (2012); Karlsruhe Institut für Technologie (2012, 2011, 2010); University of the Witwatersrand and University of South Africa (one week 2011); Indian Institute of Technology (Kanpur), University of Pune (2011); Massachusetts Institute of Technology (2011).

Challenges and outlook

It is quite obvious from the discussions about the Pedagogical Academy that, using Caldwell's (2006) review, this reward system influences individuals (status, increased salary, student satisfaction etcetera), workgroups (funding for departments, increased and more informed conversations etcetera), the line organisation (rewarded teachers active at management levels), and external discourses (overwhelming national and international interest – visits, keynotes, workshops etcetera). These levels have definitely worked as an aligned system during the past 17 years, since the introduction of the Pedagogical Academy, and in that way supported a successful development of the system.

The assessment process is a key aspect of a reward system, often performed by external assessors from other universities. However, the assessment can also be an internal process, or it can be a combination. LTH has chosen an internal process with external participation that focuses on institutional development and quality enhancement. An entirely external process would run the risk of putting much more focus on the career development of the individual teacher, and be closer to research assessments detached from the institutional context. We would see that as a serious shortcoming, as also discussed in Maja Elmgren's assessment and benchmarking report, she writes:

> "The step that has been taken to include an external insight into the process further contributes to national reconciliation. I think this is positive, and that an external member should be a permanent part of the process. An alternative could be, of course, to include opinions of external experts regarding the different applicants, but then perhaps the positive effects I see with the current process risks being lost"

Future plans include criteria relating to pedagogical leadership and increased focus on influencing colleagues beyond their own department, as well as discussions on whether the reward system should consist of one or two levels of competence. Two levels might engage more academic teachers and focus more on institutional quality development, whereas one level promotes more excellence and scholarly research-informed teaching, which might be somewhat discouraging for some teachers.

Research

In order to support the overall development of LTH, the research carried out by Genombrottet, or individuals affiliated to Genombrottet, focuses aspects of educational development, experiences of teaching and student learning, and the role of academic developers. So far, the research discipline, Engineering Education TEIDEF05 (*Swe: Pedagogisk utveckling inom teknikvetenskap*)*,* has produced two PhD theses (Torgny Roxå and Katarina Mårtensson) and two Docents (Torgny Roxå and Thomas Olsson).

In summary, the research at Genombrottet falls into three categories, a) research conducted by regular academic teachers, b) research conducted by doctoral students, and c) research conducted by Genombrottet's academic staff.

Practice-based research conducted by regular academic teachers

The guiding principle for Genombrottet is *scholarship of teaching and learning* (Boyer 1990). It implies that academic teachers at LTH conduct relevant research with a focus on their courses, teaching, and students. The reports from this research are almost always peer reviewed, either as a part of a pedagogical course, or presented at the LTH Campus conference on teaching and learning (*Swe: LTH:s pedagogiska inspirationskonferens).* Final reports are made available in a database, to date comprising about 600 reports. These are scholarly works on development of courses, threshold concepts, ways of teaching, recurrent problems in courses, and so on. The variation is enormous since this research aims at creating a collective knowledge base, firmly anchored in the lived experience of teachers. All reports have a pedagogical focus and use educational concepts and perspectives. Proceedings from all conferences are available on the campus conference webpage.

There are several benefits from the research described above. To engage academic teachers in scholarly reflection on their teaching practice in the form of short reports stored in a database, not only documents the lived experience by teachers, it creates a depository of knowledge on teaching and student learning within the faculty. Writing these reports, often done in groups, inspires the authors to reflect more systematically and thereby improve the quality of conversation on educational matters. Furthermore, the artefacts, the reports, are made available and thereby potentially strengthen the weak ties, that is, the knowledge of what is going on in other parts of the faculty.

Research conducted by doctoral students

The CEE currently supervises two doctoral students with two more under admission. For these Torgny Roxå acts as the main supervisor. One additional doctoral student is affiliated through the Swedish Institute and other sources of funding.

Doctoral students, both of whom have a first paper submitted, are:
- Annika Fjelkner, financed by Högskolan i Kristianstad, researching the formation of and variation among student significant networks in cohorts of a business program, and their implication for academic achievement.
- Lise Jensen, financed by LTH through the Department of Design Sciences, researching on patterns of academic teachers' conceptions of teaching while teaching on-line.

Doctoral students under admission, both with accepted conference papers are:
- Jenny Löfgreen, financed by Genombrottet (50%), researching epistemological dissonance

among STEM teachers participating in pedagogical courses and the potentially corresponding epistemological dissonance experienced by academic developers, with a social science background while working with STEM teachers.

- Oddfrid Kårstad Förland, financed by the University of Bergen, researching the variation among pedagogical academies in the Nordic countries and their relation to the United Kingdom Professional Standards Framework.

Affiliated doctoral student

- Lela Iosava, from Ilia State University but financed by the Swedish Institute, researching individual academic teachers as agents for emerging internationalisation and their relationship to institutional policies.

Earlier Torgny Roxå acted as co-supervisor for Cormac McGrath who defended his thesis at Karolinska Institutet on 12 June 2017. The title was "What we talk about when we talk about change: a study of change practice and change agency in higher education."

<u>Research conducted by Genombrottet's staff</u>

Genombrottet's personnel make regular presentations around the world and publish articles in international journals. Main themes are: assessing and rewarding excellence in academic teaching, problematizing academic development work, or organisational development in higher education institutions. Below we exemplify our research with three articles relating to the three themes mentioned above.

Example 1

Olsson, T., and Roxå, T. (2013). Assessing and rewarding excellent academic teachers for the benefit of an organization. *European Journal of Higher Education*, 3(1), 40 - 61.

Here we draw on more than a decade of experiences of assessing and rewarding excellence in teaching. The article presents LTH's Pedagogical Academy, a system functioning since 2001, which has been an inspiration for almost 30 similar systems within Sweden, Finland, and Norway. We emphasise that the reward system is foremost a way of developing the organisation's educational capability and the individual reward is a vehicle to achieve this. The text presents the full procedure, and presents extracts from authentic portfolios and feedback provided to applicants.

Example 2

Roxå, T., and Mårtenson, K. (2017). Agency and structure in academic development practices: are we liberating academic teachers or are we part of a machinery supressing them? *International Journal for Academic Development*, 22(2), 95 - 105.

In this article, we problematize the power used by academic developers while working with academic teachers, in particular during pedagogical courses. The text is inspired by a project where a social anthropologist observed the pedagogical courses we teach. His report was a critical account where academic developers are portrayed as instruments for a neo-liberal discourse aimed at depriving academic teachers of their role as disciplinary experts. The International Journal for Academic Development awarded our article.

Example 3

Roxå, T., and Mårtensson, K. (2015). Microcultures and informal learning: a heuristic guiding analysis of conditions for informal learning in local higher education workplaces. *International Journal for Academic Development*, 20(2), 193 - 205. Doe: doi.org/10.1080/1360144X.2015.1029929

This article illustrates the socio-cultural perspective used by Genombrottet while making sense of organisational boundaries and other forces resulting in development or maintained stability. In the background lies our earlier account on significant networks and how academic teachers, during interaction with a trusted few, construct and maintain their understanding of the educational reality that surrounds them. In this article, we take this further and formulate a heuristic template useful for understanding the dynamics in various workgroups engaged in educational matters. Key aspects are the level of trust among those involved, the sense of shared responsibility, and whether or not they share a vision for the future.

Other examples of publications concern problems related to implementation of reward systems for excellence in teaching (2018, conference paper), conceptualisation of what excellence in teaching is, and how it can be supported (2012), and excellence in teaching and governance (2018). Other articles comment on how academic developers can and should collect and show evidence of the impact of their activities (under review, international project), the use and misuse of student evaluation of teaching (to be submitted, international project), ideological issues within the community of academic developers (to be submitted, international project), and conceptions of MOOCS (2017, runner up as article of the year in the International Journal for Academic Development).

In all this research there are two guiding principles. The first concerns aspects in which LTH is engaged as an organisation. Assessing excellence in teaching, governance, student evaluations of teaching, organisational development in higher education, and the role of academic developers are all themes that result in knowledge directly fed back into our ongoing engagement in elevating the quality of education at LTH. Academic development is an under-researched field with few established perspectives, therefore we need to critically investigate our own methods. Secondly, in all research, we use examples and illustrations from LTH, something that results in positive exposure for LTH in contexts discussing development of academic teaching. At best LTH becomes known as a higher education institution that systematically develops its capacity to support student learning.

Evidence of quality and impact

One way of demonstrating the acknowledged value of Genombrottet's research and scholarship is to count the number of times members of Genombrottet have been invited as guest speakers. Recent examples include: Keynote panel at the International Consortium for Educational Development Biannual conference at Atlanta, USA (June 2018); Keynote: The German Association of Academic Development, Karlsruhe, Germany (March, 2018); Keynote: International Society for the Scholarship of Teaching and Learning, Bergen, Norway (October 2018); Guest lecture, postgraduate certificate Durham University, U.K. (January 2017, September 2017, September 2018); Keynote, Royal Institute for Technology, Stockholm, Sweden (March 2017). Invited speaker, Tromsø, Norway (February 2018)

Another way is to present rewards received by members of Genombrottet for their research and scholarship. As examples, Torgny Roxå has received the following acknowledgements:
- The Dag Hammarskjöld Distinguished Scholar in Leadership and Learning Award, at McMaster University, Canada. https://mi.mcmaster.ca/research/ (2016)
- Article of the year, The International Journal for Academic Development: Roxå, T. and K. Mårtensson. (2017). Agency and structure in academic development practices – are we liberating academic teachers or are we part of a machinery supressing them? *The International Journal for Academic Development.* Vol 22 (2), 95 – 105. Doi: http://dx.doi.org/10.1080/1360144X.2016.1218883
- Visiting Professor, Ulster University, Northern Ireland, U.K. (2011– 2017)

Furthermore, Thomas Olsson has acted as external examiner (*Swe: fakultetsopponent)* for two doctoral dissertations:

- Shalinin Dukhan (2014), *Factors Affecting Construction of Notes by Students in a First Year Biology Class.* Science Education, University of the Witwatersrand, Johannesburg, South Africa.
- Schalk P K Fredericks (2017). *Advancing scholarship of teaching and learning during professional development of new lecturers at Higher Education Institutions.* Faculty of Educational Sciences, Potchefstroom Campus, North-West University, South Africa

It is much harder to evidence how research and scholarship have impacted on the organisation. However, our research on excellence in teaching and on organisational culture has been fuelled into the way Genombrottet operates. In similar ways the problematization of academic development work has informed decisions on what should be given priority within Genombrottet and what pitfalls have to be considered.

<u>Reflection</u>

Research of the kind described improves LTH's reputation as an organisation working systematically and over time to improve teaching and student learning. The strength of the LTH brand in this respect is arguably why externally funded doctoral students find their way to Genombrottet.

Currently there is an ambiguity in how the research discipline Pedagogic Development in Engineering Education is situated within LTH. The supervisors are at Genombrottet, while the administrative structures are situated within the Department of Design Sciences. There are historical reasons for this. Even so, our vision is for the research discipline to become shared across LTH, making it possible for regular teachers to pursue educational research through this discipline, but stay closely linked to their own subjects and practice. We fear that this can be hampered by the fact that the research discipline has an unclear situation within the faculty.

On the risk side also lies the time-issue. Engaging in research is time-consuming. It is therefore of the utmost importance that the research does not negatively affect the volume of other activities such as pedagogical courses and consultancy. Currently we think that there is a good balance, and that the learning emerging from the research done is essential for LTH's work in developing education, especially since LTH is one of the leading institutions in how to develop teaching and learning systematically through a cultural approach.

We acknowledge that Genombrottet funds its research internally, while other researchers at LTH have to find their own funding. However, a general problem related to this research and scholarship is the absence of funding in Sweden. The Swedish Research Council provides funding, but almost exclusively for pure educational research. VINNOVA (Sweden's Innovation Agency) provides applied funding for innovations between universities and other societal sectors, but not for innovations in teaching within universities. This problem in applying for funding forces research into smaller projects and into research as invited members of other groups, such as an Erasmus project currently coordinated from Bratislava on the impact of pedagogical courses for academic teachers.

We believe that the current format of supervising some doctoral students who bring their own funding from other institutions works well. In doing so the only cost for Genombrottet is time for supervision. On the other hand, these doctoral students may carry with them research questions and agendas that are not necessarily linked to the knowledge most useful to LTH. These problems need to be addressed continuously and on a case by case basis.

Consulting and development

Genombrottet consults on all levels within the organisation: the student union, individual teachers, groups of teachers and departments, program directors, as well as the faculty management (dean's level). In this work, it is important to stay clear of the line organisation since, if Genombrottet becomes perceived as too close to management level, individuals may become reticent to talk about

their problems. Conversely, if Genombrottet becomes associated with individual teachers only, it would lose credibility in systemic issues, and will be perceived as entangled in the undergrowth of the organisation. The balancing act has so far been achieved by having a relatively independent role in the organisation without any responsibility to implement faculty policy, but rather to support the policy making process and support individual teachers' engagement in policy directed issues.

Recent examples

In this section we describe a number of recent situations where Genombrottet has acted as consultants.

Program evaluation methodology

In the current national quality review system, the Swedish Higher Education Authority will assess the various institutions' quality assurance systems. Genombrottet has participated in an expert function in this three-year long development project of an internal program evaluation methodology (Åkerman et al., 2017), which is now implemented as a pilot version. Furthermore, Genombrottet has acted as workshop leader during the implementation phase.

It is worth noting that the guiding principle for the new system for program evaluation follows the principle formulated by Genombrottet: More and better conversations about program quality will improve not only the programs but also the reports used for accountability purposes. It is up to the various program directors to interpret the degree outcomes formulated nationally, and to identify and describe suitable evidence showing that the learning outcomes are met, or to be able to discuss how they will be met in the future. It is believed that it is the emphasis on evidence that will enhance the conversations. The strengths of the evidence will be scrutinised by a faculty review board and through this process support a better conversation on program quality.

Evidence of the usefulness of our work is, a) after the first assessment round, the faculty review board, the board, the faculty management, and the various program leaders unanimously say that this is the way forward, and b) based on the documentation published from the program review strategy, LTH has been contacted by The Swedish Defence University with a request for further collaboration on issues of program reviews.

Course evaluations

The summative course evaluation system at LTH is organized by the faculty. As part of the evaluation, students may provide written comments regarding the weak and strong aspects of the course. After approval of students, these comments are passed on to the course coordinator. As expected, teachers react strongly to some comments, which has raised concern, not least among heads of department.

To give advice to the faculty, one academic developer at Genombrottet, who is an active teacher and the faculty quality assessment officer, held several interviews with stakeholders and conducted other studies. The efforts resulted in possible modifications that would help the system to better serve its purpose, i.e. to inform a quality enhancing process.

Digitalisation

From 2018, LTH launches a major initiative towards improved use of digital tools to enhance the learning experience for students on campus. Genombrottet has formulated the principles and frames for a faculty-wide project which is currently under discussion with the faculty management.

Within this faculty-wide project Genombrottet already consults regarding active learning classrooms that are now being installed at LTH, and draws on international networks, for example the University of Minnesota and newly established links to Purdue University.

Genombrottet is also developing three courses with regard to digitalization, namely a) Active Learning with Digital Tools, b) Effective use of Video in Teaching and Learning, and c) a series of training sessions to prepare teachers for active classrooms.

Core curriculum mathematics

All students at LTH study math as a central part of their program experience. Math is an essential tool for engineers, architects and industrial designers. For many years, there has been a debate between the department of mathematics and various program boards about the quality and output of the math courses offered. During 2017 Genombrottet headed an inquiry into students' experiences. Besides acting as a chairperson in the inquiry itself, Genombrottet was engaged in conducting a dozen focus-group interviews with students.

The inquiry has resulted in several ideas for improved education in math. The department of mathematics is currently implementing a selection of these ideas.

Other academic development units

Genombrottet collaborates with all units at Lund University, within projects, co-teaching, and leadership. Furthermore, Genombrottet personnel have been initiators and collaborators in the three rounds of the Strategic Course for Academic Developers in Sweden (2004, 2005, and 2016).

Genombrottet has also engaged itself as founder and/or organiser of national conferences for the development of higher education (Utvecklingskonferensen "The Development Conference" 2003, 2005, now renamed as NU-konferensen) and Utvecklingskonferensen för Sveriges ingenjörsutbildningar ("The Development Conference for Engineering Education").

The student union

The student union at LTH regularly hosts meetings with its counterparts in other universities in Sweden. On several occasions the student union in Lund has asked Genombrottet to participate in discussions on how to promote the development of education.

Individual teachers and other specific issues

Genombrottet regularly consults with individual teachers on almost any issue that concerns teaching and learning, such as:
1. One teacher wants to organise field trips for his students and asks Genombrottet for literature on this type of teaching.
2. A group of teachers want to publish a paper on improvement of teaching in laboratories and seek feedback.
3. A group of teachers run a project on how excellence in lab-skills can be developed among students. Genombrottet runs several focus groups on the issue, with a group of professors and students with different experiences.
4. A program director wants to identify why some students do not apply for further studies in Physics. Genombrottet participates in the design of and conducting of focus groups with students, and in a seminar presents the results for teachers at the department of Physics.
5. Individual teachers are interested in how to write a teaching portfolio and meet with Genombrottet for an hour to discuss their ideas.
6. Individual teachers participate in a European Union project and seek help to influence doctoral students towards developed communication skills.
7. An individual teacher wants to better understand why working in industry over the summer improves students' capacity in theoretical courses.
8. A research group wants to discuss ethical aspects on co-authorship.

9. A program director frequently uses guest teachers from industry and experiences dissonance in how they teach in relation to what is expected in the program.
10. Two teachers seek more student input than that which is possible to interpret from the regular student evaluation on courses system. Genombrottet conducts focus groups and reports back to teachers.
11. A head of department seeks assistance when one of his teachers was named as making ethnically harassing comments. Genombrottet participates as a sounding board and as a strategy to collect further information on the issue.
12. Many individual teachers receive individual consulting as part of the ETP process, both teachers who are rewarded, but also more importantly teachers who did not become rewarded but are encouraged to apply at a later stage.
13. A program director wants to engage students and teachers in structured development of students' writing skills. Genombrottet provides a theoretical framework, a structure and supports teachers and students in the implementation.

The Faculty Office

Genombrottet regularly acts as consultant to the office by assessing applicants for position merits against the criteria for pedagogical courses formulated by The association of Swedish Higher Education Institutions (SUHF).

Genombrottet acts as consultant to the Faculty Office in its work in gender- and equality-related issues. For many years Genombrottet coordinated a course concerning issues of gender in engineering education. In later years, this course was cancelled and currently Genombrottet offers seminars for departments on these issues instead. Genombrottet has also provided inspirational lectures for personnel of the Faculty Office.

The collegial course

As described above, this course is tailor-made to fit a specific need at a specific time, and is thus a hybrid between a consultancy and a pedagogical course. It can also be viewed as a study circle where participants read and discuss and collaboratively develop a segment of teaching for which they are responsible. Genombrottet acts as consultant both in the design phase of the course, during the course, as well as during the feedback phase, once new teaching elements have been developed.

Gender and equality issues

Genombrottet has, during 2018, developed a 3-hour workshop for departments on *How we treat each other at work – and what we think about this?* This is a workshop on both gender-related issues but also more general equality-related issues. So far one workshop has been conducted, the first time in October 2018 for 72 participants for the Department of Design Sciences. Two more workshops have been commissioned: Division of Nuclear physics and Department of Chemical engineering.

Last but not least…

The development strategy supported by Genombrottet results in hundreds of shorter accounts, written by teachers in engineering, for colleagues. This means that assumedly the most intense educational consultancy that takes place at LTH is between colleagues. Furthermore, the experience and knowledge that grow out of the assessment procedure of portfolios in the ETP system, develop a knowledge base within the body of teachers, that should not be underestimated as a resource for inter-collegial conversations about teaching and student learning. This might very well be the bulk of educational consultancy, and it happens at best during every-day practice within departments and disciplinary communities.

<u>Evidence of quality and impact</u>

The value of consultancy should be measured against the overall development of the faculty. It is incredibly difficult to trace development back to conversations during a consultation, even if these are recurrent over a long period of time. Perhaps the best indicator of quality in consultancy is the fact that individuals and parts of the organisation come back for more support, and that Genombrottet is being used by individuals as well as faculty-wide educational development initiatives. The most important examples of the latter categories are the new system for program review and the initiative for digitalisation.

On the other hand, as exemplified by the collegial course, consultancy is a potent way to support more and better conversations among personnel responsible for education. In this it is crucial not only to consult individuals but as much as possible consult groups of teachers. It is not solely the new insights and ideas that count, it is a collectively owned knowledge on how to improve student learning.

Evidence of impact from Genombrottet's activities

In the Strategic Plan 2017 – 2026 for (LTH 2016, p.11) it is stated that:

> By 2026, LTH will be known for its leading role in educational development and high-quality teaching.

Development of teaching is explicitly stated as a strategic goal for LTH, and Genombrottet is one of the most important agents in this endeavour. However, this is only partly true. Teachers and the work they inspire in students determines the quality, everything else is a support for this. Genombrottet as an organisational entity is only one support structure for the educational development, aligned with the Strategic Plan for LTH.

In the beginning of the section on discussion of Genombrottet's activities, the main purpose was stated as follows: *Genombrottet supports an emerging culture of scholarship of teaching and learning at LTH.* This is operationalized as supporting a move towards more and better conversations among LTH staff involved in educational practices. Central to this is the belief that academic teachers and others make decisions about teaching immersed in a constant flow of life-world experiences. Different practices are intertwined with each other and the flow of impressions is intense. Hence, if professional development activities, consultancy, and incentives do not manage to compete in terms of meaningfulness in this real-life academic world, they are of limited worth. The way to bring them to life is to make them appear as meaningful in the significant interactions in which teaching staff are engaged. The hard part is to evaluate whether this really happens.

One indication of impact is that the number of ETP awarded teachers within the organisation increases. The portfolios submitted to ETP, as well as the contributions of campus conference proceedings, evolve in quality. To evaluate the value of the strategy, to increase the number and the quality of conversations on teaching and student learning, a recent project has analysed all teaching portfolios submitted during 2018 for ETP. Results reveal a variation in how applicants describe what has influenced them as they develop as teachers. This variation matches the result of the assessment board. Those who describe how they are influenced be significant colleagues and by literature and observations of students, are deemed more positively by the assessment board.

We can also consider external interest in what we do as evidence of our being on the right track. Each year several delegations visit LTH to study what we do, to become inspired toward similar attempts in their respective institutions. One example of this was a delegation from the University of Twente (NL), headed by the rector, 14 members of the senior management spent two days in Lund on 21-22 January. In December 2018, a group from several German institutions will present at LTH pedagogical inspirational conference, and spend 3 days in total studying how we engage academic teachers in educational development.

LTH Pedagogical Academy has given rise to interest in Sweden, where 26 other reward systems for excellent teachers have been developed, all inspired by LTH. The University of Helsinki, the University of Tartu, the University of Bergen, and national bodies in the Republic of South Africa, all work in the same direction.

The site visit from the Centre for Higher Education Policy Studies (CHEPS) at the University of Twente, the Netherlands, commissioned by NOKUT, the Norwegian Agency for Quality Assurance in Education, is another sign of external interest. In this case NOKUT was interested in finding and problematizing educational quality cultures. LTH was one out of five cases studied. Again, this is an indication that what LTH is doing is good.

But all this counts for nothing unless the students notice improvement. After all, they are the ones dependent on the educational quality of LTH. On the other hand, student evaluation of teaching (SET) is an extremely delicate matter. SET has been proven to be biased by a number of issues. Furthermore, SET is, in many institutions, designed without sufficient input from educational research necessary to secure both reliability and validity, and lastly, many studies arguing for the value of SET are smaller in size and thereby risk overstating the evidence SET produces.

At LTH we use the Course Experience Questionnaire (CEQ), developed by Paul Ramsden in Australia and later used extensively in the UK while Ramsden was head of the Higher Education Academy. The CEQ is designed, by surveying student experience of courses, to discern aspects that support students taking on a deep approach in their studies. Deep approach being shown to be linked to a student's efforts to understand the course content, in contrast to a surface approach where students limit themselves to memorising strategies and studying for the exam.

In Genombrottet's pedagogical courses the deep- and surface-approach perspective is fronted, partly because academic teachers have no problem identifying the two approaches and favour the deep approach. Academic teachers at LTH are usually interested in teaching strategies that favour the deep approach. In addition, by focusing on the approaches to studying Genombrottet's courses, teachers are better equipped with the necessary terminology to interpret the results of CEQs.

For the purpose of this text, especially as a sign of the impact of Genombrottet, we can consider the Good Teaching scale within the CEQ. This scale consists of six items:

- The teaching has motivated me to do my best.
- During the course, I received many valuable comments on my achievements.
- The teachers made a real effort to understand the problems and difficulties one might be having in this course.
- The teaching staff normally gave me helpful feedback on the progress of my work.
- My lecturers were extremely good at explaining things.
- The teachers on the course worked hard to make the subject interesting.

Students in a particular course answer by ticking 1 for totally disagree, 3 for being neutral, and 5 for totally agree. For statistical purposes the system translates 1 to -100, 3 to 0, and 5 to +100. After this, answers on the six items can be put together and produce a value for the course, representing how much the teaching supports a deep approach to learning among the students.

However, the CEQ is a relative and not an absolute measurement. Ramsden warns against claiming that a 4 is always better than a 3. SET data has to be evaluated contextually. Furthermore, and as has been said already, several biases are built into SET. In order to use SET data, the data should be sizeable and the context should be kept stable. Thus, if we compare the value for the CEQ Good Teaching scale within LTH from the academic years of 2003/2004 to 2016/2017 and we have a large data sample, we should be able, with a high degree of certainty, to say something about an existing

development, or a lack of (or even negative development of) teaching quality at LTH, as experienced by students.

Figure 10 shows that the student experience of good teaching as measured through the CEQs in the academic year 2003/2004 was 3.9 (in a scale from -100 to +100). By the academic year 2016/2017 it had increased 23.7. The number of filled-out questionnaires is 247 224 (the number of items ticked is over a million). It is fair to say that something good is happening at LTH: Teaching as experienced by students is improving.

However, Figure 10 does not explicitly support a claim that Genombrottet has succeeded in its attempt to develop the educational quality at LTH, by supporting quality conversations among staff at LTH. But in the context of this text, Genombrottet claims that it has played an active part in this development and that the change can be used as evidence of positive impact. The degree of impact is still unclear since the development of teaching quality is dependent on decisions made and practices implemented by teachers and other staff involved in education, not directly by Genombrottet.
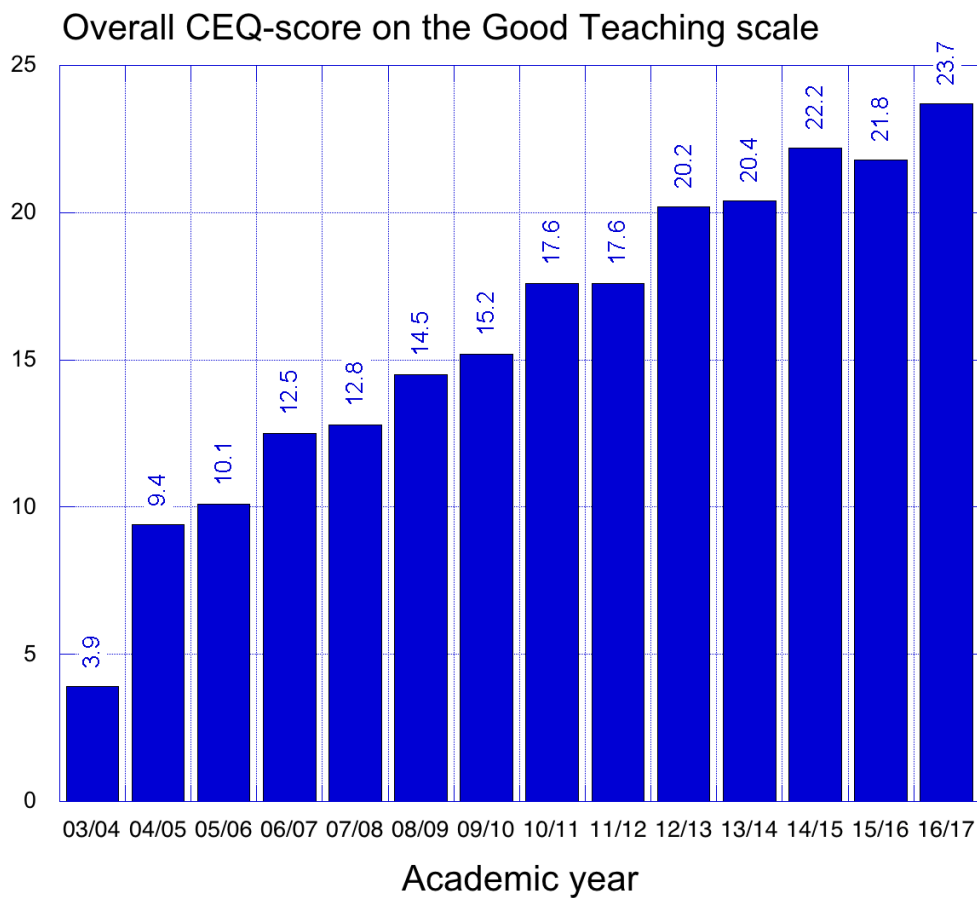

Figure 10: Evidence of general improvement in teaching in LTH, based on 247 244 CEQ-values of the Good Teaching scale. Each value is composed of six elements, i.e approx. 1.5 million items answered on a 1-5 Likert scale, which is transformed so an average of 1=-100%, 3=0 while 5=+100%.

Reflection

In a report from The Association of Swedish Higher Education Institutions, Bolander Laksov, Kettis, and Alexandersson (2014, p.40) identify ten critical aspects for an academic development unit to be successful while contributing to quality and development in its home institution. Translated into English these state that a successful education development unit is:

1. Context-specific: It works from within the educational practices and takes into account university and subject cultures
2. Flexible: It takes into account changing conditions and employees' and students' needs
3. Inclusion: It involves all staff contributing to students' learning, as well as students and management
4. Cooperation-oriented: It shows respect for teachers as professionals and individuals, their skills and knowledge, and treats them as equals
5. Scholarly: it is based in knowledge and theory and strives to gather evidence in a rigorous manner
6. Strategic: it is linked to institutional management and is governed / influenced by explicitly formulated goals in the longer and shorter terms
7. Multi-faceted: It stimulates a variety of activities, both bottom up and top down, both initiated centrally and locally
8. Visible: It communicates well at all levels within the institution
9. Resource-rich: It has an effective leadership and enough qualified employees for fulfilling its tasks
10. Reflective: It continuously and critically assesses its practices and strategies

It is our view that Genombrottet is strong or very strong in all these aspects. LTH provides the resources [9] necessary for us to interact with teachers and other staff in many ways, both as supporting bottom up innovation, but also through top down initiatives [3, 7]. We align our activities with policies formulated by management [6]. We aim at influencing academic teachers in their everyday practices, something which allows activities to be context specific and thereby relevant and meaningful for participants [1], but also flexible, as participants formulate and work on their own experienced needs as much as possible [2, 4]. Members of Genombrottet continuously and critically reflect on how to best support development within departments and disciplinary communities [10], and engage in national and international discussions on academic development [5]. Last but not least, Genombrottet maintains a high profile in general discussion on how to best support development in higher education organisations [8]. This is done in research, as invited keynotes and as workshop organisers.

A limitation, as well as a strength, is that Genombrottet uses an explicit perspective on academic development: cultural development through an intensified and informed conversation among those engaged in educational matters. The strength is that this makes critical reflection possible; we know what we are thinking about. It also allows for effective evaluation of impact, since we know what we should look for. The limitation shows itself not only in that some things fall outside the perspective visually, but also in that some strategies are hard to defend. For example, it is hard to approach individuals or disciplinary contexts that do not engage. As a result, there are still a few places within the faculty with which Genombrottet does not interact. The generous cultural approach with an emphasis on supporting localized and informed conversations does not include sanctions for those who chose not to develop their own culture. Over time, these pockets become increasingly harder to engage through the approach chosen. The conclusion drawn by Genombrottet is that it is our task to see LTH as a whole, and as the organisation continuous to develop we leave these pockets alone. After all, Genombrottet does not have, and should not have, any authority to impose sanctions.

Considering the above, a deeper contact with the departments is potential for further development. At LTH the program committees coordinate the programs and carry the responsibility for educational quality in the organisation. But departments design and teach the courses that make up the programs.

Heads of departments, study directors and regular teachers, including disciplinary communities within departments, could potentially engage much more systematically to increase the quality of education within LTH.

Doctoral education support and development by the CEE

Doctoral education in Sweden and at LTH

Swedish doctoral programs encompass 240 ECTS, or four years of full-time study. Each doctoral program has a general study plan that establishes the proportions of research and course work. The doctoral students are supervised by one main and at least one co-supervisor. These and other study resources are formalised in the mandatory individual study plans of each student. The objectives of Swedish doctoral education are framed by a set of demanding intended learning outcomes (Högskoleförordningen, 1993).

LTH encompasses 19 departments that host 61 doctoral programs in which 570 research students and ca 200 main supervisors are active, along with at least 200 co-supervisors. Ca 80% of the students are full-time employed by their departments. Scholarship students and industry employed students each make up ca 10% of the student population. The proportion of international versus native Swedish students is ca 40:60 at the faculty. Each doctoral program at LTH has a study director affiliated with one of the five professors who are appointed Doctoral Education Leaders in the LTH Doctoral Education Board. This Board is led by the LTH Deputy Dean. It further includes student representatives, doctoral education administrators and a CEE-based faculty study director. The Board is involved in national and local doctoral education practices, policies, assessments and audits, along with other quality control issues.

Objective, strategy and educational context

The CEE is involved in aspects of doctoral education across the faculty that are complimentary to the core academic activities of individuals, research groups and departments. This involves 1) generic skill training of doctoral competencies; 2) doctoral supervisor training; 3) a role as faculty study director in the LTH Doctoral Education Board; and 4) on-demand activities for all legitimate stakeholders (thematic seminars, carrying out student and supervisor assessments, etc).

The CEE aims to provide a balance between doctoral student research output and development of doctoral skills (integrated *doctorateness*, Trafford and Leshem 2011). The doctoral education development philosophy at the CEE is inspired by that of Genombrottet. The overarching strategy is thus to be relevant and available to all involved stakeholders and to mediate a wider perspective on the development of doctoral education beyond producing theses and doctoral diplomas. On a more operative level, the doctoral education activities at the CEE strive to produce and communicate local knowledge related to doctoral education, through course participant and CEE-initiated investigations and reports/documents relevant to doctoral education at LTH. Ideally such artefacts cross-fertilize stakeholders and support fact-based, rather than unfounded, educational decisions on all organisational levels (Figure 11).
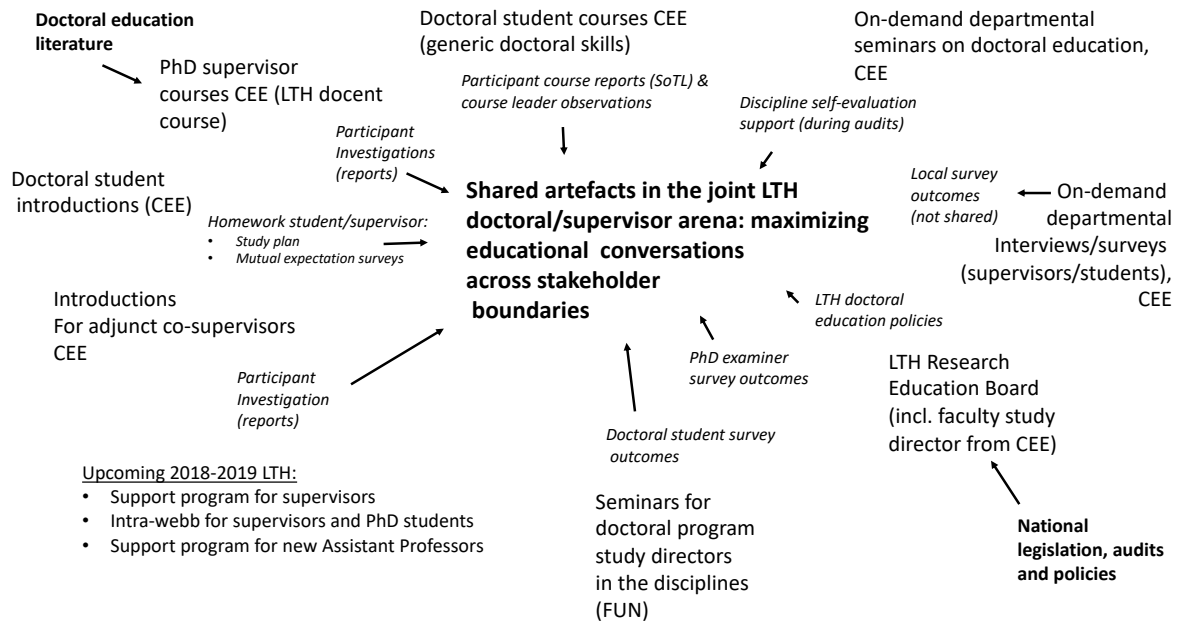
Figure. 11: Doctoral-related CEE activities and overall strategy. FUN is the LTH Doctoral Education Board.

Organization of activities

The doctoral-related activities at the CEE are organised by the faculty study director Anders Ahlberg, and education coordinator Lisbeth Tempte at the CEE. Given the substantial size of doctoral education at LTH, the strategy outlined above requires a sense of course program economy, availability of course leaders, expected numbers of participants, and course scopes that suite students' individual study plans. This includes balancing elective and compulsory activities. The central administration of Lund University offers few doctoral activities and admits very few students in total, so generic skill doctoral course programs do indeed need to operate at faculty level and below at Lund University. Many doctoral courses at the CEE are fully booked several times per year, which means that requests from students based at other faculties and universities are often turned down. Course leaders include academic staff from the CEE along with active academics and emeriti from departments at LTH, LU Centre for Languages and Literature, LU Department of Philosophy and LU Department of Medical Ethics at the Faculty of Medicine.

The joint LTH doctoral course program at the CEE

The LTH joint doctoral course program is made up of 10 course modules available with various periodicities depending on demand and availability of course leaders (Table 1). Normally, ca 18 courses are offered each year. Some courses are classified both as pedagogical and doctoral supporting courses. Some alternate course languages between English and Swedish. The courses are typically classroom bound, made up of a series of spaced meetings, with elements of blended learning. They are normally assessed through project task reports that are defended in seminars at the end of each course module, typically in combination with other handed-in compulsory tasks. The CEE registers course credits in the national LADOK system and issues in some instances, the pedagogical courses, course diplomas that provide information on the achieved learning outcomes. The courses are routinely electronically evaluated with LU Survey and Report (S&R) upon the course finale (including reminders), using a set of course evaluation questions specific to the LTH doctoral courses program. After each course module S&R summaries are sent to the study director and the main course leader, who negotiate any required changes in course designs or teaching teams in cases where there are

problems. The CEE faculty study director normally shares overviews of the ECTS credit production and course evaluation summaries, annually or every 2nd year, with the LTH Doctoral Education Board (FUN).

Table 10: The CEE course program for doctoral students, complimentary to courses provided in the LTH departments.

Course	Credits ECTS	Courses instances annually	Max particip.	Both PhD and pedagog.	Language
Introductory workshop for all new PhD students	2	2	40-50		English
Introduction to Teaching and Learning in Higher Education	5	4	25	Y	Swedish/English
Communicating Science	5	2	20	Y	English
Project Management in R&D Projects	5	2	20		English
Project Management in R&D Projects, Specialisation	3	Individual			English
Scientific Information Management	3	1-2	15		English
Academic Writing for Publication in the Engineering and Science Disciplines	6	6	16		English
Academic Writing for Publication in the Engineering and Science Disciplines	4.5	1	20		Swedish/English
Technology, Risk and Research Ethics	4.5	1	15		Swedish/English
Ethics, Integrity and Misconduct in Research (new)	1.5	1	20		Swedish/English

Doctoral supervisor training at LTH

The Docent course is taken by researchers affiliated with LTH who aim for the Docent title, e.g., a promotion to Associate Professor. This constitutes the main internal career route for future doctoral supervisors at LTH, and is in practice the "driving license" for acting main doctoral supervisor. The course corresponds to 3 weeks of full-time work and includes 10 group meetings in 10 weeks. It is held twice annually, with unlimited access for eligible LTH participants. The Docent course also counts as a qualifying course in teaching and learning in higher education. 30-40 researchers participate annually, including some paying participants from other faculties and universities. The course is organised by the CEE faculty study director, and it revolves around core researcher activities at LTH, such as research supervision, doctoral education, academic conduct and assessment of doctoral candidates. The course comprises lectures, group discussions and written assignments reported individually and in groups. To be able to pass the course, participants must have attended the scheduled activities and fulfilled their course tasks. In order to gain as much as possible from the course, participants should have some postdoctoral experience of co-supervision and research, and it is recommended that they apply for the course 1-2 years after achieving their doctoral degree.

In addition to the Docent course, the CEE faculty study director offers personal introductions to externally recruited full professors unfamiliar with the doctoral education frameworks of LTH, Lund University and Sweden. LTH also engages a limited number of external adjunct professors as part-time doctoral co-supervisors. They are offered a condensed one-week teaching and learning course at the CEE that includes introductions to the frameworks of Swedish education and supervision.

The CEE's role on the LTH Doctoral Education Board (FUN)

The CEE-based faculty study director participates in monthly FUN meetings, together with the Deputy Dean (Head), five doctoral study leaders (professors, supervisors), three doctoral study representatives, a quality-coordinator, and three doctoral study-oriented study administrators. The faculty study director is typically involved in FUN missions such as

- Surveys and interviews of students, supervisors and external examiners.
- Support for doctoral disciplines that are subject to the national audit (UKÄ).
- Development of faculty policies for doctoral education.
- Issues of academic conduct in doctoral education.
- Development of support programs for doctoral supervisors (new).
- Thematic workshops for LTH's doctoral program study directors.
- Recurrent on-demand thematic departmental seminars on issues of doctoral education.
- Development of the doctoral examination assessment processes.

The CEE's support of research group and departmental doctoral education activities
The CEE study director performs long-term as well as brief activities (workshops) with Lund University partners, Marie Curie program's cohorts of Early Stage Researchers (cf Ahlberg 2017). He also provides departments with supervisor and student group interviews on demand (cf Ahlberg, 2018).

Evidence of quality and impact

The CEE doctoral course program

A majority of students pass the courses, either on schedule or after re-examination. The value of the doctoral course program can partly be indicated by the total output of the CEE-derived course credits, in relation to the overall volume of doctoral education at LTH (doctoral courses plus research). In 2015-2018 the CEE courses produced 4690 ECTS which corresponds to ca 5-6% of the LTH ECTS total research + coursework output or, for a comparison, 20 produced doctoral diplomas (240 ECTS each), or, ca 12% of LTH's ECTS production in doctoral courses; see Figure 12. The CEE credit production is thus on par with an average academic department at LTH. The CEE doctoral course program at LTH is mostly elective and thus competes with other doctoral course providers. Demand for the LTH doctoral courses has been high in the past 10 years plus, with a multitude of full or nearly full courses. However, demand is dependent on several aspects such as course popularity, variations in LTH student cohort size, the volume of courses offered locally by LTH departments, and changes in the required course credits of the LTH doctoral study programs. Notably, LTH has historically required a clearly higher course versus research credit ratio for doctoral degrees than most other faculties and universities. Some LTH disciplines currently cut down on course demands, typically down to 75 ECTS per doctoral student, which is still on the high side.

Course evaluation summaries (overall appreciation) may serve as another measure of the CEE's doctoral course impact. Web surveys were gradually introduced in most CEE doctoral education courses in 2015-2018. They show consistently high student ratings (Figure 13). Opinions on the courses were submitted by 683 informants. The CEE has also gradually introduced a course evaluation question on how well the CEE doctoral courses suited the doctoral training of the participant. Across the different courses, 320 such answers indicated that the course program is indeed relevant to doctoral training at LTH (Figure 14).
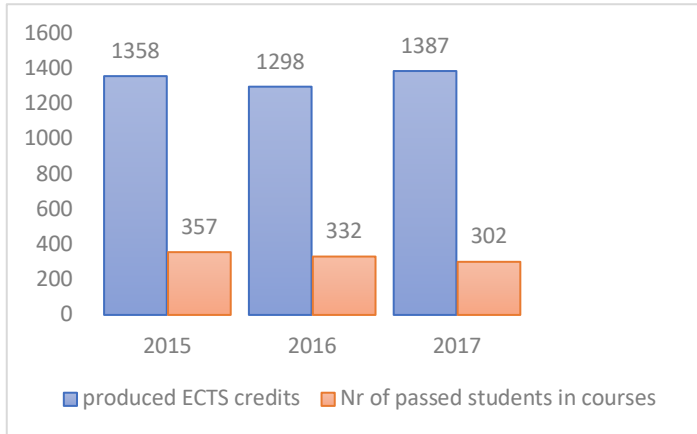
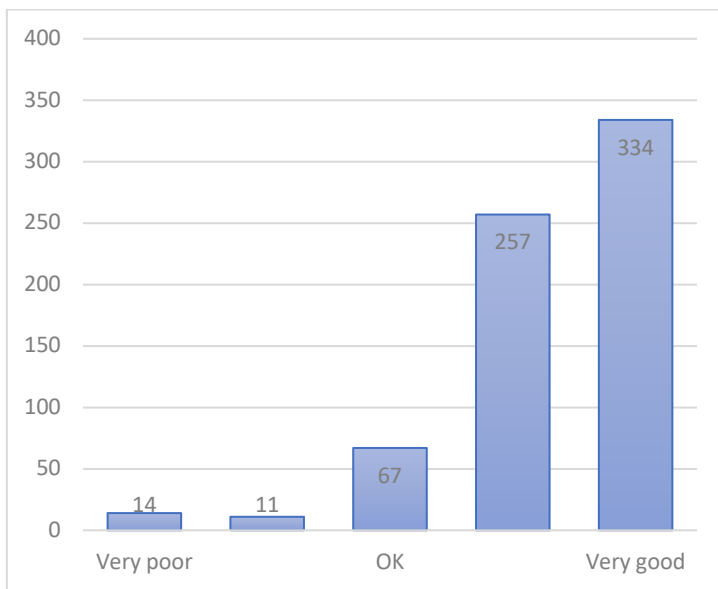*Figure 12. The CEE contribution to doctoral education output at LTH 2015-2017.*

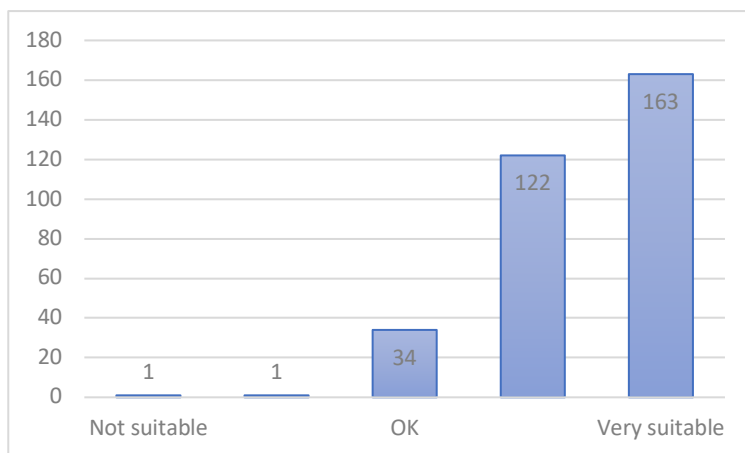*Figure 13. N= 683 course participants' assessments of doctoral course quality 2015-2018.*

Figure 14: N= 320 course participants estimating the relevance of their CEE doctoral course 2015-2018.

Supervisor training

The vast majority of doctoral supervisor training occurs in the LTH Docent course (the minimal adjunct professor course, and other one-on-one-training, is disregarded here). During the forming of the CEE, 2015–2018, the Docent course was held seven times, and 127 participants passed. All applicants who are endorsed by an LTH Head of Department are accepted, which means that the volume of the output appears sufficient (no limit of LTH participants). After their course, 74 participants responded to web forms. The overall course quality was numerically rated very strong (Figure 15), an impression that was confirmed by free-text comments on course relevance. The participant production of local knowledge on doctoral education adds particular value to the course (Figure 11). Participants share and receive findings, and such knowledge is then used on a range of occasions and in various arenas at LTH, including informing the LTH Board of Doctoral Education of their empirical findings (cf. Figure 11).
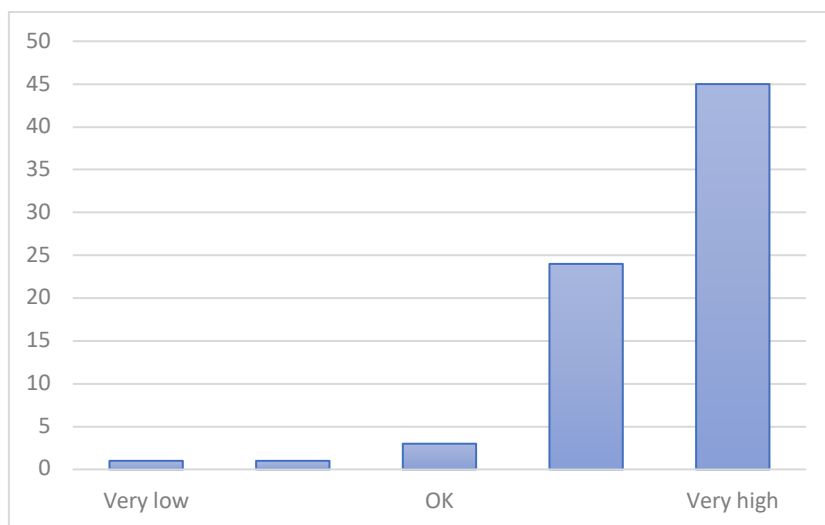

Figure 15: Course evaluations 2015-2018, LTH Docent course.

LTH organization for doctoral studies

The course programs for supervisors and students have developed over a couple of decades, regarding both content and course structure. The currently expanding CEE work within the line management organisation on the other hand is more recent, from 2015 onwards. The deliberate strategy of shared educational artefacts (reports, local facts) across stakeholder boundaries, has turned out to be valuable (cf. Figure 11). The currently increasing demand for local consultancy, leadership discussions, workshops and research group collaborations constitute the most apparent sign of the CEE's impact on doctoral education at LTH.

External exchange, dissemination and benchmarking
In addition to the employment of course leaders from other faculties at Lund University, the CEE faculty study director has extensive exchanges with others at Lund University involved in supervisor training, regarding course design, course teaching and investigations into doctoral education. These collaborators include former and present Head of the Lund University Academic Development unit AHU, Drs. Åsa Lindberg-Sand and Anders Sonesson, Eva Brodin and Prof. emeritus Jitka Lindén. Since 2009 the Lund University supervisor trainers have participated in annual meetings at a national level in NFU, the Swedish network for supervisor trainers. The CEE faculty study director has recurrently presented LTH findings at the dominating international doctoral supervision meetings, the biannual conferences Quality in Postgraduate Research and Postgraduate Supervision Conference, along with other doctoral education meetings (Ahlberg and Sonesson 2009, Sonesson and Ahlberg 2009, Sonesson et al. 2010, Ahlberg 2013a, 2013b, 2015, 2016).

There is some evidence indicating that the LTH course program has a sizeable output per invested SEK compared to other universities. The cost per produced doctoral ECTS typically ranges from SEK 600-1800, and the Docent course has a total budget of SEK 1700 per person and week of training. For instance, Umeå University presented their supervisor training program to the Lund University Board of Doctoral Education on 9 April 2018 and revealed markedly more expensive supervisor courses per participant compared to those at the CEE. The CEE framework to support doctoral education (Figure 1) has recently received some attention, as the faculty study director is the invited speaker at a Swiss doctoral supervision development symposium at ETH Zürich, on 24–25 January 2019.

Challenges and outlook

The doctoral course program comes across as strong and relevant, which does not mean it has been consciously planned. Rather, it has evolved as a response to observed student needs and formal pressures (for instance students need a course in teaching and learning in order to be allowed to act as a TA). The CEE course program does match fairly well the learning outcomes requested nationally (Högskoleförordningen, 1993), aspects that are rarely covered by the doctoral courses in the LTH departments. However, it is a viable idea to now compare, in greater detail, if there are themes missing in the course program that national audits might request. The overall non-compulsory character of the course program could also partly be re-negotiated. In order to get everything in place at the beginning of each student's doctoral journey it has been suggested that the 2 ECTS *"Introduction to new doctoral students"* be made obligatory, as in other LU faculties. This introduction workshop is also an appropriate opportunity to incorporate hidden aspects of research integrity and research ethics for junior doctoral students (an Achilles heel according to repeated faculty surveys).

The postdoctoral supervisor training seems to work well. However, these are aimed at fairly junior faculty who only co-supervise students, not experienced main supervisors. Although a voluntary support program for main supervisors is under way now in 2018-2019, there is most certainly a need to better inform experienced supervisors, as they may not be entirely aware of current frameworks and national demands of doctoral education.

While the CEE doctoral and docent-related "course factory" is up and running at a fast pace, the multifaceted CEE work in the LTH organization and boards for doctoral education is clearly expanding now. The dependence on two key personnel, the CEE faculty study director and course administrator, has become an apparent limitation. A viable CEE strategy would need the involvement of additional staff with doctoral education development experience. It would be even better if such additional staff could research aspects of doctoral education at the CEE.

Other activities

LTH Career Academy

The LTH Career Academy is a development program for assistant professors, which should provide skills that are valuable in their academic career. The aim of the initiative is to improve the ability of junior teachers to maintain a sustainable career within the academy.

The CEE has been commissioned by LTH to develop and run the program until 2022. The LTH Career Academy comprises five components:
1. LTH Career Academy Seminar, a one-year program for approximately 20 people.
2. LTH Career Academy mentor program.
3. Advanced pedagogic training.
4. The Docent course.
5. A leadership program, preferably from LU's available options.

The LTH Career Academy Seminar is the core of the activity and will cover topics such as My LU, The research group, Funding of research, International perspectives, The responsible teacher, Communication and media, Research ethics and academic conduct, My LTH. The program has been modeled on a very successful, but discontinued LU program called LUPOD: It will be led by professor Hannah Isaksson and associate professor Daniel Hellström, and supported by associate professor Anders Ahlberg and professor Per Warfvinge of the CEE. The program will be launched in mid-April 2019, with an annual budget of kSEK 1200.

From an organizational and economic standpoint, it has been very easy to accommodate LTH Career Academy within the CEE: funds are made available by LTH, staff is brought in from departments, the faculty office and the CEE, all costs are debited a dedicated "activity" and the overhead costs are clearly defined and predictable. It is also an advantage that other components within LTH Career Academy, such as the advanced pedagogic training and the Docent course are given by the CEE, making is possible to create a well-coordinated and coherent program without overlaps.

Commissioned education for the University of Michigan

Since 2009, LTH has offered undergraduate research opportunities for engineering students from the University of British Columbia and the University of Toronto. In 2017, the University of Michigan (UM) joined the program, in which the students undertake a project in a department at LTH. The program begins early May and ends late June and welcomes 20-30 students annually.

In addition to the undergraduate research project, which amounts to 12 ECTS, the University of Michigan has asked for an additional course that would count against the general studies requirement in the UM curriculum. In response to this request, the CEE developed the course Swedish Society, Technology and Culture TFRG45, 4 ECTS. The course was held in 2017, and the credits generated were utilized by LTH to generate semester exchange places at UM. Thereby, the course could be offered without charging UM. The course was highly appreciated. But in 2018, UM requested a change of conditions as they could no longer offset the credits with semester exchange places. Therefore, the course was offered as commissioned education to UM. Hence, the CEE invoices UM, not the individual students.

The course was offered to, and completed by, 12 students in 2018. Six students responded to a survey distributed among the students on their return to UM. Overall the students had a positive experience of the summer program, would recommend it to others and found it worth the time and investment. Regarding TFRG45, five out of six students strongly agreed with the statement "I enjoyed the course", while one student agreed. A majority agreed that they were intellectually challenged by the course and that faculty and instructional staff were available for consultation.

General reflection

Input from the Board of the CEE

As described in the Introduction, the board has overall responsibility for the centre's activities, sets out detailed guidelines, sets out budget proposals and the annual activity plan, decides on the forms of quality assurance, and should convene at least three times each year. Examples of issues that have been handled by the board are the framework for doctoral education at the CEE, communication strategies, annual priorities, economic follow-up and the current evaluation of the CEE.

The view of the Board is that the CEE is a staff function, despite the organizational similarities to a regular department. The Board recognizes that although the CEE may appear independent in theory, it is not independent in practice since almost all resources are supplied by the faculty. The Board has no problem with this organizational structure and feels that it gives the CEE some flexibility without jeopardizing the overall mission of the CEE to serve LTH as a whole. One board member pointed out that the current model is better than others that were discussed prior to the formation of the CEE, such as a more decentralized structure where different departments should act as hosts for specific activities.

At a Board meeting in September 2018, the Board was asked to describe its role. This was done in terms of phrases such as "to support", "to make sure that the CEE stays on track", "forum for discussion", "to give input from the stakeholders", "gives insight and transparency", "to check that things work". However, the Board expresses that as long as the activities work well, there is no need to take a more active role.

The Board sees a need for relevant quantitative measures that reflect whether the CEE is "on track". Such measures could include the number of participants in pedagogic courses, participants in staff training, cooperation with other units within LU, publications etcetera. The Board expects that the current evaluation could help define such measures.

The dialogue between the Board and the Director of the CEE on one hand, and the Board and the Dean of LTH on the other, needs to be developed. A dialogue between the Dean and the chair of the Board of the CEE would be welcomed, especially as the mandate of the Board expires at the end of 2018.

On a more operational level, it is clear that the activities regarding PhD and staff training are very well coordinated between the CEE and the faculty level, as one person from the CEE (Anders Ahlberg) is a member of the Faculty Board of Doctoral Education (Forskarutbildningsnämnden).

The Board wants to see a more structured interaction between the CEE and the Faculty Board of Education (LG GU). Currently, the CEE gets limited information about current issues at faculty level. This lack of inclusion limits the CEE's ability to be proactive. The lack of structure is somewhat compensated for by good personal relations between the CEE and the management of LTH, but overall the situation is not satisfactory. The CEE strongly suggests that this issue is addressed by LTH, sooner rather than later.

The Board is also concerned about how information flows from the CEE to the faculty level. According to the Instructions of the CEE, the "director should submit an annual report to the faculty board." Currently, this is mainly informal or in conjunction with the budget proposal. The CEE would welcome a clearer picture of what is expected in order to fulfill its obligations in this respect.

The CEE – A versatile organizational model

Prior to the formation of the CEE, several organization models were considered:
1. Keep all activities within the faculty office but increase the level of coordination, which is the model of the academic development unit MedCUL of the Faculty of Medicine.
2. Create one unit and embed it into an existing department, which is similar to the model used for LU's academic development unit AHU.
3. Transfer all staff to various departments at LTH and coordinate the activities within the framework of a virtual centre.
4. Create one unit directly under the LTH board and maintain close contact with the faculty management.

In hindsight, we are very satisfied that the last option was chosen. The model combines a clear line organization with a commitment to serve LTH, in a broad sense.

We want to highlight a few consequences of the chosen model.

One advantage is that the academic staff of the CEE have an academic as head of the unit where they work. In this respect, the CEE is no different from any department at LTH. Leadership in an academic organization has to do with creating good working conditions in general, setting priorities, communicating with academic stakeholders and also discussing and offering feedback on academic matters. The current organization allows for this.

The academic developers within the CEE are strongly committed to one or more of the aims and objectives of the centre. If the CEE were embedded in a department, it is likely that the priorities would change from serving LTH, to more local priorities set by the individuals and by the department in question. Hence, LTH would most likely gradually lose control of the activities.

It is clearly stated in the Instructions of the CEE that the CEE should not build its own administrative capacity. This implies that key CEE administrative staff have their affiliation with the faculty office, which is both an advantage and a risk. One advantage is that the arrangement is quite flexible. For example, the LTH Career Academy needs a mere 10% administrative support, which would be impossible to handle within the CEE. The flexibility related to LADOK support and economic services and control is another positive example. With the current arrangement, the CEE can minimize the overhead costs, and does not have to engage in aspects of professional development for administrative staff. It is also a fact that the CEE could not offer an attractive administrative career. A disadvantage with the current situation is, however, that administrative staff that work mostly for the CEE may become disconnected from their colleagues and lose a true sense of belonging in their workplace. In summary, it requires an open, trustable, and informed discussion between the CEE and the Faculty Office to balance the interests of the employees with other considerations.

Challenges and outlook

The CEE certainly faces challenges. One is that many of the key staff are around 60 years of age. To counteract this inevitable problem, we are gradually engaging some of the younger teaching staff at LTH in the activities. We are confident that the Pedagogic Academy is instrumental in securing competent academic developers for the future. We also engage in doctoral education in Engineering Education in order to build a new generation of academic staff for the CEE.

The Pre-University Courses and SI have their specific challenges related to the vulnerability that comes with dependence on one, or at least, very few staff. The CEE is aware of the potential problem and creative solutions have been suggested by the staff concerned.

The CEE has grown organically in the last few years. Recent additions to the staff have been triggered by the program evaluation system, increased demand for doctoral courses, the LTH Career Academy,

digitalization etcetera. However, the CEE strongly feels that the line organization, including departments and programs, must ramp up their efforts in teaching, program and staff development to meet increased expectations and fierce competition in the higher education sector. The CEE should not expand to a point where it loses its soul.

Nationally as well as internationally, academic development units and academic support activities such as SI tend to be subject to reorganization quite often. Maybe, because the activities are not purely academic, and not purely administrative, the academic development units tend to find themselves subject to constant recreation. In fact, Lund University is a good example: Only since the late 1990s has LU had PUS, UCLU, CED and AHU. To these we may add CITU and Lärande Lund, all dealing with more or less the same range of activities, engaging just about the same people.

We believe that the CEE has the potential to be a stable platform, yet is flexible and responsive enough to develop with LTH.

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