

Co-Teaching is Great! – But Only if There is Time: Teacher Perspectives on Online Co-Teaching

Taina Eriksson, Minna-Maarit Jaskari and Päivi Kinnunen

Abstract

In response to recent societal trends and growing demand for online education, several higher education institutions are building online curriculums and collaborating in teaching. There is an extensive body of literature of student experiences in online teaching, but more research is needed on teacher experiences, especially when courses are co-taught across universities. To examine the advantages and challenges of co-teaching in large-scale online courses, we collected survey and interview data during 2017-2019 from 16 teachers who have been teaching in the national “LITO - basic business studies” online module. Based on a qualitative analysis, the advantages and challenges were classified into three distinct categories: teacher, student, and university levels. All in all, numerous important benefits were identified, with peer-support, sharing, and networking being among the more significant ones. Organizational support for co-teaching was identified as being a critical factor enabling the benefits.

Keywords:

co-teaching, higher education, online teaching, large-scale class, qualitative research

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1. Introduction

Higher education is faced with various changes internationally (see e.g. Kennedy et al. 2016; Marcelo and Yot-Domínguez 2019), and Finland is no exception in this matter. The measures universities take to meet the challenges affect everybody at the university from upper management, staff, and faculty to students. In this study, we investigate how teachers experience an initiative that aims to tackle both the expectation to offer more online education and national expectations regarding collaboration between universities.

The universities in Finland, where this study took place, face new challenges and demands due to both external and internal powers. On one hand, there is the internal drive to specialize in selected focus areas, and on the other hand, the government urges the universities to differentiate and collaborate¹. The roadmap for the national vision in higher education towards 2030 was published in January 2019 (Ministry of Education and Culture 2019). It emphasizes digitality and modularity to enhance the accessibility of higher education. In addition, the roadmap puts an emphasis on collaboration in e.g. producing open access materials.

Universities are also encouraged to enhance their online and distance education. There are several reasons behind this. First, students' expectations regarding higher education are very high and somewhat different from previous decades. Most notably, they expect more freedom in deciding when and where to study (cf. Tomlinson 2017). Second, universities are encouraged to think about how to answer the demand for life-long learning challenges (Laal and Salamati 2012; Opetus- ja kulttuuriministeriö, 2018). Third, in addition to these demands, the technologies that are utilized in higher education develop all the time. Technological development opens new opportunities, but it also challenges conventional pedagogical methods (Lucas 2016). All in all, higher education, in general, is undergoing turbulent times and universities need to adapt to the change.

Finnish business schools have responded to these challenges through a national online study module known as "*LITO*² - basic business studies" which offers a minor in basic business studies to a growing group of university students. The idea for LITO was initiated in 2015 and teaching started two years later. The purpose of the LITO study module is to add to the students' work-life skills through a pedagogically solid, scalable online offering. Business studies supplement the know-how developed in the major studies in many other fields, such as engineering, social sciences, or medicine. This initiative is also a novel approach to university collaboration and an exceptional opportunity for the teachers to co-teach across university boundaries.

In the 2017-2018 academic year, LITO was launched as a collective effort of ten Finnish universities. LITO consists of eight online courses (each 5 ECTS³) ranging from marketing to accounting and management to business law. All courses are completely online courses. This means that teachers and students do not meet face-to-face. All the teaching happens in an online learning environment⁴ that has been acquired specifically for the LITO study module. Therefore, it is not tied to any university, but students and teachers can access the environment with the username of their own university.

The decision on how the eight LITO courses are organized in practice is given by teachers

1 In the Finnish system, the universities are autonomous organisations, yet they receive most of their funding from the government. Hence, the government funding scheme has a great impact on what the universities choose to do.

2 The abbreviation LITO is derived from the Finnish name of the study module "Liiketoimintaosaamisen opintokokonaisuus"

3 The European Credit Transfer and Accumulation System (ECTS). 5 ECTS course requires approximately 133 hours of work.

4 The learning environment is Blackboard Open LMS (Learning Management System)

who have the responsibility for the pedagogical choices in the courses. The only boundary conditions that teachers have are the curriculum of the LITO study module, the time span in which the course has to be organized and the requirement of scalability for hundreds – or even thousands – of students. Using ideas and concepts of distance education introduced by Moore (2013) the implementations of LITO courses vary slightly from each other. Some courses are more *structured* than others in the sense that in some courses, students are totally free to choose the order in which they study the course topics, whereas, in some other courses, the structure suggests a more uniform advancement from one topic to another. The type of feedback on learning students receive, the kind of evaluation used in the course, and the kind of interaction that is fostered in the course also vary from course to course. For instance, some courses use peer evaluation as the main evaluation method whereas in some other courses, evaluation is done solely by the course instructors. In one quantitative course, the course evaluation is based mainly on automatically-graded assignments. The requirement of scalability restricts the *interaction and dialogue styles* between teachers and students that teachers are able to plan in their courses (cf. Anderson and Dron 2011). The common feature of all LITO courses is that they require a high level of *autonomy* from the students.

The courses have been running since October 2017 and the number of students has been growing. Currently, the average number of students registered for each course is nearly 400, and the volume is expected to continue growing steadily⁵. Thus, there is a need for teaching resources, but also for innovative approaches to online co-teaching. Scalability of the courses is one of the leading ideas of the study module and hence the teachers need to find pedagogically sound methods that scale well. Moreover, the teachers are typically not located in the same city but are geographically apart, which adds complexity to their collaboration and interaction. In addition to advances in teaching, the success of the national collaboration in university teaching also calls for renewal on the administrative side. Traditionally the administration has been organized to support teaching and studying within a single university. Teaching collaboration between universities on a larger scale calls for developing the information exchange between universities and information systems.

Universities made the decision on who teaches which course based on the teachers' expertise and interest. In this way, universities that were well known for, for instance, marketing courses, were able to offer their course also to the students from other universities. In LITO, 25 teachers are co-teaching online courses in teams of two to five people. In most of the courses, the teachers come from two to three different universities. How the teachers structure the course and divide the responsibilities is up to the teachers to decide. To our knowledge, even though there has been extensive research on online teaching and distance education in general, earlier research on teacher experiences on co-teaching in an online learning environment is scarce (e.g. Zawacki-Richter et al., 2018, Zheng et al. 2016). However, in order to support the development of discipline-based online courses, it is important to understand what the advantages and disadvantages of co-teaching in this specific context are. Thus, the LITO study module serves as an interesting context to study co-teaching in an online learning environment with a relatively large number of students. More specifically, *this study aims to fill the research gap mentioned earlier by examining the advantages and challenges of co-teaching in large-scale online courses.*

⁵ Based on student numbers, LITO courses can be categorized as large-scale courses. They are different from massive open online courses, where the student numbers may grow to hundreds of thousands (e.g. Zheng 2016). However, also LITO courses aim for scalability.

This paper proceeds as follows. First, we briefly visit the earlier literature on co-teaching with the focus on online education. Then we discuss our methodology and proceed to present our findings of teacher experiences on online co-teaching, both advantages, and challenges. Finally, we give suggestions to online educators and program managers about co-teaching. This study contributes to the online co-teaching literature, especially in large-scale courses highlighting the importance of the teachers' experience and demonstrating the variety of nuances invisible to earlier research.

2. Advantages and challenges of co-teaching

Teachers working together is definitely not a new phenomenon. Several concepts have been used to study this, such as teacher collaboration (Vangrieken et al. 2015), team teaching (Vesikivi et al. 2019), and co-teaching (Rytivaara and Kershner 2012). Teacher collaboration is an umbrella concept covering several aspects of teachers working together, not just teaching. For the purpose of this paper, we have focused on co-teaching and define it as two or more teachers working together with the students and sharing the work, i.e. planning, organizing, delivering, and assessing. However, as we are interested in co-teaching in an online learning environment, we departed from several earlier definitions (Bacharach et al. 2008; Bacharach et al. 2011; Cook and Friend 1995) that include physical space in their definitions, whereas in our study, we looked into online learning environments. Moreover, in our study, co-teaching also involves specifically collaboration across universities. These are the two distinctive features of the study at hand. Therefore, this study offers new insights into co-teaching in the absence of physical proximity between the teachers by highlighting for instance the significance of the division of labor.

Based on teachers' roles and responsibilities, several co-teaching strategies can be identified (Bacharach et al. 2008; Cook and Friend 1995). For example, the *one teach one observe* co-teaching strategy means that one teacher has the main teaching responsibilities while the other is observing specific behaviors. Close to this is the *one teach one drift* strategy in which the other teacher teaches and the other assists students with their work, monitors behavior, or corrects assignments. In the *station teaching strategy*, the instructional material is divided into parts and each teacher teaches one group of students which then rotates from one teacher to another. In the *parallel teaching strategy*, the students are divided into groups and each teacher teaches one group with similar instructional material. *Supplemental teaching strategy* conveys that one teacher works with the students on the expected skills level while another teacher focuses on those students needing extended or remediated material. The *alternative or differentiated teaching strategy* implies that teachers aim to reach common learning objectives using different approaches, while the *team teaching strategy* implies that the teachers are actively involved in the teaching at the same time with no prescribed division of authority. In the *team teaching strategy*, two or more teachers can also take turns to deliver sessions (Dugan and Letterman 2008). This so-called tag rotation approach or what we refer to in this study as the *theme-based co-teaching strategy* allows teachers to align content according to their professional expertise and knowledge base (Money and Coughlan 2016). Moreover, these themes can be presented not only by teachers but also by guest lecturers and other knowledgeable professionals.

The traditional co-teaching approach perceives teachers basically in two different set-ups: either so that one teacher is more knowledgeable on the topic and the other assists, or so that one is a general teacher and the other is a specialized teacher (Bacharach et al. 2008). The

theme-based co-teaching approach posits teachers either at the same level on the same topic or on the same level with different topics or even different disciplines, such as business and engineering. Typically, the teachers share the leadership and responsibilities in the classroom (Thousand et al. 2006).

Despite the extensive literature on co-teaching in special education and teacher education, little is known about co-teaching in other fields in higher education. Money and Coughlan (2016) contributed to filling this gap by examining student experiences on delivery methods in computer science. They compared team-taught courses with courses taught by an individual teacher and found that individually-taught courses were preferred. The advantages identified in individually-taught courses include consistency and continuity of course content and advice and familiarity with the teacher's teaching style. However, the students' experience was that they might be missing out on knowledge in individually-taught courses. Thus, the advantages in team taught courses were a greater insight into the topic (Bacharach et al. 2011). However, the students identified challenges of overlapping content, conflicting communication regarding assessment, and that the team teachers not taking ownership of the course. Also, Helms et al. (2005) found that students may feel uncertainty to know which teacher to contact if needed as well as concerns about the disparity in grading.

Earlier research on co-teaching highlights its positive outcomes for teachers. Co-teaching allows teachers to develop their knowledge base, expertise, and pedagogical skills. The teachers may see the teaching through the learner's eyes and avoid repetitive, isolated, and sometimes insecure solo teaching experiences. Teaching together may build collegial relationships, foster mutual respect, and in the case of interdisciplinary teaching, gain new insights, and build bridges across disciplines. Thus, co-teaching allows the teachers to grow professionally (Vesikivi et al. 2019; Bacharach et al. 2008; Thousand et al. 2006). More specifically, it has been reported that co-teaching in an online environment helps to meet the needs of the online learners in a more timely and efficient manner, and provides greater satisfaction to both students and teachers. Competent co-teachers can complement each other and provide students with greater insight and opportunity to view topics from different perspectives. Also, co-teaching may help in giving more in-depth feedback to the students (Scribner-MacLean and Miller 2011). The challenges faced when teaching together are not so well reported, noting that team teaching requires teamwork skills and more planning than individually-taught courses (Baeten and Simons 2014; Helms et al. 2005).

3. Evolving online education

Online education is a rising trend. Around one-third of higher education students have taken at least one online course and the trend is growing (Allen and Seaman 2017; Best Colleges 2019). As the European Union and the Finnish Ministry of Education and Culture are encouraging universities to plan education for lifelong learning purposes, the same trend is expected to continue in Finland (Ministry of Education and Culture 2019).

Anderson and Dron (2011) describe how distance education has evolved from postal correspondence to mass-media-generated content to interactive online learning. Indeed, technological changes have been a great driver for distance education and contemporary technologies allow us to use technology for intelligent and flexible learning. Also, the pedagogy and learning designs within distance education have evolved, transforming online education from cognitive-behaviorist pedagogy into constructivist and even connectivist pedagogy. The cognitive-behaviorist pedagogy of distance education emphasizes the personal construction of

knowledge. Learning is seen as measurable changes in knowledge and behaviors. The locus of control is the teacher and the instructional design stresses clearly defined learning objectives that exist apart from the learner and the context of the study. Learning activities include individual activities such as reading and watching and evaluation is based on what can be recalled, for example, in form of a quiz or exam. Scalability of such courses is high as many of the assignments can be prepared in advance and feedback can be automated. This kind of pedagogy that focuses on individual learning is useful when online education is independent of place and time. Students can progress at their own pace and receive feedback once the assignments have been completed.

The constructivist pedagogy of distance education is based on social constructionism and it focuses on the social construction of knowledge. Teachers are not the locus of control, rather they act as an instructor, coach, or learning facilitator. The students are not seen as passive recipients of knowledge but actively engaged knowledge creators. New knowledge is seen to build on earlier knowledge, thus having an individual meaning. Learning activities often include group-based discussions, construction, and creations through which students reflect on their learning based on their readings and peer discussions. The focus in evaluation is on how knowledge is created and methods such as essays or diaries are used. The scalability of constructivist online courses is low (Anderson and Don 2011), as there may be more than one correct answer but the interest in evaluation is in structures, arguments, and representation of knowledge.

The aim of the connectivist pedagogy of distance education is to include technology and connection making as learning activities. By doing this, the learning moves into the digital age, where information is plentiful (Siemens 2005). The learner's role is to have the capacity to find and apply knowledge where and when it is needed - not to memorize (Anderson and Dron 2011). Connectivist learning pedagogy stresses informal learning as a significant aspect of the learning experience, thus learning is seen as occurring in a variety of ways over the learner's life (Siemens 2005). Teachers' role shifts towards being a collaborator who creates the content of the study with the learners (Anderson and Dron 2011). The connectivist pedagogy sees learners as active and engaged in learning and expects enough autonomy and self-control to work in connectivist learning environments (Kop and Hill 2008).

All three generations of pedagogies are present nowadays, but the adoption of a certain pedagogy or a combination of pedagogies affects the way online courses are planned, taught, and assessed (Anderson and Dron 2011). For instance, a loose course structure that allows students to study the course topics in the order they want gives more freedom for individual students but makes it more challenging for a teacher to initiate and facilitate various dialogue styles. Peer discussions, for example, are challenging if students are studying the course topics in a different order. Thus, choosing between the preferred pedagogical approach and course design is a balancing act where the pressure of scalability and the freedom that students expect to have when studying may have a strong effect on the actualized course design. The LITO teachers had the freedom to apply whichever pedagogy, or combination of pedagogies, they felt were the most appropriate for their own course. The quality of teaching was assured by emphasizing the relevance of intended learning outcomes and content to the target audience, the importance of constructive alignment in course planning, and monitoring the student feedback and course completion rates.

Both the pedagogy and the number of students affect the role of teachers (Lowenthal et al. 2018). When student numbers get very high or even massive, it is impractical to work

alone, even if this has been typical in traditional lecture-based teaching. Indeed, when teaching large-scale courses, the teachers may face multiple challenges that scale-up compared to traditional teaching. For example, Zheng et al. (2016), interviewed 14 instructors from massive open online courses (MOOCs) and found five key challenges associated with MOOCs: logistical complexities collaborative work; scaling to meet expectations; extreme criticism, and reputation risk; and insufficient support. Whereas the focus of our study was on large-scale courses, it can be assumed that the same themes will occur, but on a smaller scale.

Based on the earlier research there is an understanding of co-teaching in the physical classroom setting (Bacharach et al. 2011), however, not so much in online settings. Moreover, contemporary attempts to foster collaboration between universities is not studied in a co-teaching setting - to our knowledge. Thus, more knowledge is needed about teachers' experiences of co-teaching in an online learning environment when working in collaboration with other universities. In order to fill this research gap, we specified the following research questions for the empirical part:

1. What co-teaching strategies are used in different large-scale online courses that are taught in collaboration with other universities?
2. What advantages do the teachers experience in teaching in large-scale online courses that are taught in collaboration with other universities?
3. What challenges do the teachers experience in teaching in large-scale online courses that are taught in collaboration with multiple universities?

4. Methodological choices

In order to grasp teachers' experiences, the empirical part of the study was conducted using qualitative research methods. Data were collected with a qualitative online questionnaire (Fink 2003) and semi-structured interviews (Kvale 1996) conducted over Skype. In addition to the data from teachers, we analyzed steering group meeting memos.

In order to understand how the teachers experienced online co-teaching, we gathered data from those who had been developing the LITO courses and taught in them. The teachers' experiences were collected with multiple rounds of inquiry in the different phases of the project. The first round of data collection was done in September 2017 when the first courses were about to start. At this stage, most of the teachers had at least started building the online course on the learning platform and they had collaborated in the teacher team in planning the course. The primary purpose of the first round of data collection was to serve as background information concerning the teachers' relationship with online teaching.

This initial data collection round fed into the later rounds by giving the research team an understanding of the teachers' starting point and their earlier experiences. The initial questionnaire was broad and allowed the teachers to bring up a variety of issues they perceived as being important. See Appendix 1 for the questions.

The second round of data collection was done in spring 2018 after the teaching for the first academic year had been completed. Data were collected via semi-structured interviews conducted over Skype. The program manager interviewed eleven teachers so that at least one teacher from every course was interviewed. The interview questions are included in Appendix 2. The idea was to have open-ended questions so that the teachers could emphasize the issues that they had experienced as important during the first academic year when all of the courses

were implemented for the first time.

The data collected during the interviews highlighted the importance of co-teaching experience and it led to focusing the study on co-teaching in an online course. Therefore, the teachers were asked in more detail about their co-teaching experiences after the second academic year. They were asked to respond to a short online survey with open-ended questions (see Appendix 3). Table 1 summarizes the empirical data that were collected.

Table 1. Data collection timeline

TIME	DATA COLLECTION METHOD	PURPOSE	INFORMANTS
September 2017	Online questionnaire	Mapping the teachers' starting point	8 teachers
April-June 2018	Interviews	Examine the experiences from the first implementation	11 teachers
May 2019	Online questionnaire	Gather the reflections after two academic years	10 teachers

Sixteen teachers participated in the data collection. Three teachers were included in all three rounds, seven were included in two rounds and six were included in only one round. Approximately 23 teachers were involved in developing and teaching the courses during one academic year. There was some variation between the initial planning phase, the first academic year, and the second academic year. Yet, the numbers varied only slightly between academic years. Hence, a good proportion of the teachers involved were reached. The researchers put an effort into having responses from at least one teacher on every course.

In addition to the data from the teachers, we had access to the meeting notes of the project steering group. The data set included the notes from 15 steering group meetings from January 2016-June 2019. A list of the times of the meetings and the main themes of each meeting are listed in Appendix 4.

The steering group notes served in analyzing the advantages and challenges of teaching collaboration between universities. This is an essential part of the teachers' experience as it is the context in which they work and where they need to balance between the requirements of their own university and the national cooperation initiative. Understanding the context in which the teachers work is essential for understanding their experience of co-teaching.

Data were analyzed after every data collection round and hence each round fed into the following data collection effort. The initial survey responses were analyzed relatively briefly since they provide a background understanding of the teachers' relationship with online teaching. Since the amount of data was relatively small, the analysis was done by summarising each respondent's responses and looking into recurring issues in the responses.

In the second data collection round each interview was recorded and transcribed verbatim. The data were analyzed with qualitative content analysis and the researchers searched for recurring themes in the data. The approach to data-driven content analysis was conventional when the researchers approached the data with an open mind and their goal was to work out what had been important for the teachers during the first academic year (Hsieh and Shannon 2005). Having identified co-teaching as the most outstanding theme in the teachers' responses, the researchers scrutinized all the responses that were linked to co-teaching.

Finally, the data from the third data collection round focused on the outstanding theme identified in the interviews. Also, these data were analyzed with qualitative content analysis,

but with a directed approach, because the scheme for analyzing the content was derived from the understanding based on the literature and the earlier collected data (Hsieh and Shannon 2005).

5. Findings and discussion

The main phases of the project and the themes the steering group had been dealing with are illustrated in Figure 1.

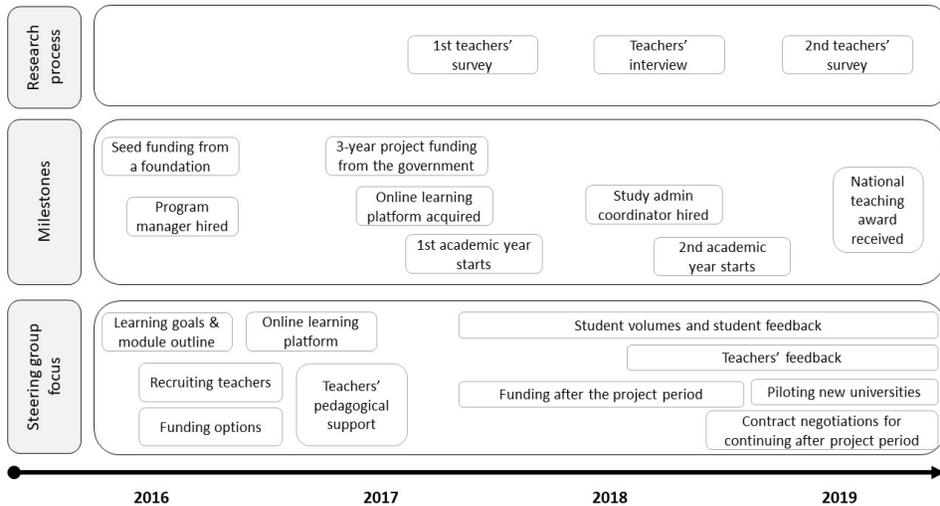


Figure 1 Timeline of the LITO project

As can be seen in the figure and in Appendix 4, funding has been a focal theme that the steering group has discussed during the early years of the study module project. It is noteworthy that the discussion on funding did not stop when project funding was received, but the work continued towards finding a more sustainable solution that integrates the study module into the operations funded by the university budget from the government.

In addition, the steering group maintained a focus on the numbers of students, as the goal was to create a scalable study module. In addition to pedagogical challenges, also the administrative challenges create a critical bottleneck for scalability. The processes and information systems do not support collaboration across universities, and therefore there is an urgent need for development. Quality was another focal theme and the steering group paid considerable attention to the feedback. In addition to the feedback from the students, the program manager also reported the feedback from the teachers from the beginning. Based on the discussions on student numbers and teacher feedback on the workload, the steering group asked teachers to refine some solutions that had not been sufficiently scalable.

The initial survey with the teachers revealed that the LITO teachers are typically open to new technologies and are quite willing to experiment with new tools and methods in their teaching (Kinnunen and Eriksson 2018). This is not surprising since the teachers were willing to take part in the project that was about developing a novel online study module in collabo-

ration between universities. In addition, the teachers shared a positive attitude towards online teaching. Yet, they also seemed to share an understanding that there are also numerous potential challenges, thus their expectations were quite realistic.

Based on the data from the two latter rounds, we identified two modes of co-teaching: a “Theme-based co-teaching” strategy in which each teacher is responsible for a specific theme and a “One teach one drift” strategy in which one teacher is responsible for the teaching and the other(s) take care of other tasks around teaching, for instance, grading assignments and giving feedback. The first-mentioned strategy was more common, as six out of eight courses were taught using the theme-based co-teaching strategy.

“We had weekly themes and each teacher had the same number of themes. Other tasks were divided rather equally.”

In the course that used a “Theme-based co-teaching” strategy, the teachers agreed on the content to be taught during the curriculum planning and divided the contents so that each teacher was assigned specific parts of the course. Most of the courses were organized around weekly modules, so each teacher had N weeks when they are in charge of delivering the course.

Teachers recognized various advantages and challenges of the large-scale online study module taught in collaboration between multiple universities. The advantages and challenges related to teachers themselves, students, and the university.

Table 2. Advantages and challenges of co-teaching identified by LITO teachers and the program manager.

TEACHERS
Advantages <ul style="list-style-type: none"> – Sharing ideas between teachers and developing the course – Peer support for assurance & backup (in terms of pedagogy, substance, online teaching) – Networking – Shared responsibility = shared workload – Focusing on the parts of teaching/content where one has most expertise – Professional development through co-teaching (including peer-mentoring) – Being involved in creating the future of higher education – Teachers can be more present on the online course due to shared responsibility (e.g. week-based division)
Challenges <ul style="list-style-type: none"> – Unequal division of labour (particularly challenges in planned vs. realised workload) – Finding time for communication between the teachers – Finding joint time for planning sessions – Not having possibilities for frequent face-to-face interaction with other teachers.
STUDENTS (BASED ON TEACHERS’ PERCEPTIONS)
Advantages <ul style="list-style-type: none"> – Teachers more available to students, because there are many of them – Interaction typically with more than one teacher and hence access to multiple perspectives
Challenges <ul style="list-style-type: none"> – Students do not know which teacher to contact – Getting multiple replies when one teacher does not know that the other one has already replied (confusing if there are differences in the teachers’ responses)

UNIVERSITY (BASED ON TEACHERS' PERCEPTIONS)
<p>Advantages</p> <ul style="list-style-type: none"> – Collaboration between universities allows for division of labour – Possible to offer a range of courses to own students without the necessity of teaching all of the courses with own resources – Possible for universities to focus on the operations that establishes a profile for them – Teacher's professional development through co-teaching (peer-mentoring) – Diffusion of proven practices in and out of the university – Being involved in creating the future of higher education – Teaching collaboration between universities will have an increasing importance in university funding from the government
<p>Challenges</p> <ul style="list-style-type: none"> – If the division of labour becomes unequal there is asymmetry between contributing universities (the costs may become an issue) – Processes & practices related to joint teaching (no standardized procedures and e.g. procedures of evaluating teachers' workloads vary) – Administrative processes vary between universities + are very labour-intensive in university collaboration, because of old isolated information systems – Providing enough study guidance for students as the online LITO-studies are very flexible

Advantages for teachers

All the teachers mentioned that they valued and felt motivated by the fact that they were involved in creating a national-level initiative that represents a new approach to higher-level education. The teachers' overall experience of co-teaching was positive even though the LITO experience was the first time most of the teachers had been involved in teaching a large-scale online course and/or it was their first co-teaching experience. The most notable advantage of co-teaching appears to be the opportunity to share responsibility and new insights. As one of the teachers put it:

“One major advantage surely is the fact that the responsibility is shared, and the one teacher doesn’t have to prepare everything by himself. In total, more time is required to prepare “a lecture” on an online course for the masses but there are more hands sharing the work. For an individual teacher, the shared responsibility releases resources for other tasks. From the self-development side in teaching, the shared course gives an insight to practices in other universities and is good way to network too.”

The quote above also highlights the benefits of co-teaching across universities. All the teachers who were involved in teaching courses that were organized in collaboration between two or three universities reported that they experienced positive gains from the collaboration.

Having a team makes it possible to enable the students to experience good quality learning without creating an overwhelming workload for one teacher. In addition to having multiple persons sharing the workload, the teachers also experienced many professional and social benefits. Many teachers emphasized the networking aspect that is particularly featured in collaborations between several universities. The teachers also seem to perceive strategic benefits in co-teaching:

“[I got] New ideas for online teaching and also good practices and ideas for other teaching/courses. It has also been “nice” to hear that other universities have the same kinds of problems and challenges. So, we can share experiences, knowledge, practices and basically all the elements related to teaching and university life.”

“It is a kind of shared responsibility for teachers and they can teach a course together even if they are in different cities or even countries. It creates a strong teaching network that is necessary for our dynamic world”

Teachers felt that in addition to sharing the actual workload (in terms of work hours), it was beneficial to have at least one other teacher available for support if they wanted to get someone else's opinion on their ideas. Hence, teachers perceived that it was important in a large-scale online course that the other teacher who was knowledgeable of the course details provided assurance when needed; a kind of mental support when one might feel insecure. This is understandable as the teachers were creating something completely new and had to deal with multiple uncertainties during the process. Since the courses were open to a wide range of students, teachers did not know about the students' background beforehand, except that they were university students, teachers had to examine the scalability of the working methods and the workload of the students carefully. In addition, most of the teachers were not familiar with the specific online learning environment.

Advantages for students

Regarding the advantages of co-teaching for the students, the teachers developed an understanding based on student feedback. The students appeared to value the presence of multiple teachers since it was easier to get advice when needed. Also, students perceived the interaction with multiple teachers as being an advantage when it offered multiple perspectives on the course content for the students. This was evidenced by the following quote from one of the teachers:

“This co-teaching online course has some advantages for students because they became familiar with different perspectives and ideas and they will have more opportunity to discuss one subject from different dimensions”

Advantages for university

At the university level, co-teaching across universities also offers novel insights. Teachers' collaboration can help in diffusing proven practices in large-scale online education. In addition, the collaboration in selected areas enables universities to make strategic choices in allocating internal resources. In terms of image, it is also important to be part of an initiative that renews higher education.

Challenges for teachers

Teachers also identified several challenges in co-teaching in a large online course. The most notable challenge related to the realized amount of work and the actual division of labor. In many cases, the number of hours allocated in the teachers' annual work plan for teaching large-scale online courses was insufficient. Therefore, the teachers faced conflicting demands, and the level of commitment varied between them.

For the teachers, the situation was particularly challenging when the planned division of labor was equal, but the realized division was not. In some cases, the differences in teachers' commitment and other work assignments led to situations in which one teacher took care of the teaching duties planned for another. The situation was problematic if the changes were not explicitly agreed upon amongst the teachers. The absence of a hierarchy between the teachers

made working very flexible and equal. Yet, when the teaching team consists of peers, talking about the uneven workloads was challenging for teachers. One of the teachers reported that when the course was running: *“I felt that one of them didn’t do anything unless being asked, which was uncomfortable”*. When there is no hierarchy between the teachers, a team member avoiding responsibility could become a critical issue that is difficult to handle. It seems that this is a critical challenge that needs attention both at the course level (communication between teachers) and on the organizational level (allocating resources).

Differences in the teachers’ level of experience in using online tools also led to inequality in some cases. This kind of experience was reported by one teacher: *“I think we have aimed at 50/50, but for example, with peer evaluation, I took the responsibility as I know more about that tool.”* However, in cases where the experience factor was considered in the division of labor, it did not cause problems between teachers. Another challenge a teacher identified in their own work related to the complexity of the task (that is building and teaching a scalable online course) that is amplified when the teachers are located in different cities and only rarely have the opportunity to meet face-to-face.

Challenges for students

The most notable challenge relating to students relates to communication. In a course in which there are several teachers, students may be confused about which teacher to contact. In addition, the chance that different instructions could be received from different teachers or different universities’ study offices could be an issue. Teachers reported that there were some individual cases in which the student received different information from the teachers and the study administration. This is a challenge of teaching collaboration across universities.

Challenges for university

Based on the data, it became evident that time and resource allocation are critical development needs on the organizational level. There is an obvious and compelling need to re-examine the way the workload of a large-scale online course (or online teaching in general) is evaluated. Teachers felt that it would be important that collaborating universities would have some uniform system of how teachers’ workload is estimated and how that workload is considered in teachers’ work plan. The differences in university customs in calculating teachers’ workloads sometimes posed challenges in the division of labor. This is linked to a broader discussion on the overall appreciation of online teaching and calls for more attention in the near future if high-quality online teaching is to be pursued.

Another challenge for universities that became evident in teachers’ responses related to the need for study guidance. When the flexibility in courses increases, the student must assume greater responsibility for their own progress. In terms of study guidance, cross-university collaboration in the form of online teaching is a potential challenge. The student’s home university needs to put extra effort into providing study guidance. It is important that the student knows where to get advice if they have questions on the suitability of the courses for their degree etc. Also, the teachers need to know where they can refer the students to with questions that need to be dealt with e.g. a study counselor. When the university boundaries blur in the kind of teaching collaboration described here, it may be difficult for the student to identify where to get answers for which questions.

6. Conclusions

In this study, we investigated university teachers' experiences in co-teaching and what teachers perceived as advantages and challenges related to co-teaching in the context of large-scale online courses taught in collaboration between universities. A *theme-based co-teaching* strategy in which teachers divided the teaching responsibility by themes (Dugan and Letterman 2008) was used in the great majority of LITO courses. Only two courses utilized a *one teach one drift* type teaching strategy, where the other teacher was more responsible in teaching and the other in assisting the teaching. Despite delivering differing contents, all the courses had to meet the key criterion of being scalable and being taught completely online. Hence there are connections between the choice of pedagogy and the requirements the courses had to meet (Andersson and Dron 2011). Based on the study, it is clear that despite there being a tradeoff between the degree of freedom teachers have and the coherence of the study module, it is necessary to have a relatively strict frame within which the courses are planned and executed. In the context of online co-teaching, having a clear framework for the course enables focusing on the content and the pedagogical choices. Nonetheless, it is beneficial if teachers can be involved in defining the boundary conditions of the course frame.

Teachers' experiences of co-teaching in the LITO online courses were mainly positive, which corroborates earlier research that has identified how teachers tend to perceive co-teaching very positively (Bacharach et al. 2008). However, when the focus of the research was on co-teaching in the same physical space by Bacharach et al., our research suggests the same in an online learning environment. Teaching online brings more complexity to teaching because of physical and social distance as well as technical challenges. In general, many of the advantages and challenges teachers mentioned related to teachers' daily work or processes and strategy work at the university level. Particularly the adaptability and flexibility that is the sum of online teaching and co-teaching became highlighted.

Many of the advantages of co-teaching identified related to teachers' professional development through peer support and mentoring and diffusion of good practices. For instance, teachers appreciated the opportunity to network with other teachers and discuss pedagogical issues with each other. This result corroborates the earlier studies on the focal advantages of co-teaching (Vesikivi et al. 2019; Bacharach et al. 2011; Bacharach et al. 2008; Thousand et al. 2006; Cook and Friend 1995). The teachers also appreciated the opportunity to learn how the other teachers utilized technology in their teaching. Moreover, in addition to the professional development aspect, the teachers also appreciated the opportunity to consult with a colleague who is knowledgeable about the course. The uncertainties related to developing and teaching a novel study module probably highlight this need. Hence, it is important that collaborative initiatives of this type acknowledge the teachers' need to get a second opinion and to share and discuss their choices with knowledgeable colleagues and potentially also expert advisors.

Teachers appreciated the opportunity to share the teaching responsibility and workload. Co-teaching also made it possible for teachers to be more available for students during the course thus adding possibilities for interaction and dialogue between students and teachers. Also, since there were several teachers teaching in the course, the teachers felt that students had access to multiple viewpoints on the topic. These findings are similar and confirm earlier research by Money and Coughlan (2016). At the university level, teachers perceived the co-teaching between universities as an opportunity to offer a wider range of courses to their own students without the need of teaching all the courses with their own resources.

Similar to the findings of Zheng et al. (2016), this study shows that complex collaborative

work is a challenge, and in this case, it culminates in communication when there are very limited opportunities for face-to-face interaction. For instance, finding enough common planning time between teachers or establishing clear interaction procedures between students and several teachers were experienced as challenges. In addition, the challenges of co-teaching between several universities were also related to the varying administrative procedures and isolated information systems. However, the teachers did not mention the risks related to reputation and criticism identified in earlier research by Zheng et al. (2016). This may be due to the study context. Zheng et al. focused on massive open online courses, whereas the focus in our study was on large-scale courses in which student numbers were restricted.

Based on the challenges the LITO teachers experienced, we conclude that time is one of the essential factors that affect the positive co-teaching experience. This is aligned with earlier research (Bacharach et al. 2008; Helms et al. 2005; Baeten and Simons 2014) that found that co-planning is one of the vital success factors in effective co-teaching. Indeed, allocating enough time for teachers to develop and teach the course is essential. This means that explicit discussions (between co-teachers and teachers and their own university) are needed to clarify how much time each teacher can allocate to teaching. These kinds of discussions are likely to diminish the risk of unintentional uneven distribution of labor among teachers. In addition, the aforementioned agreement on how much work online teaching realistically includes, is very important for the future development of online co-teaching. For online teaching collaboration to succeed in the longer term, the teachers must have the resources needed. This is tightly linked to the appreciation and being respected as a skilled professional. Furthermore, teachers need more support (technical, pedagogical, and administrative) in the context of online co-teaching (across universities) compared to other types of teaching.

In addition to these challenges, it is noteworthy that also the administrative challenges in teaching collaboration across universities have an influence on the teachers' experiences. The ambiguity of administrative processes as well as delays in getting students' grades registered, all create additional pressures on the teachers as they are the contact point to students with urgent questions. Hence, it is important to develop also the study administration to enable smooth processes so that the teachers do not need to solve any extra questions.

Another essential aspect that warrants more attention in co-teaching an online course is the interaction practices between the teachers. The results of this study corroborate Helms et al. (2005) notion that it is important to agree explicitly on the practical issues like how students know whom to contact, who answers the students' questions, and what the most suitable ways are for teacher teams to interact within the team.

All in all, our study highlights the dynamics between the teachers on a co-taught online course. Because the interaction also between the teachers is mainly virtual and face-to-face meetings are rare, there is a great need for explicitly agreeing on e.g. the division of labor. Any deviances to what has been agreed need to be addressed. This is a challenge when the course is co-taught in collaboration between multiple universities. It is also important to acknowledge that communication requires an extra effort in this context, and it must be allocated sufficient time in the teachers' workplan.

The study has limitations that stem from the choices described above. The findings of the study are not generalizable due to the limitations of the data and the focus in the selected context. In addition, the number of informants is limited. The aim of the purposeful selection of informants was to collect data on information-rich cases that were interesting from the perspective of this study (Patton 2002). Hence, it was natural to limit the group of informants to

include only teachers who are involved in the LITO project and hence share the experience of developing and teaching a large-scale online course (within the LITO project). Despite these limitations, the study offers valuable insights into the teachers' perspective on co-teaching and highlights issues that are important for future work in developing teaching collaboration between universities.

In order to gain a holistic understanding of the advantages and challenges of co-taught online study modules, there is a need to focus on student experiences as well. Indeed, LITO provides an interesting context to study student experiences, as students are diverse in their backgrounds, representing different disciplines. In the future, we will expand our research interest to cover students' experiences and viewpoints in co-taught online courses. Also, future studies need to focus on the point of view of university management and pedagogical leaders of large-scale co-taught online courses and study modules in order to gain a better understanding of the implications of co-teaching on the universities as well as on collaboration between universities.

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Appendix 1

Questions: Teachers' initial survey

1. Name
2. Year of birth
3. Highest degree (M.Sc. or PhD)
4. Job title
5. University
6. Work experience in a university (years)
7. Teaching experience in a university (years)
8. How many ECTS of pedagogical studies have you undertaken?
 - a. Have you undertaken the teacher's pedagogical studies 60 ECTS?
 - b. If yes, which year?
9. Does your university offer pedagogical studies to teaching staff members?
10. Does your university require you to take pedagogical studies if you wish to be promoted in your career (e.g. tenure/lecture track positions)
11. Which one of the following statements describes you as a teacher the best?
 - a. I am actively developing new, innovative teaching methods/I am usually the first among my colleagues who tries new teaching methods.
 - b. I am usually among the first ones to try new teaching methods.
 - c. I usually adopt new teaching methods only after I have heard my colleagues' experiences of how the method works.
 - d. I usually adopt new teaching methods only after most of my colleagues have experiences of how the method works.
 - e. I do not usually see any reason to adopt new teaching methods. The methods I have used work still well.
12. Which one of the following statements describes you as the user of educational technologies the best?
 - a. I am usually the first one to try/develop new technology.
 - b. I am usually among the first ones to try out new technology.
 - c. I usually adopt new technology only after I have heard about the experiences of it from my colleagues/friends.
 - d. I usually adopt new technology when most of my colleagues/friends have had experiences with it.
 - e. I am usually among the last ones who adopt new technology.
13. What would you consider as the strengths of online courses?
 - a. From a student's perspective
 - b. From a teacher's perspective

- d. From the university perspective
- 14. What would you consider as the challenges of online courses?
 - a. From a student's perspective
 - b. From a teacher's perspective
 - c. From the university perspective
- 15. How many hours you have reserved for
 - a. Planning the course (only your part)?
 - b. Planning the course as a team?
 - c. Teaching the course (only your part)?
 - d. Teaching the course as a team?
- 16. What best practices you have identified in course planning?
- 17. What has been the most challenging in course planning?

Appendix 2

Questions: Teachers' second survey

1. Name
2. Year of Birth
3. Highest degree (M.Sc. or PhD)
4. Job title
5. University
6. Work experience in a university (years)
7. Teaching experience in a university (years)
8. Have you previously taught and / or designed an online course?
9. How many ECTS of pedagogical studies have you undertaken?
 - a. Have you done the teacher's pedagogical studies 60 ECTS?
 - b. If yes, which year?
10. Does your university offer pedagogical studies to teaching staff members?
11. Does your university require you to take pedagogical studies if you wish to be promoted in your career (e.g. tenure/lecture track positions)
12. Which one of the following statements describes you as a teacher the best?
 - a. I am actively developing new, innovative teaching methods/I am usually the first among my colleagues who tries new teaching methods.
 - b. I am usually among the first ones to try new teaching methods.
 - c. I usually adopt new teaching methods only after I have heard my colleagues' experiences of how the method works.
 - d. I usually adopt new teaching methods only after most of my colleagues have experiences of how the method works.
 - e. I do not usually see any reason to adopt new teaching methods. The methods I have used work still well.
13. Which one of the following statements describes you as the user of educational technologies the best?
 - a. I am usually the first one to try/develop new technology.
 - b. I am usually among the first ones to try out new technology.
 - c. I usually adopt new technology only after I have heard about the experiences of it from my colleagues/friends.
 - d. I usually adopt new technology when most of my colleagues/friends have had experiences with it.
 - e. I am usually among the last ones who adopt new technology.
14. Use of work hours on the LITO course
 - a. How much time did you use to plan and prepare the course?
 - b. Which tasks took the most significant proportion of the time? (e.g. transferring teaching materials to the online format, making videos...)
 - c. How much time did the whole team of teachers (responsible and assisting teachers) use for planning and preparing the course?
 - d. Which tasks took the most significant proportion of the time?
 - e. How much time did you use during the course? (Time spent on preparing, teaching, evaluations, giving feedback etc.)
 - f. Which tasks took the most significant proportion of the time?

- g. How much time did the whole team of teachers (responsible and assisting teachers) use while the course was ongoing?
 - h. Which tasks took the most time?
 - i. How would you compare the amount of time used for planning and execution of the course to a similar course that is not taught online?
15. What worked well in your course? Please elaborate on some best practice(s) used in your LITO course.
- a. What indicated that the above-mentioned practice/process worked well?
16. What challenges did you face in planning and execution of the course? How did you react to the challenges?
- a. What was the challenge?
 - b. How did you notice the problem? (e.g. did a student send a message?)
 - c. Who reacted? If nobody reacted, why was that?
 - d. What was the reaction?
 - e. What followed from the reaction? Was the problem solved?
17. What student feedback did your course received? How has the team of teachers dealt with the feedback?
18. Are you going to make any changes for the next academic year?
19. What did you learn when teaching the LITO online course?
20. Can you use the experience gained in the LITO course or the materials used in some other course? If yes, please elaborate on what and how.
21. What support and/or training would you need before your course runs the next time?
22. Now that you have produced / taught the online course, what would you consider as the strengths of online courses
- a. From a student's perspective
 - b. From a teacher's perspective
 - c. From the university perspective
23. Now that you have produced / taught the online course, what would you consider as the challenges of online courses
- a. From a student's perspective
 - b. From a teacher's perspective
 - c. From the university perspective
24. Please elaborate on your experiences on the virtual learning platform

Appendix 3

Questions: Teachers' interviews

1. Your name
2. What have you gained from sharing the responsibility for teaching the online course with another teacher/a team of teachers?
3. How did you decide about the division of labour within the team?
4. What challenges did you face in online co-teaching?
5. Would you recommend co-teaching online courses to your colleagues? Why?
6. What support has been the most helpful for you during the LITO project? (either within the project or from other sources)
7. What support would you benefit from as a teacher in organising LITO courses?
8. What works well with the [learning platform]?
9. What is challenging with the [learning platform]?
10. Any additional feedback? (Related to the above themes or anything else linked to LITO)

Appendix 4

Main themes of the steering group meetings

MONTH/ YEAR	MEETING THEMES
2/2016	Study module learning objectives and course outline
4/2016	Recruiting teachers, funding options, principles of digitality in the study module
6/2016	Funding options, division of labour in developing the courses
10/2016	Funding options, initial outlines of the courses, online learning platform selection, teachers' pedagogical support
1/2017	Funding, schedule and course outlines for the pilot academic year, online learning environment
5/2017	Contract negotiations related to project funding (received from the government), roles of the university responsible for a course and the teachers responsible for the course, pilot year student quotas
8/2017	Collecting student feedback, administrative processes, motivating the teachers
11/2017	First experiences of the courses, collecting student feedback, teaching materials, administrative processes, division of labour for the next academic year
2/2018	Preparing for the next academic year, administrative processes, course scalability
4/2018	National level university funding model renewal, student feedback, student volumes
6/2018	National level university funding model renewal, realized student volumes & course feedback, feedback from the teachers, administrative processes
8/2018	Applying for extension for the period when the project funding can be used, administrative processes, student guidelines
11/2018	Current student volumes, extending targeted student groups, preparing contract for the period after project funding
2/2019	Piloting with one additional university, preparing for the next academic year, administrative processes, preparing contract for the period after project funding
5/2019	Preparing contract for the period after project funding, administrative processes