Costs and benefits of online teaching and learning: the student's perspective

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Abstract

During the COVID-19 pandemic, all teaching and learning activities shifted online out of necessity. While in-person meetings were reinstated once the pandemic was under control, certain aspects of the online classroom have been maintained. We recognize that there are potential benefits and drawbacks to incorporating certain course activities online, as well as embracing a hybrid learning approach. To gauge the impact of online teaching activities, we distributed a survey among bachelor and master students at the Faculty of Science at Lund University. The results of the survey indicate that the vast majority of students prefer in-classroom teaching as the dominant format of teaching during their university studies, and nearly half prefer some online teaching as a complement to in-person teaching. More than half of the respondents perceived benefits of online course elements, but challenges related to reduced focus and lack of quiet space at home were stated to impede online learning. Based on the insights gained from the survey, we suggest teaching activities that aim to reduce the stated adverse effects of online teaching on student motivation. Our findings may provide input for shaping future pedagogical activities and may help to refine and optimize the learning experience for both students and educators.

Background

During the COVID-19 pandemic, educational institutions worldwide swiftly adapted to unprecedented challenges by transitioning all teaching activities to virtual platforms. Online teaching became the primary mode of instruction, necessitating a rapid shift from traditional classroom settings to virtual environments. Educators leveraged various digital tools and platforms to conduct live video lectures, facilitate discussions through virtual classrooms, and disseminate learning materials electronically. This shift to online learning happened at the same time as the pandemic forced students around the world to use physical distancing to slow the spread of the pandemic, contributing to a sense of social isolation. This, combined with the stress and anxiety associated with a global pandemic, led to record numbers of students dropping out of higher education (1).

Distance learning is nothing new, and has been in use since personal computers became commonplace in the late 1990's (2). There is a large body of theoretical and empirical work dedicated to understanding how and why to incorporate online components into classes. Some challenges that students face in the online classroom is a higher reliance on self-discipline, greater risks of avoidance and procrastination, and difficulty becoming motivated in the absence of in-person interaction with peers and teachers (3). There is also the problem of socio-economic inequality, where some students may lack the equipment, internet speed, and office space that they need to work effectively. This could help explain why students became de-motivated and dropped out during the COVID-19 pandemic.

Despite these challenges, online teaching has positive aspects for student learning (3, 4). Some examples are the possible shift in focus to self-directed learning and autonomy, the option to spend more time in class on interactive activities, and the possibility for students to have more flexibility in their schedule. This could help imbue a sense of autonomy in students, which is a central aspect of the Self Determination Theory (SDT) of motivation (3, 5). During the COVID-19 pandemic, the online teaching experience involved utilizing collaborative tools to encourage student engagement, such as virtual breakout rooms for

group activities and discussions. Assessments were administered through online platforms, ensuring the continuity of evaluation processes. Teachers often employed multimedia elements, interactive quizzes, and pre-recorded lectures to enhance the virtual learning experience. Virtual office hours, discussion forums, and collaborative projects became integral components of the online learning landscape. This transition also prompted the development of new digital skills for both educators and students, emphasizing adaptability and resilience in the face of unforeseen challenges. While the online teaching experience presented its share of hurdles, it also underscored the importance of flexibility, technology integration, and ongoing pedagogical innovation. Despite the distance imposed by the online format, educators sought innovative ways to maintain a sense of community and foster student-teacher interactions, which are important for sustaining the students' sense of connection and for experiencing a feeling of belonging, defined as relatedness within the SDT (5).

Now that the COVID-19 pandemic no longer poses a threat to society, classes have been able to shift back to in-person teaching. Many teachers use blended learning, which means using digital learning tools as a complement to in-person activities in courses. This has been described by Maria Esaiasson, a communicator for Lund's Digital Learning Environment project and coordinator at the Unit for Education Services, as "the new normal" (https://www.education.lu.se/en/article/new-normal-literature-review). The Unit for Educational Services at Lund University encourages teachers to use digital tools in their classes, and provides support for both students and teachers in how to use these tools. Blended learning is generally thought to have a positive effect on students' learning and understanding of course material (4), and empirical work shows that blended learning can have a positive effect on students' grades (3). However, online learning is often met with skepticism from teaching faculty (3) and the outcomes found in systematic literature reviews are mixed. A meta-analysis of blended learning implemented where online learning replaced some in-class time showed that learning outcomes of students were unaffected (6). In a 2019 review of studies of blended learning, the term was found to be ambiguous and most research was overwhelmingly done in small-scale studies and based on quantitative data such as students' grades (7). They highlighted that studies rely too heavily on easily-available data such as grades, and there is a general lack of qualitative data focused on the students' experiences, values, and perceptions of digital learning (7). The Expectancy-Value Theory of motivation posits that students are intrinsically motivated when they believe their learning activities are valuable and that it is possible to achieve their learning goals (8). Therefore, what students deem as valuable and attainable is essential information in order to determine how online learning affects students' intrinsic motivation.

Aim and Goal

Fully-online, hybrid, and blended learning are all used to different extents in courses offered at the Faculty of Science at Lund University. However, we know little about students' perception and value of online teaching and learning. We aim to find out more about where current students stand and what challenges or benefits they encounter in their experiences with online teaching. With this knowledge, we can identify strengths and weaknesses in the current approaches of teachers implementing online teaching at the faculty of Science, and recommend areas where improvements can be made.

Design

In order to assess master and bachelor students perceptions of online teaching, we conducted an online survey for students enrolled in programs at the Faculty of Science at Lund University. The survey was constructed using the tool available through Lund University, Sunet Survey (9). In total, 72 students answered 16 questions regarding their preferences for online learning and experiences of the virtual classroom environment. The set of questions were limited in order to keep the survey relatively short, which also helped to increase the number of respondents (Table 1). All responses were anonymous and all survey questions were voluntary.

Table 1. Survey questions and answer types.

Q	Survey Question	Answer
1	I am … years old	Numerical
2	I identify as…	Male, female, non-binary
3	I am currently enrolled in...	MSc, BSc, Neither
4	During the COVID-19 pandemic, I was enrolled in...	MSc, BSc, SecondaryEd, Neither
5	I am currently studying at the Department of	Multiple choice (departments)
6	I was born in the following country	Text
7	I have resided in Sweden for more than 5 years	Yes/No
8	My parents hold a bachelor's degree or higher from a university	Both, One, None
9	Which of the following alternatives have been part of your online learning experience?	Multiple choice (online tools/activities)
10	How much of the teaching during your time enrolled in your study programme has been online?	1 (none) to 10 (all of it)
11	Has your online learning experience been negatively affected by any of the following options?	Lack of sufficient equipment/hardware at home, Difficulties in accessing teaching material or software from home, No quiet place at home, other

12	In your experience, has online learning led to a negative or positive outcome for your opportunities to communicate with fellow students?	1 (Strongly negative) to 5 (Strongly positive)
13	In your experience, has online learning led to a negative or positive outcome for your opportunities to communicate with the teacher?	1 (Strongly negative) to 5 (Strongly positive)
14	The opportunity to watch and listen to teaching material online has benefitted my learning	1 (Strongly negative) to 5 (Strongly positive)
15	My preferences for learning online or in-class are:	1 (Always in class) to 5 (Always online)
16	I have an easier time focusing when…	In Class, Online, No Difference
17	Additional Comments	Text

Assessment and evaluation

The survey respondents primarily consisted of female students (67%). Biologists were overrepresented (73%), as were students younger than 25 years old. The experience of studying within academia varied, but most respondents were enrolled in a masters' programme (60%) (Table 2).

The majority of the students had stronger preferences for in-classroom learning over online learning. 47% held the view that in-classroom teaching should be complemented with elements of blended learning, whereas 40% of all students stated that they exclusively preferred in-person teaching at campus. A minority of 10% preferred to have most teaching online (Figure 1). Respondents #34 and #79 states:

> *"I have autism and ADHD which is why online learning has been very beneficial to me (less distractions, less anxiety about social situations). But I don't want to only do online learning since a lot of social aspects are lost to it."*

> *"I wish Lund had more online courses/programmes. Anxiety/depression and general overstimulation at campus sometimes forces me to stay home anyway. When classes are online, I never miss a single lecture, and always stay focused since I can keep the preferred volume/brightness I need. It's amazing and I miss functioning so much now that I have courses at campus."*

Table 2. Descriptive statistics of the survey respondents.

Respondent characteristics		Respond-ents (%)
Gender	Male	32%
	Female	67%
	Non-binary	1%
Enrolment	Bachelor student	40%
	Master student	60%
Enrolled during the COVID-19 pandemic	Yes, in a bachelor programme	71%
	Yes, in a master programme	10%
	Yes, in upper secondary school	13%
	No	6%
Department of study	Biology	73%
	Chemistry	1%
	Physical Geography and Ecosystem Science	1%
	Geology	13%
	Physics	1%
	Maths	0%
	Centre for Environmental & Climate Science	5%
	Other	5%
Origin	Swedish	68%
	European	25%
	Other	7%
Lived in Sweden for over 5 years	Yes	74%
	No	26%
Educational level of parents	Both hold a BSc	52%
	One holds a BSc	27%
	None do	21%
Age	19–25	74%
	26–30	22%
	31 <	4%

Benefits of online teaching

Greater emphasis on online learning within a course seem to help students who have some additional needs, such as those with a diagnosis, allowing greater freedom and flexibility for adapting the learning environment to fit their requirements. Of all respondents, 8% indicated that online learning provided beneficial conditions for concentrating and focusing on their work (Figure 1).

Pre-recorded lectures were perceived as beneficial elements of online teaching, as they provide the potential to press the pause button and rewind during the explanation of a difficult concept. Students not feeling well or with a cold may then also be provided the opportunity to learn aspects which they would otherwise miss:

> *"The benefit of online teaching is the potential to record the session and review for revision purposes."*

> *"Recorded lectures were really good for when one missed a lecture or missed some points in the lecture because not all ppts are created equal."*

Challenges of online teaching

On the other hand, technical issues with software may also impede learning from home, since not all issues can be easily solved. Slightly more than one third of all respondents found that learning had been negatively affected by technical issues or software problems (Figure 1). One respondent highlighted that students who are socioeconomically disfavored are more likely to experience issues with lack of well-functioning equipment, poor internet access or lack of quiet study space. The observation that 38% of students experienced disruptions in their learning due to issues like noise (Figure 1) suggests a potential challenge within online teaching. While online education offers flexibility and accessibility, it can also inadvertently magnify existing social and economic differences. For example, students from various socio-economic backgrounds may have different levels of access to quiet and conducive learning environments at home. Those with ample resources might have a dedicated study space, while others facing financial constraints or living in noisy environments could encounter disruptions.

Additionally, factors such as access to high-speed internet, digital devices, and a suitable environment for virtual learning can vary among students. These discrepancies may contribute to unequal educational experiences, potentially exacerbating disparities among students. The challenges faced during online teaching, as indicated by disruptions in learning environments, underline the importance of addressing socio-economic factors to ensure an inclusive and equitable educational experience for all students.

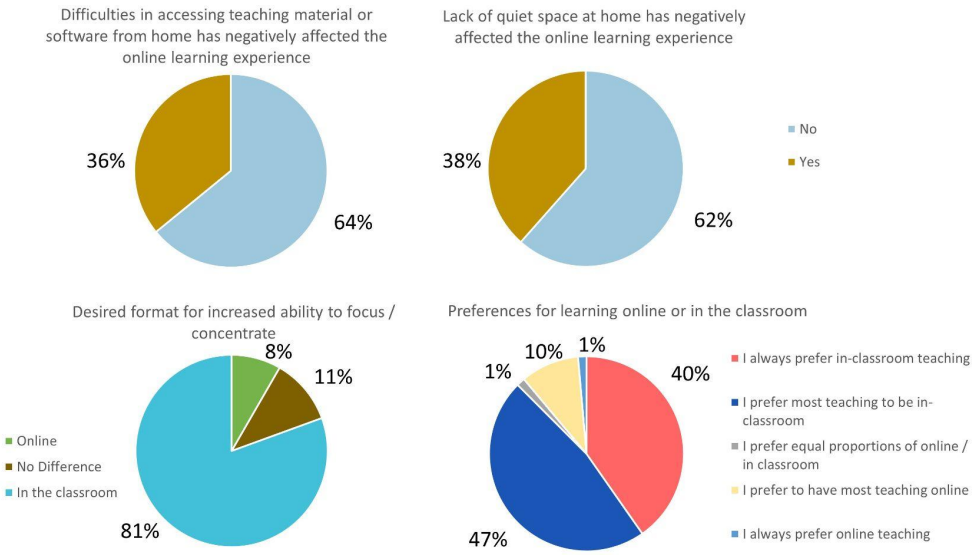

Figure 1. Respondents' perceptions of online teaching and challenges relating to accessibility, the home environment, concentration, and overall preferences for online learning.

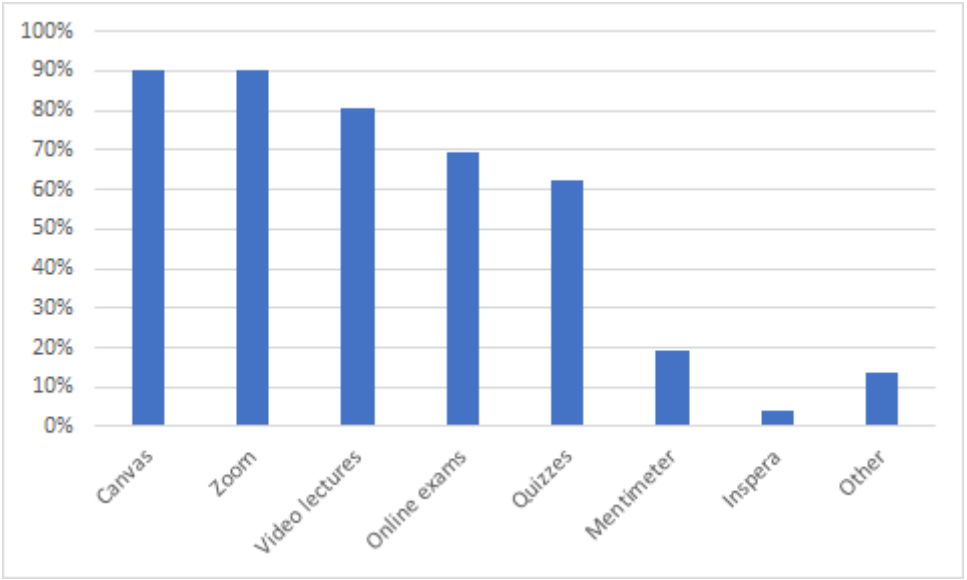

Figure 2. Stated familiarity with online activities among the respondents. The y-axis shows the percentage of students who indicated that they have participated in that activity.

Figure 2 shows the distributions of the different online tools used by the students in the survey. The Figure shows clearly that Canvas and Zoom were the most used tools.

Three respondents mentioned that very high proportions of online activities during a prolonged period of time, as experienced during the COVID-19 pandemic, were detrimental to their health as it contributed to reduced social interaction. The survey data analysis indicates that there are large differences in the share of allotted time for online learning

between courses within the Faculty of Science. Most of the courses seem to maintain low to moderate levels of online teaching activities (Figure 3).

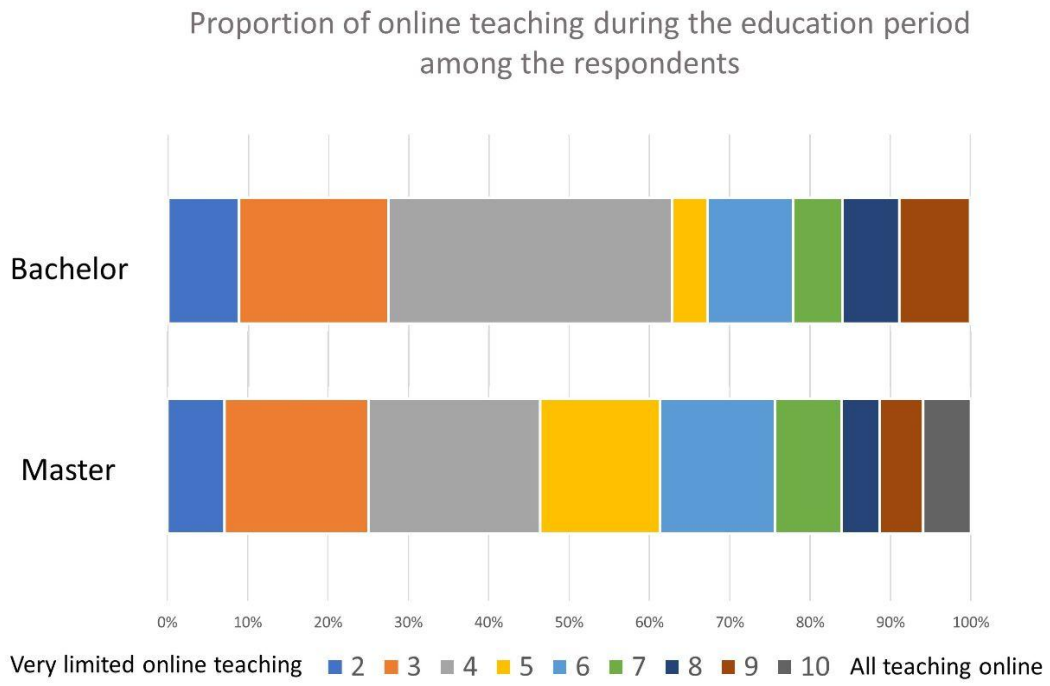

Figure 3. Stated proportions of online teaching to in-classroom teaching during the bachelor or master education period among the respondents.

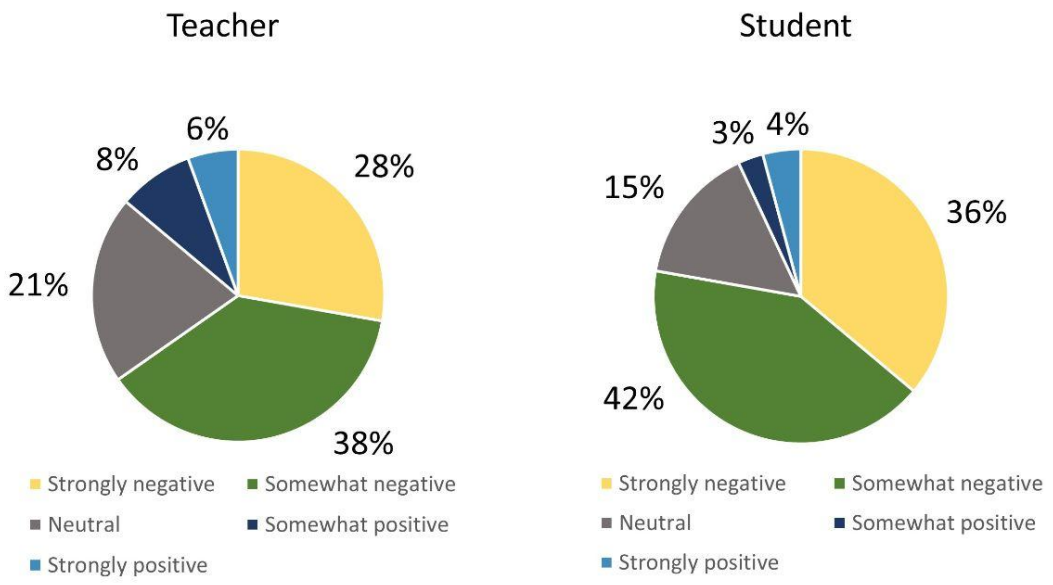

Figure 4. Perceived effects of online learning on opportunities to communicate and interact with the teacher (left) and other students (right).

Proposed changes in learning activities based on the survey results

Fully online and hybrid courses

Our findings suggest that about 20% of all respondents experience the majority of their learning through online courses in the Faculty of Science. Given that online education is a field that constantly evolves as new technology becomes available, understanding and enhancing the sense of relatedness can contribute significantly to the ongoing development and effectiveness of online teaching methodologies. We propose that in courses with very little in-person interactions, teachers should use breakout rooms for group discussions and online office hours to improve opportunities for communication between students and teachers. However, fully-online courses do not face the same barriers as they did during the COVID-19 pandemic. Virtual interaction cannot compare to in-person interaction, so if most students are studying at the same location, teachers could book study rooms for students to come together and watch online lectures or do exercises to increase their sense of relatedness. Online courses can also have an in-person event, such as a mingle or mini-conference, at some point during the course so that students can get to know each other and their teachers.

The survey results suggest that many students have experienced a lack of social connection and reduced possibility to communicate with the teacher during prolonged periods of online teaching (Figure 4). Studies have shown that reduced opportunities for interaction limit the sense of belonging, contribute to feelings of dissatisfaction, and can hamper the development of social bonds (10). We therefore propose that courses that mostly take place online should contain elements of teaching that focus on interaction and collaboration with students to a greater extent. Not only should the students collaborate in smaller groups, but preferably also engage in discussions within the whole class (11). While various tools for online communication are readily available, their optimal functionality and benefits can only be realized through increased usage and familiarity. It is essential for individuals to actively engage with and become accustomed to these tools as part of the online teaching experience.

Blended learning

We propose that blended learning approaches are more likely to suit a diverse set of needs and be more inclusive to students with reduced ability to adapt to strict in-classroom teaching. It was clear from the survey results that students value having options and flexibility. Many people responded that while they are able to focus and learn better in the classroom, they value being able to revisit the lecture at any time in case they missed something. One possible solution would be to record in-person lectures and post them on Canvas afterwards, or to offer both pre-recorded and in-person versions of the same lecture. To manage attendance, teachers could award credits for in-class activities, but with exceptions for people who miss class because they are sick or have special needs.

Assessment of proposed changes to learning activities

We recommend incorporating questions in course evaluations that specifically address students' perceptions of relatedness, access to technological equipment and software, home working environment, and communication opportunities with the teacher and peers, particularly in the context of online education. This approach is crucial for assessing whether improvements can be implemented with positive effects on a course-by-course basis. Benefits of introducing both in-person and online lectures could be assessed by using formative assessments focused on the lecture material to evaluate students' understanding.

Limitations of the study

Our approach has not specifically distinguished between responses from students who where enrolled in fully online courses and those who experienced blended learning during some course segments. We believe that the students who voluntarily select fully online programmes could be less likely to experience detrimental effects of social isolation and low relatedness since they have actively chosen that approach to learning. Additional questions to explore could also focus on distinguishing between interactive and non-interactive teaching both online and in the classroom. A larger sample size and a statistical analysis would be required in order to draw more firm conclusions on differences between students based on their enrollment, gender, or parental educational background.

Process report:

We all started with a brainstorming session to come up with ideas to pursue. JB, ERE and VS together created the survey questions. JB performed the formal analysis of the data, figure and table creation. ERE wrote the 'Aim and goals' and 'Background' sections. JB and VS wrote the 'Design' and 'Assessment and Evaluation' sections. JB, ERE, and VS contributed equally to editing the report and responding to feedback.

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Feedback summary:

We received feedback on the report from our peers and the course instructors. It was suggested that we should discuss the COVID-19 pandemic in the discussion, since it was brought up in the introduction. We were also given the suggestion to organize the results into pros and cons of online learning. It was confusing to readers when we were discussing fully-online learning versus hybrid and blended learning and we should be more clear about the differences between them. We were instructed to define theories when they are introduced in the text, to help the reader understand what we are referring to. We have made small corrections to the text for clarity and updated tables and figures. We have added a table of all survey questions to clarify the scope and format of the survey. We have added a section about how we can assess any effects of the proposed changes on students' perceptions and learning outcomes. We also discuss the limitations of our study based on the survey design.