



CHALMERS
UNIVERSITY OF TECHNOLOGY

Teachers' needs and attitudes towards the use of E-learning in higher education

Observation and analysis of an ongoing strategy process to
increase the use of blended learning at Chalmers University of
Technology

Master's thesis in Learning and Leadership

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ABSTRACT

The education system has changed a lot since the introduction of IT in teaching, often called E-learning, and the use of it still continues to grow in popularity. Flipped classroom, which is E-learning mixed with classroom education, is one famous and effective teaching approach that has started to gain popularity in higher education. This has become interesting for Chalmers University of Technology, as they want to increase the use of E-learning, especially the use of the Flipped classroom approach among the teachers and organisations at campus. One way they do this, is to establish a production help and support group for E-learning, which should educate and understand the needs of the teachers who will use E-learning in teaching. This is also interesting for Chalmers Professional Education, an organisation connected to Chalmers which provides education for professionals. They want to understand what teachers at Chalmers think about E-learning and how they work with the technology, to better improve their own organisation.

Against the background of those conditions at Chalmers, the aim of this thesis is to understand the teachers perceptions and needs when using E-learning in campus education, but also to identify the support needs that they require.

The thesis was conducted as a case study, where interviews with teachers and observations of meetings about Flipped classroom and E-learning techniques were the main sources of data. The results show that the teachers have different experiences and thoughts about using E-learning in their teaching. They can see benefits as well as challenges, but in general are their attitudes towards the use of E-learning in education positive. Teachers see the many new opportunities that exists with E-learning, foremost the opportunity to collect continuous student data and more time for active learning in the classroom. The critical problem is the extra time required to produce and administer E-learning activities, which teachers wish Chalmers organisation could help them with.

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1 INTRODUCTION AND BACKGROUND

In February 2015, Chalmers technology university released a commitment (*Chalmers, 2015a*) to increase the use of IT in basic education at campus, with the establishment of a support group for blended learning, which is IT mixed with classroom education. Teachers and Chalmers organisations have since then had the opportunity to get help with pedagogy and production of E-learning, the educational use of IT.

One organisation that heard about this new strategy was Chalmers Professional Education, a substitute to Chalmers offering competence development to companies. The company needed to expand their market by increasing the use of E-learning courses, and thought that there was much to learn about this subject at Chalmers University. Chalmers Professional Education published a call for a master thesis which aimed to understand and analyse what teachers thought of this new strategy and how they work with E-learning.

1.1 Chalmers University of Technology

Chalmers is located in the city of Gothenburg and has around 11 000 students distributed at two campuses. There exists 18 departments and around 3000 employees, of which 2000 work as teachers (*Chalmers, 2015*). In 2012 Chalmers received good results from the “Swedish Higher Education Authority” evaluation, which granted Chalmers substantial fundings to be used to increase the quality of education. The money should be used from 2015 to 2017 and all teachers associated to the programs that received very good results in the evaluation were allowed to apply for the fundings. In 2014, a call for projects was released and the projects should be related to at least one of 5 stated categories. These were: “*Students’ learning environment*”, “*Course and programme development*”, “*Increased experience of working*”, “*Improved pedagogical qualifications for teachers and increased pedagogical support*” and “*Student Support*” (*Chalmers insidan, 2014*).

The fundings were also used to establish a project group, called “blended learning support group”. The group’s purpose is to give guidance and support to teaching staff and other Chalmers organisations when it comes to pedagogy and production of blended learning courses at campus.

In parallel, Chalmers started its own MOOC (Massive Open Online Courses) project ChalmersX. MOOCs are courses open for everyone and free to take. This project should launch at least four MOOCs and became soon a project under the newly build blended learning support group. As part of the MOOC project, Chalmers signed a contract with edX, a major platform for MOOCs courses

that nevertheless can also be used for blended learning courses. As a consequence, Chalmers started to promote this platform at campus in addition to the learning platform Pingpong, which is the main platform used at campus to administrate students and courses. The university introduced the edX platform to teachers and at the same time, gave information and shared knowledge about blended learning at workshops, meetings and seminars. This support was primary for the teachers that applied for quality fundings in order to help them to develop their courses (*Chalmers, 2015a*).

1.2 Chalmers Professional Education

A subsidiary to the university is Chalmers Professional Education, a company whose aim is to “provide industry with world-leading knowledge in technology-related knowledge areas” (*Chalmers Professional Education, 2014*) by training professionals in the fields of “Executive, Industrial engineering, Shipping, Energy and Built Environment” (*ibid.*). Chalmers Professional Education offer different training programs, such as programs open for everyone, in-company or seminars (*ibid.*). The training takes place at Chalmers Professional Education or at the customer's company, a few programs are also running at distance. The teachers in the training programs are often consultants, and some of them work as teachers at Chalmers or other universities. Others come from companies worldwide.

Chalmers Professional Education heard about this new strategy and investments and wanted to understand what Chalmers does in terms of E-learning and what support and help they can get from the university. They were also interested in what platforms teachers use for E-learning and what the teachers think about it, in terms of administration and creation of course materials, especially when it comes to the new edX platform.

To solve this problem, Chalmers Professional Education announced a call for a master thesis which should deliver two products and one service to them. The service should contain continuous information about the changing situation at Chalmers throughout the writing of the master thesis. One of the products should be a resource document with information about distance education, with valuable findings that have been provided through the literature study in the thesis. The second product should be a manual or documentation about edX and how it could be used at the company to sell new courses.

1.3 E-learning and blended learning theories

Online learning, today called E-learning, was first mentioned in the mid-1980s and has since then grown in popularity both in education and in competence development. E-learning is the learning that occurs with the help of technology. Two frequently used E-learning concepts are distance and blended learning (Allen and Seaman, 2014). Distance learning, or distance education, is when a course uses online learning instead of classroom education, teaching that occurs in the classroom. Blended learning is a mix of classroom education and online learning (*ibid.*). There are especially two teaching approaches, Flipped classroom within blended learning, and MOOCs in distance education, that are important to mention.

MOOC (Massive Open Online Course) is a relative new concept, which has developed in the last few years. MOOCs are completely free online courses, making it possible for any person in the world with computer access to get educated, but without a graduation (Docebo, 2014).

In blended learning education, the Flipped classroom teaching approach is very popular. One definition of the teaching approach is:

“Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter.” (Flipped learning network, 2014).

It can be used in all level of education. In higher education, Flipped classroom is mostly used in mathematical and science subjects, but can also be used efficiently in other kind of disciplines as well (Rahman et al. 2015).

1.4 E-learning pedagogic

A lot has been written in the field of pedagogy in education. To be able to understand why E-learning is used in teaching, basic principles as well as the benefits and challenges with different learning approaches will be explained.

The first modern theories about educational pedagogic emerged from the field of behaviorism. The center of the behaviorism is learning through reinforcement with the teacher as the dominant center with complete control (Carlile and Jordan, 2003). It focusses on changes in external behavior and views students as a whole homogenous group. Their individual reflections and inner processes are

not considered. Most of traditional lecturing in class, and many MOOCs are based on behaviorist principles.

Later a new theory became popular, constructivism. Constructivism is more about the individual itself. Everyone is different and therefore everyone also have different ways of learning. With this mindset, teaching should not be centered on the teacher but the individual student, because of their different needs, making the teacher's role in the classroom more challenging (Carlile and Jordan, 2003). Still, ordinary classroom lectures should be used, but it is important to also have a lot of feedback and customized tasks for the students. Hence, the behaviorism is the core of learning, but the most efficient learning for students will occur together with the

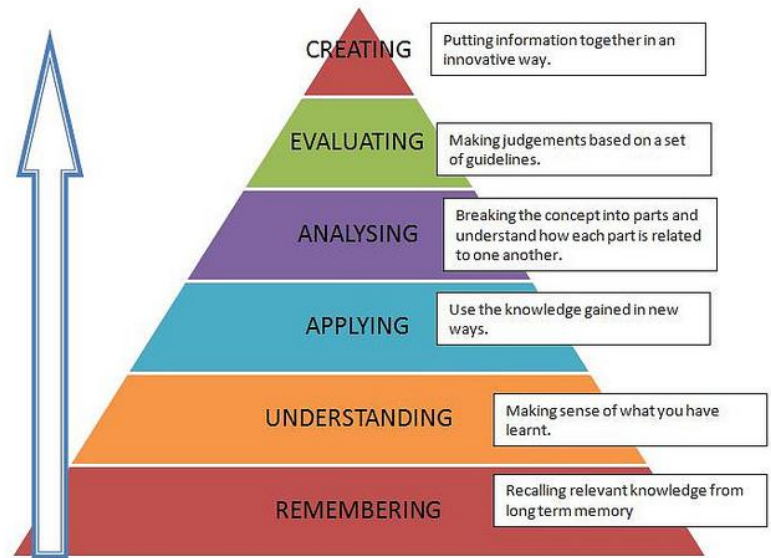


Figure. 1. Blooms Taxonomy (nist6dh, 2012)

constructivism, because they both deal with two different important aspect of teaching.

To better understand those differences, it is helpful to consider the different kinds of learning outcomes that exist. There exists a lot of studies about student learning outcomes in the classroom. The by far most popular conceptualization of learning outcomes is Bloom's taxonomy (Carlile and Jordan, 2003). It is a model which mention six different cognitive levels (see figure 1), all related to students learning outcomes. It starts at the lowest level, where a learner remembering facts, and then increase in cognitive difficulty for each level towards the highest one, creating, which require a learner to have enough knowledge and understanding of a subject or area to be able to create new innovative processes. Especially higher cognitive levels of learning are difficult to achieve with traditional education based on behaviorist theories.

To be able to achieve a high level learning outcomes, several challenges must be solved where constructivist approaches are often better suited. The challenges are described in a meta-study (Strader and Thille, 2012), which presents five possible problems with classroom education. The first issue is about the level of difficulty of the content taught in the classroom. Because students have a lot of different knowledge and experience about the subject it is hard, nearly impossible, to make a lecture that fits all persons in a classroom. The next problem is closely connected to the first one. The difficulty for a teacher to know what level of prior knowledge the students have about a subject.

From the student point of view, two matters are brought up in the study, feedback and impact, which both fit well into the constructivism theory. Feedback usually reaches the students a while

after the actual task was completed, often because it takes time to conclude it for the teacher. But research shows that feedback should be delivered as fast as possible to maximize the learning outcomes (*Strader and Thille, 2012*). The second matter is the student's lack of impact when it comes to deciding how the learning in a classroom should be done. Students can sometimes influence the teaching, but it is impossible for teachers to customize the teaching to every student in the classroom. The last challenge is about the teachers themselves. Everyone who teaches has a lot of knowledge and experience, which is often shared between colleagues, but rarely documented. That means that a bigger focus must be spent on continuity. Some of these problems can be solved, or eased if the Flipped classroom approach is implemented and used.

The strength of Flipped classroom is the way the learning takes place, because the students will focus on remembering and understanding at home when working with materials and watching videos, which are the lowest part in Bloom's taxonomy for teaching. In class, the teacher can instead help the students to analyse and applying their knowledge by conducting more interaction between students and create a more active learning. This can be achieved by do experiments and have discussions, which will reach the higher levels in the taxonomy (*Stone, 2012*).

The parts in Flipped classroom that occur online can be as effective for learning as if they were conducted in the classroom as long as the teaching is done in the same way. That is often the case when video lectures are used. However, one important factor is the grade of interactivity with the E-learning. Some studies have shown that the learning outcome may not increase although a lot of difference activities are used, such as simulations or labs (*Means et al., 2009: 38*). The critical factors are to cover all aspect of the learning and create activities that activate the student.

Research has also shown that the learning outcome increase when Flipped classroom is used instead of ordinary classroom education (*Stone, 2012*). One study conducted two flipped courses and two similar traditional classroom courses, used as control groups. Of five exams and one assignment, nearly all students in the Flipped classroom performed better. It was just for one exam that the control group did a few percentage better. For the assignments, students in the control group did ten percent better. A recent meta-study (*Rahman et al. 2014*) shows that better learning outcome are achieved when Flipped classroom is used in science and mathematical subjects, but good results have also been seen in other domains as long as the concept is implemented in a good way.

The benefits with Flipped classroom is also recognised by the teachers. A large faculty survey (*College Faculty, 2015*) concluded that students were both more active and learned better when teachers introduced some E-learning in their education. Many teachers said that they have seen improved grades for students, after the Flipped classroom approach was implemented. It was also found that at least half of the teachers adapt Flipped classroom because of the following reasons: Increase student engagement and learning, more learning-centered teaching and last, and improve the learning environment. Increase of student engagement and learning were the most important reasons, which were claimed by more than $\frac{3}{4}$ of the teachers. Most of the decision to use blended

learning came from the teachers themselves. The influence of colleagues was rather marginal - only one of eleven teachers used Flipped classroom because he or she had heard about other teachers who used it at the school (*College Faculty, 2015: 8*).

1.5 E-learning approaches and platforms

The main components in E-learning are the pedagogy and the technology that make the teaching possible. There are several different teaching methods that can be used in both E-learning and the Flipped classroom model. It is also common that learning platforms, such as Pingpong and Edx, are used to better administrate students and courses.

First of all, E-learning methods can be distinguished by whether they are taught in a synchronous or asynchronous way. Synchronous learning is when the participants interact at the same time. The learners, often with the teacher, work with the platform in real time. Two examples of this could be seminars or skype-meetings. Synchronous E-learning is often facilitated by video and talking communication tools, such as Skype or Adobe Connect. But it could also be used when an exercise or exam is jointly carried out at a specific time. The other teaching mode is asynchronous learning, where learners can access and interact with the material on a platform anytime they want. Reading materials and recorded lectures are examples which are often used in asynchronous learning. A self-paced distance course or Flipped classroom often uses only asynchronous learning. Quizzes, exercises and discussions, are examples that can be used in both approaches (*Hrastinski, 2008*).

Both methods have their benefits and limitations, and should be used in different situations to maximize the participants' learning outcome. Synchronous learning takes more time and requires every student to be active at the same time. It is closer related to classroom education, but with the advantages that participants have the possibility to discuss and work with each other. Synchronous learning on the other hand is characterized by the limited communication, but is on the other hand flexible for both the learners and the teachers (*Hrastinski, 2008*).

A meta-study by Educause (*Hrastinski, 2008*) presents the different learning aspects that can take place, depending on the method that is used. They argue that reflection and information processing for a learner is the focus when asynchronous learning is used, because more time exists to understand complex tasks. In the synchronous teaching, students are often more motivated and committed to the activities.

Video lectures are often the main component in asynchronous e-learning. It is used both in distance and blended learning education, but sometimes with different purposes. In blended learning, both classroom teaching and recorded lectures can be conducted. In these cases, recorded lectures act more as a compliment. One study (*Ronchetti, 2010*) presents four different purposes to why video

lectures should be used as a compliment. They mean that one reason is the possibility for students to catch up with information they missed or did not understand during the classroom lecture, same for students which could not attend to the lecture. Another reason is related to the students with physical disabilities, such as poor hearing or visual impairment, which may not be able to follow a classroom lectures. The last reason to why recorded lectures should be used, is the possibilities for students to rehearse the materials for repetition.

Other activities can also be used in E-learning to be able to help students to learn better. Examples would be the use of simulations and quizzes or other tools that can be used to understand a concept or task. Even so, only activities which are a good compliment to each other will help students to learn better. Still, there exists no significant drawback, if a lot of different activities are used, as long as the concept or task is explained right (*Means et al., 2009: 38*).

When a learner use E-learning materials, he or she must first be able to access it somewhere on the web or with a program. The teacher, or distributor of the materials, must therefore first use a service provided from a website or program to create/upload the E-learning materials. Then the teacher can distribute the E-learning materials to the students from the program/website, such as given the link to a Youtube video or an invitation to a Skype meeting. It is also possible to use a LMS (Learning Management System), a platform which can provide various E-learning techniques and services, both from the platform itself, but also from other services such as Youtube or Google Drive. LMS are used in nearly all E-learning education, universities, MOOCs, competence development, to mention a few (*McIntosh, 2015*). Chalmers uses the LMS PingPong for students and courses at campus, and edX for MOOCs.

The LMS edX was first announced by Harvard and MIT in 2012 and is today the second largest platform for MOOCs. A year after the launch of edX they made the source code available to the public, making it possible for anyone to contribute and take part of the development of the LMS (*Stanford Report, 2013*). As a result of this, edX has a lot of functionalities and can embed other programs and tools on the Internet into the platform (*GitHub, 2015*). Quizzes, discussion forums and automatic grading are some of frequently used functions in the platform (*edX, 2015a*). It is also possible to create private, password protected courses on edX. This can be done by creating courses in edX private environment, called edX edge. edX edge works nearly on the same way as the edX platform except two major differences: every course requires a login and everyone taking a course must be invited to it (*edX, 2015b*). Chalmers have bought licenses to the edX platform which includes up to 20 courses in edX edge per year for its teachers and organisations at this point.

Pingpong is a LMS created in 1996 for two courses at a university in Sweden. It have since then grown in popularity and is today the primary LMS used at a number of schools, universities and businesses. It is often customized for each organisation it is implemented for, and is supported and developed by both the company Pingpong and the buyer of the custom made solution. It is a large platform with its strength in administration and scalability. It is also possible to use functions such

as quizzes and grading processes (*edX, 2015a*). Pingpong is the platform used in the majority of all courses at Chalmers and students grading and course system is integrated in it (*Pingpong, 2015*).

1.6 Production and administration of E-learning

Learning outcomes, which can be considered the most important aspect of education, have been described in earlier paragraphs. However, to be able to conduct E-learning, other factors must also be considered. One paper from The University of British Columbia (*Bates, 1997*) states that a school or university uses E-learning education to be able to improve quality, access and/or for cost-efficiency for both implementation and operation of E-learning. The paper makes it clear that it is hard to make improvements in all of these, but none of the sections should decrease in quality in favor of the improvement of another. These factors can be of more and less importance depending on who is asked. Teachers may be more eager to improve the quality, while the stab or head of office can be more interested in the cost-efficiency aspect of E-learning education.

A comprehensive study (*College Faculty, 2015*) describes the challenges for the teachers. The authors point out that it takes extra effort to plan and produce E-learning activities. The study shows that the introduction of E-learning elements tends to increase the workload of affected teachers, often related to administration or production roles. Benefits from the teachers' point of view, could also be found in the study. The teachers did not have any problems with departments or college when blended learning was implemented and used. Neither were the use of new technologies a major problem for the teachers when they started to flip the classroom. Activity for a teacher using E-learning is the production of video lectures. The responsibility of producing such videos often falls on the teachers themselves, which naturally require them to have skills in recording, editing and uploading (*Hartzell and Yuen, 2006*). The recording can be done using just a smartphone or similar recording equipment. When recording a lecture, it is important to pay attention to the quality of the sound, video resolution and content. It is recommended for teachers to use recording equipment that makes the process of editing and recording as easy as possible - a process that otherwise can take hours. A video can be uploaded to a site allowing its users to upload videos for free, file server or directly to a learning management system, to mention a few possibilities.

It is should be clear from the previous paragraphs that E-learning in distance or blended learning courses requires a different planning process compared to classic classroom education. In both teaching approaches the need of a course plan is necessary, but the planning phase of a course implementing E-learning further add steps to pay attention to. A study from University of

Technology in Sydney (Alexander, 2001) explains that E-learning planning should contain three different phases:

- *Context of learning, - understand who the learner are and what he or she need to learn.*
- *Information technology - what technology is available and what can be used.*
- *Teaching/Learning design - what teaching style is needed and how it could be used. It is the second mentioned phase that is unique within E-learning teaching.*

The study points out that for these plans to work the organisation must have a strategy about E-learning that is informed to teachers and staff. The organisation also need to provide the material, support and help required to conduct E-learning, as it should not be the solely the teacher's responsibility. The importance of having a plan is also mentioned by other studies (Baylor and Ritchie, 2002). They mean that the plan should address the following component: "*technology maintenance and support, the presence of an action plan and timeline, and facility infrastructure, configuration, and funding issues*". The study also highlights the importance of knowledge sharing and change of technology attitudes among staff, teachers and students.

2 AIM

The aim for the master thesis is to understand the teachers of Chalmers' perceptions and expectations introducing E-learning in their education. This aim is in-line with Chalmers' new strategy to increase the use and knowledge of blended learning teaching among teachers. Experiences from teachers within this study will also help Chalmers Professional Education to better understand the usages of E-learning at campus. The thesis' primary goal is to collect and analyse teachers' thoughts by conducting interviews and attending to meetings and other gatherings where these matters are being discussed.

This lead to the following research question:

- What are the teachers' expectations and perceptions about using E-learning in their classroom courses and what support do they need?

Which further can be divided into the following questions:

- What challenges and benefits do teachers believe exists with E-learning used in higher education?
- How do teachers want to work with E-learning techniques?
- What do teachers know about the support and help provided from Chalmers University?

3 METHODOLOGY

This master thesis will investigate and highlight the teachers of Chalmers' thoughts and attitudes towards the use of blended learning. This will mainly be achieved by gathering information from the teachers through interviews and when they attend to activities associated to Chalmers strategy about E-learning. The study will therefore be conducted as a case study (*Baxter and Jack, 2008*), where an ongoing public process will be followed as well as personal meetings with the teachers.

It is also necessary to decide whether the study should be qualitative or quantitative. With a qualitative approach, the amount of cases or items is often lower compared to a quantitative study, but the information is often richer and more informative. The larger sample group of a quantitative approach, on the other hand, allows to generate a statistical basis for generalization and prediction (*Newman and Benz 1998: 16-26*). In this study cases, the main sample teachers describing their point of view. A qualitative approach is chosen in favour for the rich in-depth information. A literature study is also conducted to make sense of the data collection and to clarify, strengthen or questioning the results.

Further, from the background chapter it is known that the project group will arrange meetings with the teachers to discuss the strategy and what kind of support that is needed. To understand how the project group and teachers are interacting with each other, observations of these meetings will be made - at least one observation for every different type of meeting will be done.

In sum, this leads to the following three data collection methods which will be used for information gathering, where the two latter are the most important and most comprehensive data collection methods.

1. Qualitative interviews
2. The observation of meetings
3. Literature studies

4 DATA COLLECTION

Before the gathering of data begins, a plan for the three data collection methods, interviews, observations and the literature study are necessary. Formulations of questions and the creation of the sample group, as well as the selection of which meetings to observe, need to be done.

4.1 Interviews with teachers

The main reason to conduct interviews was to generate data that could help answering the research question. It was clear already from the beginning that the knowledge and experience amongst teachers were the most important source of information to the thesis. The goal with the interviews was to answer the following two questions from the aim chapter.

- What experience do teachers have when it comes to blended learning?
- How do teachers experience the introduction of new blended learning methods?

To be able to create as good interviews as possible these questions were reformulated and subdivided, leading to the following issues in need of further investigation through interviews:

- Experience and knowledge of E-learning and blended learning at and prior to Chalmers.
- Attitude to blended learning at Chalmers and in education.
- Knowledge and thoughts about the existing blended learning help at Chalmers.

From these subjects, open-ended questions were formulated to help the conducting of rich in-depth interviews. The structure of the interview questions followed a guide from PathFinder International (*Boyce and Neale, 2006*).

Interviews were conducted during 4 weeks, between May and June. The time span was necessary because all teachers agreeing to be interviewed had to be scheduled. It was also important to conduct all interviews around the same time. The preparation of interviews started two weeks before the execution of the first interview.

The interviews were conducted at the campus of Chalmers, Johanneberg and at Lindholmen, often

at the teachers' working place. Every interview was documented on a computer and nearly all were recorded. A maximum of one hour were set as the interview time but in average they lasted around 45 min.

All interviews were done in a semi-structured way. That means, an interview guide was created containing a number of guiding questions to structure the interview and cover all important themes. However, if the interviewee addressed new or in-depth aspects related to the research questions, deviations from the guide were accepted. The interviews were conducted this way to be able to obtain relevant data from all interviewees (*Mears, 2012*).

The sample group of teachers was made by asking all teachers attending to three introduction meetings about edX. All teachers in the quality funding project had been invited to these meetings. The choice to pick these teachers was based on two reasons: firstly, these meetings were the first of its kind to inform teacher about the help and support that exists about blended learning at Chalmers. So, the teachers attending to these meetings should be interested in E-learning and blended learning. The second reason was that it was an effective approach, because it was possible to meet all the potential participants and explain the master thesis and ask about interviewees. In total, ten teachers were interviewed. They were coming from the departments Applied Physics, Fundamental Physics, Computer Science and Engineering, Signals and Systems and Learning Services at Chalmers library.

4.2 Observation of meetings

During the time of the master thesis there were three different types of meetings arranged about blended learning and E-learning techniques: A workshop and information meeting about edX, meetings related to support for the quality fundings projects and a blended learning seminar. These meetings had a high relevance for the master thesis because the project group for blended learning hosted these to inform and discuss questions with teachers interested in blended learning. The data collected from these meetings were notes written down and then analysed.

4.3 Literature study

The literature study was based on some key terms and topics that needed to be addressed to be able to make sense of the results and to draw valid conclusions. The most important topics were basic theories about E-learning and blended learning, Flipped classroom concept, understanding of what good teaching is, advantages and disadvantages between classroom education and blended learning. These key topics were all connected to the questions formulated in the aim chapter.

Databases were the main source for the literature study. Sites as Google Scholar, EditLib and LIBRIS were used. Other organisations at the Internet also played an important role such as edX and the flipped learning network.

5 DATA ANALYSIS

The data analysis attempts to make sense of the collected data from the interviews and observations, by processing it and determining what information to use as a results.

5.1 Analysis of interviews

The analysing of the interviews was done in several steps. After each of the interviews, the protocol was proofread, restructured and sometimes complemented by the recording. When all interviews were conducted, patterns were found between the answers from the teachers, by first creating a summary of all important answers of the interviews. The important answers were the ones that answered the questions stated at the “Preparation of the interviews” section in the methodology chapter. Sometimes teachers gave answers that didn’t match any questions. In these cases, a decision was made whether the answers were relevant or not. Often, if two or more teachers gave a similar answer and it was somehow connected to the research question, it was of value for the study. The summary was then used in the creation of the results, which gave a clear view about the teachers’ thoughts and experiences.

5.2 Analysis of observations

The analysis of the observations was a fairly straightforward process. The notes written on the meetings were proofread and rewritten as a summary in the results. Specific information about the teachers courses were not included in the results, neither was other unrelated topics, which did not had any connection to E-learning.

6 RESULTS

The results consist of data from meetings and interviews, reported separately. The sections follows the guidelines from data collection chapter.

6.1 Meetings and workshops

Three types of meetings were observed and used in the results. The information gathered from these were: Type of meeting and the agenda, participants and what questions and topics they briefly brought up.

6.1.1 INTRODUCTION MEETING ABOUT EDX

Three meetings were arranged by the blended learning support group to inform teachers about the new platform edX. These were the first meetings which were arranged by the group. Between 1 to 3 members from the group attended to each of these meetings. To invite teacher to these meetings the project group sent out e-mails where teachers filled in an internet form to respond if they wanted to attend or not. 23 person used this form and 21 of these wanted to attend to at least one of the occasions. Nearly all worked as teachers at Chalmers, except the members from the project group and an occasional observer.

Every meeting was held by someone from the project group. The agenda of the meeting was about edX and its functionality. After the explanation of the platform a period of time was set for questions. The most common question was if edX should be used instead of Pingpong. The project group answered that it was not the case, edX should be a complement to Pingpong and one among other technical tools to be used for blended learning. Another frequently asked question was about licenses and copyright, who owned the material if it was used at edX server. The project group did not have a full answer, more information was to come. How students should be invited and administered in edX was also a question asked by some teachers. The project explained that administration worked well, but pointed out that edX was not integrated in Chalmers system at that point.

The teachers had various thoughts about edX, especially teachers who already used blended learning were skeptical. One argument was that they already had a course on another platform and

did not have time to recreate the material on a complete new platform. Still, the majority of teachers was positive, especially those who wanted to create a course from start. Teachers pointed out that simplicity and usability were the two foremost benefits of the platform. However, some uncertainty prevailed about Chalmers investment on blended learning education. The project group informed that the edX introduction meeting is just one part of the strategy and a lot of more information and help will be provided soon. They also pointed out that one of the most important matters for the project group was to understand the teachers' needs of support.

6.1.2 WORKSHOPS ABOUT BLENDED LEARNING PROJECTS

These workshops were arranged for all teachers with quality funding projects. The aim of the meetings was to help the teachers with their projects and inform about the existing blended learning support at Chalmers. The invitation mail to the meetings mentioned three issues; the aim of the meeting, what the project group want to know from the teachers and a request for the attendance to do a presentation about their projects.

The meetings were in small groups of 2 to 5 people from the funded projects and 2 people from the blended learning support group. They discussed their ideas and problems with the support group and each other. Some teachers had just started with their projects and needed help and feedback about course structure. Teachers that already had produced their courses, assisted with their knowledge and experiences.

6.1.3 FLIPPED CLASSROOM WORKSHOP

This workshop was organised by the blended learning support group and arranged for all teachers interested in the Flipped classroom teaching approach for courses at Chalmers. It was a half day workshop and consisted of both discussions and presentations. The blended learning support group and between 30 to 40 teachers were attending. The support group explained that the aim for the meeting was to increase the knowledge about blended learning by pointing out the help and support opportunities provided at Chalmers. The aim was also to create a forum for teachers to make it easier for them to discuss and help each other.

The workshop started with a short introduction of the blended learning project group and clarification of the agenda. Next followed an exercise, the main part of the workshop. Teachers were given the task to create a plan for a new blended learning course and then discuss the idea in small groups. The results from this exercises varied a lot between the teachers, some of them had

already a clear plan about their courses even before the workshop started, while others had a rough time to come up with any ideas.

Two presentations were made after the exercise. The first presentation was about a teacher's earlier experience with creation and running of a Flipped classroom course. After the presentation numerous questions were raised, with a majority concerned how the collection of statistics could be done and also how the teacher collect information about student progress. The second presentation was about video production. Teachers asked questions about the production support provided at Chalmers what recording devices they could use and what technology they could borrow from the blended learning group.

6.2 Interviews

The section is divided in three subsections, following the topics formulated in the data collection chapter.

6.2.1 EARLIER EXPERIENCES WITH AND KNOWLEDGE ABOUT E-LEARNING

All teachers had at least some earlier experience with E-learning. Four of them had been enrolled to one or more distance courses, and one of them had taken a master programme completely at distance. All teachers knew about Pingpong, since everyone had used it in their own courses. Just a few had enrolled in a Pingpong distance course. Similar platforms were also mentioned, such as GUL and Frontliner and two teachers did not remember.

All teachers knew about Chalmers introduction of MOOCs, but a majority of them did not have any earlier experience or knowledge about the edX platform. Three teachers had enrolled or used a MOOC earlier, two from Coursera and one from edX, no other platform was mentioned.

“I first heard about edX when it was introduced together with the MOOC project in our department, didn't know what it was in that time”

Of all teachers who had earlier experiences from distance education or MOOCs, all except one were positive towards MOOCs. They believed the main reasons for a good MOOC were good teachers and interesting tasks in the courses. The negative aspect from the courses was mostly the lack of interaction between the enrolled students. In addition to that, one of the interviewed did

not like the teachers in the course. Another one thought it was too easy to be complete these courses.

Teachers, who had used E-learning in their education, had a lot of thoughts about it, both in regarding to advantages and disadvantages. Half of the interviewed teachers had used Pingpong to more than just administering students, and one teacher had a distance course connected to the platform. The most commonly used functions by the teachers in Pingpong were the documents and handout functions. Less common were the usage of videos and quizzes.

“I have only used the Pingpong platform, but mainly for administration and some other simple task. I have tried to do other tasks, such as creating student tests, without succeeding.”

Around half of the interviewed teachers liked the student administration functions in Pingpong, mainly because it was integrated with Chalmers courses and students. Some teachers even said that it was easy to do administrative tasks with the platform. However, three of the interviewees did not like the platform, and nearly everyone were somewhat skeptical to the platform when used for E-learning activities. Some teachers criticized that it was hard to create new course materials, because they often did not know how to do it. A few teachers had comments about the scale of the platform - it was too big and had a lot of functionalities, which they thought no one needed to use. Finally, one interviewee said that students did not like this platform.

“The problem with Pingpong is the difficulty to create simple question tests and be able to upload recorded videos, there must exists platform where this is way simpler to accomplish”

Other platforms were also used, and some teacher express that they needed a complement to Pingpong. A few of the interviewed wanted better student statistics, and some asked for improved video streaming or better quizzes and grading systems.

6.2.2 ATTITUDE TO BLENDED LEARNING AT CHALMERS AND IN EDUCATION

No matter if a teacher taught a distance course at Chalmers or just has been using a few functions in Pingpong, all agreed that the use of E-learning techniques has strengths as well as weaknesses. However, the teachers had different opinions about the critical factors that are necessary to succeed with E-learning.

One of the most critical factors regarding E-learning education was the challenge of having personal meetings between students and teachers, and also between the students themselves. All interviewees mentioned this aspect and half of the participant perceived it as the greatest challenge in distance education. The teachers argued that personal meetings increased the learning outcome and also made a course more interesting. One teacher claimed that the learning that occurs when students help each other are better than the learning coming from the literature or teachers. The majority thought that blended learning, in form of flipped classroom, were lectures watched online and group activities and discussions done in the classroom, which they thought was a much better approach compared to traditional teaching.

“In E-learning there must exist some kind of personal interaction between the teacher and the students, else I believe it’s not so learning effective, the personal meetings are really important”

Another benefit of E-learning that was mentioned by about half of the teachers, mainly the ones that had used E-learning in their courses before, was the possibility to track the progress of the students. Tracking made it easier to understand how well the student manage different tasks and exercises. The teachers that used statistics were also eager to collect even more data, but usually did not have the time for it. One teacher used statistical tools for reviews about the course itself, which according to him helped a lot.

“It’s really important for me to be able to collect statistics about the students so I better can adjust my teaching and also know if any student need some extra help. I would like to be able to collect a lot of more statistics to make it even better.”

One third of the interviewees mentioned the advantages of blended learning for the student point of view. Students can work in their own pace and it will also reduce the lecture time. At the same time, nearly as many teacher argued about possible problems when students work for themselves. That they could easily fall behind if they lack the motivation. Two teacher suggested mandatory moments in E-learning to solve this problem, because students often skip course activities, if it will not be included or tested in the examination. Two other teachers had noticed that some students get tired at the lectures, and that blended learning may fit them better.

Comments about workload and time spent for teachers outside the classroom were also an important issue. Around half of teachers, both those with or without blended learning courses, pointed out that it will require a huge amount of time to create blended learning or distance courses. It takes effort to think everything through and create material in advance. One teacher said that it is easy to change a lecture from time to time, but it is a lot harder to do the same for an already recorded video. And two teacher mentioned a collision in the planning phase of a course, when lectures need to be recorded at the same time as the plan is created for the course.

“It took a tremendous amount of time to develop my E-learning course, a lot more than I thought from the beginning, and it’s not only that, It also always requires time to maintain and update my course for every new semester”

Teachers said that it is already a challenge to get enough time to plan a course. So the teachers that had blended learning courses had often worked overtime to produce the E-learning activities. Even so, the interviewees agreed that if it is done in the right way, it can in fact save time in the long run. On an overarching level, some teachers believed that restructuring of the education system is necessary in order to succeed with blended learning.

6.2.3 KNOWLEDGE ABOUT THE SUPPORT AND HELP AT CHALMERS

When teachers were asked about Chalmers’ strategy, help and support with E-learning, the answers were similar among the interviewees. Most teachers did not know so much about this, no matter if they had applied for quality funding or not. They all knew about the existence of the blended learning support group which could help them to develop blended learning courses. The interviewees wanted different types of help from the group depending on earlier experiences. Teacher who had developed blended learning materials said that they did not need the technical help, for example to develop courses on a platform, but would need help and tips to be able to record videos with high educational quality. While the interviewees who had not worked so much with E-learning said that it was important to have someone who could help them to use the technology.

7 DISCUSSION

The aim for the thesis was to investigate and answer three questions, each of the questions is discussed in the sections below. The questions are answered with the help of the results of all three data collection methods.

7.1 What challenges and benefits do teachers believe exists with E-learning used in higher education?

The results show that knowledge and experiences about E-learning varied a lot between teachers. Still, some topics were more frequently discussed than others. Chalmers MOOCs was one of them, which may not be a surprising results. Chalmers had used different channels to inform teachers about this concept, and as mention in the results, some teachers also discuss about MOOC projects at their institutions.

The first interesting finding from the results was the absence of comments about Flipped classroom and blended learning, while the concept of distance education was well-known by the teachers. The reason for this is probably that teachers do not use the word blended learning. Instead, the word E-learning appears to be used more frequently to describe both blended and distance education. Nearly the same applies to the concept of Flipped classroom, which at least was mentioned by a few teachers, but still not used by so many. This was a bit surprised when looking at the literature which showed a lot of example of how good the flipped classroom approach was, such as the large faculty survey (*College Faculty, 2015*). But this may not mean that the teachers at Chalmers had heard about this learning approach.

Another interesting finding was that teacher with more experiences with E-learning in education tended to have a particular perception of E-learning at Chalmers, while less experienced teachers had a significantly different view. The more experienced teachers mentioned the possibility to collect statistics and follow the students' progress, and therefore better understand how to create efficient E-learning materials, but also talked about the disadvantage, how time costly it was to develop and change E-learning course. While less experienced often pointed out the importance of creating E-learning which the students would think is interesting and more learning efficient. These two approaches highlights one important theme, the learning outcome. It shows how eager teachers are to make the teaching as good and learning effective as possible, not use technology because they can or to make it easier for them. Where the experienced teachers had a more analytic view on it, or wanted to measure the learning outcome, not only just use E-learning as such.

These findings was somewhat in-line with the studies from the literature, which pointed out that the reason to use E-learning was often to improve quality in education or reduce cost in learning (*Bates, 1997*). The quality in education can be closely connected to both teachers will to improve learning outcome by making interesting E-learning, but also for collecting statistics to improve the

education in the long term. While the reducing cost aspect, from the literature, wasn't mentioned at all by the teachers. The reason for this could be that teachers usually don't have the economic responsibility.

There were also questions, for which the answers did not depend on the experiences of the teachers. The first one was regarding the earlier experiences of E-learning, namely if a teacher had taken an online course or similar, before teaching one at Chalmers. Some teachers had done this and some had not, but no evidence could be found that more experienced teachers had used more E-learning before, or vice versa.

The third interesting finding was the large focus on the Pingpong platform, which all teachers had experienced with. This was a dominating theme during all interviews. Other platforms were also talked about, but these were just used sporadically by some of the teachers. The experienced teachers either used more functionality in Pingpong than less experienced, or did use another platform. Less experienced teachers seemed not to have experiences with any other platform than Pingpong, and they mostly used it as an administration platform.

It may not be a surprising result that teachers knew so much about Pingpong, because it is the platform that is used in many courses at the campus, for the administration of students and course materials. Another finding from this was that many of the teachers expressed a somewhat negative experience with the platform. They tended to like the administration part, but did not want to interact with the platform apart from this basic function. Their comments also suggest that the students tend to not like the platform as well. This shows that teachers seem to generally have a negative attitude towards Chalmers's most widespread E-learning platform.

The findings from literature described that it requires some skills to do the simplest task in E-learning, mainly creation of videos and administration, which make it understandable that the teachers' choice to stay with a platform they know the most about. This points out the importance of having an easy-to-use E-learning platform that requires lesser skills in these two competences. Good E-learning does not necessarily require more complex functionality but the literature states that a wide spread of different E-learning modules, more than videos, such as quizzes and assignments, would favor more learning styles. This will require teachers to have even more knowledge about E-learning and its techniques to be able to get full use of the edX platform.

At the meetings, teachers often discussed with each other about E-learning, either how they manage to work with it or how they wanted to work with it. The results also show that the teachers had a lot of different knowledge and experiences, but the platform Pingpong was often mentioned. For the most part, the answers were similar to the interviews. However, one additional matter, which was brought up here, were licenses and copyrights for the online material. Teachers were unsure about what happens with materials that were put online, and what they were allowed and not allowed to do with it.

The collaboration between teachers themselves and with staff did not seem like any problem, which would make it easier for teachers to start using and evolving E-learning in their courses, as long as they had the time and knowledge. This is also in-line with the literature, which states that teamwork between teachers often works well and that the universities are willing to support teachers with E-learning.

7.2 How do teachers want to work with E-learning techniques?

The teachers raised a lot of questions during the edX meetings about how E-learning should be used at Chalmers, such as, if edX should replace Pingpong, or how copyright material in E-learning worked. The stated agenda of the meeting was about the functions and use of the edX platform, but it seemed the teachers had a lot of other concerns as well. Later, when the teachers were asked about edX in the interviews only one had started to use the platform. The conclusion could be that the teachers' needs at that moment, when edX was introduced, were not so much about the technical side of the new platform, but it was more important to make them understand what was going to happen with E-learning at Chalmers.

The following up meetings and workshops hosted by the blended learning group addressed the needs of the teachers better. In these meetings the teachers explained and discussed about their problems and thoughts about using E-learning. As mentioned before, the more experienced teachers wanted to make their E-learning activities even better, while less experienced wanted to focus on how E-learning material, mostly videos, could be created. This was also in-line with the work of the blended learning group, which had both recording studios and equipment available to the teachers.

The literature also describes the different reasons to use recorded videos instead of classroom education, but neither in the meetings nor in the interviews did anyone mention the advantages with recorded materials for students with disabilities, which the literature pointed out as one of the important reasons. Only the reasons to rehearse and catch up information were mentioned.

From the results it is also clear that the teacher wanted to use one platform that has everything necessary to run an E-learning course, so more advanced activities, such as simulations, did not appear to be so critical. This would mean that teachers only needed basic functionality, which must be simple to use, because of the lack of time for teachers. The results indicate that videos,

sharing documents and quizzes are the functions that the teachers desired the most. But another aspect is also essential for them, the administration of students, which can be managed in Pingpong. The platform also has the basic functions, which in that case would in principle be a platform fitting the teachers basic needs.

It is also interesting to do a comparison between Pingpong and edX, because these two platforms are the ones that the teachers talked the most about, and these platforms are also the ones that Chalmers is promoting. While Pingpong has the necessary functions, teachers are somewhat negative towards the creation and administration of course materials. On the other hand, teachers seems to like edX, because of the easy to use platform, that is nevertheless not integrated in the Chalmers system. Still, it could be used, but will most likely require more time for teachers to perform administrative tasks, such as inviting students. The problem of switching platforms seems not to be a potential decrease the students' learning outcomes, but the time and effort teachers need to spend to create and administer course materials.

7.3 What do teachers know about the support and help provided from Chalmers university?

Not so many teachers knew much about the blended learning support at Chalmers, and they did not know what the project group did. Still, the result shows that some teachers knew about a recording studio at Chalmers, or the possibility to enroll to a course about Pingpong or blended learning. There was no correlation between the experiences of a teacher and what they knew about Chalmers blended learning support. As mentioned in the results, teachers who had developed E-learning activities had done it mainly without the support at Chalmers. This could be explained by the fact that the implementation of Chalmers' blended learning strategy was still in an early phase.

As it seems when the interviews were conducted, the work of the project group had not progressed very far, and because of that teacher did not know much about them. More insightful are the teachers' perceptions that were expressed during the first meetings. The way questions were raised by the teachers, it can be concluded that they had high expectations towards the project group. They would like to understand what was going to happen and how it would affect them. As mentioned before, the blended learning project team could not give any clear answers, because the purpose was to understand what kind of support the teachers needed, which also was clarified at the meetings. It would probably have been more productive, if the agenda of those meetings had been about blended learning at Chalmers, instead of the edX platform only.

At the quality meetings and blended learning workshop teachers uncertainties towards using E-learning changed a bit and they seemed to become more open to this way of teaching. As already

mentioned, the approach at these meetings was more focused on the teachers' problems and questions. The project group also had more time to explain their responsibilities and functions at Chalmers. It is clear that the teachers had a lot of thought about E-learning and wanted to understand more, at least the ones attending to this kind of meetings. This also addresses another issue, the importance for teachers to meet each other and share experiences. So in the end, the strategy to let teachers help each other and let Chalmers organisations organise and facilitate these communications, appears to be a good approach for knowledge sharing and to create an increased awareness about E-learning teaching.

On this meeting just a minority of teachers attended. It seems like Chalmers needs to increase the awareness about this strategy over the whole campus, not only providing the help to the teachers who knew about it, but also for the ones that do not. Because at the meetings and workshop, which the blended learning support group hosted, both techniques and interesting topics have been discussed that should be of value for many more teachers. This is also something that the literature points out as an important factor to succeed with E-learning, to educate the whole university and make everyone aware of this teaching approach. Chalmers still seems to have an organizational plan about E-learning education, which is something that the literature states as something important to have to be able to succeed.

One approach to make teachers more aware of this plan could be to work more actively with institutions/departments. At the time of the interviews, just a few teachers said that they work with blended learning at their department. By trying to find a responsible person at the department level that would be more active in promoting blended learning, information about benefits and support for blended learning could be communicated more broadly the institutions/department could e.g. finance projects or facilitate the teachers' development. However, it may also be important to notice that E-learning is not the perfect solution for everything. There will probably be teachers that do not want to use E-learning in general and there are also courses where E-learning does not fit due to the content and scope.

8 CONCLUSIONS

8.1 Answers to the research question

The aim of the thesis was to understand Chalmers teachers' expectations and perceptions about using E-learning and what support they would need. The first conclusion that can be drawn, relates to Chalmers teachers' attitudes and perceptions towards the use of blended learning, or flipped classroom. The following benefits for the use of blended learning could be identified: First of all, teachers think it will increase the learning outcome, which is also confirmed by the literature. Second, some of the teachers said that they liked new technology and wanted to try new stuff, which also is a good criteria to combine E-learning with classroom teaching. Third and last, with the support from Chalmers, teachers could produce E-learning activities without it taking too much time from ordinary classroom planning.

Teachers could also see problems with blended learning, particularly the E-learning components, these could be identified as the main reasons: First, teachers believe personal meetings are critical, both between students themselves and with the teachers, which is not possible, or at least hard to conduct, with distance education. Second, teachers also seem to like classroom teaching more. This was not pointed out in the interviews, but the ambivalence towards creation of E-learning in courses would prove this statement, or at least that classroom education is easier to work with. It is also important to mention that Chalmers approach to education so far was to have classroom teaching, not any distance courses, which could further have strengthened the teachers' opinion against it. Third and last, it takes time for teachers to create E-learning. As mentioned, the planning phase is different and requires more allocated time, which they seem to be short of.

The second part of the research question was about teachers' need of support for production and pedagogy of E-learning activities in their courses. The following conclusions can be drawn from the findings from the results: Teachers primarily want to use technology that makes it as easy as possible to create E-learning activities, and are well integrated into Chalmers courses and students system, because they believed that administration and learning of new technology takes a lot of time. However, it is a significant difference between the activities teachers want to use in E-learning. Administration of students, courses and video uploads were all desired functions in a platform. Quizzes were also a popular request. Teachers also preferred to meet and discuss with each other in order to share experiences and knowledge.

8.2 Limitations

The case study required several limitations to be able to narrow down the wide research area. Firstly, the teaching and learning in blended learning approaches consist of elements inside classroom and outside. The scope of the master thesis only dealt with the E-learning that occurs outside a classroom. ICT (information and communication with technology) in the classroom was not concerned.

Secondly, the aim for the thesis was to understand and analyse the teachers' thoughts. No data collection was therefore made regarding what the blended learning support group or other actors at Chalmers (e.g. leadership) believed or knew about the teachers' thoughts and needs.

The last limitation was about the research question's scope. It is the teachers' overall thoughts about E-learning that was examined, especially how they worked, or wanted to work with the technology. It was not within the scope to understand details about teaching and planning of courses.

8.3 Findings for Chalmers Professional Education

The master thesis was carried out for Chalmers Professional Education and one of the delivered products were the findings of the master thesis.

The results will certainly help the company in two ways to develop courses with E-learning. Firstly, they have the possibility to get help and support from the blended learning support group. Secondly, the company have usages of their thoughts, because teachers from Chalmers are hired for the professional development courses. From both the literature and the results it is clear that production and administration of distance courses could be rather problematic, at least in the planning and producing phase. Topics regarding the understanding of technology, responsibilities, the continuous administration, rules and regulations, need to be considered.

Chalmers Professional Education believes that the edX platform can be of good use when they develop new distance courses. They understand that it is a rather complex task to develop new kinds of teaching approaches, and it requires some changes in the organisation. In general, the company is satisfied with the findings, although there was nearly no experiences of course development with edX among the teachers, which the company had wished for.

8.4 Future work

This study was conducted to understand teachers' thoughts about blended learning at Chalmers. But this was only one way of doing it, there exists other approaches too. At this time the teachers, especially those with blended learning projects have begun to develop their courses and it could therefore be possible to evaluate this process, either from the students' or teachers' point of view.

It could also be interesting to understand how widespread the use of blended learning is among courses at Chalmers and how teacher work with it. Such a study could be conducted as a quantitative approach instead of a qualitative one.

This report also had the limitation to not collect data about technology used in the classroom, which could be a big part of flipped classroom - to understand how IT is used in the teaching at Chalmers, and could advantageously be studied in another master thesis.

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