

Article

Reshaping Sustainable University Education in Post-Pandemic World: Lessons Learned from an Empirical Study

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Abstract: The outbreak of COVID-19 has affected people all around the world. Governments had no choice but to put people in self-isolation to stop the spread of the virus. As a result, all companies and educational institutions switched to working or studying from home. The purpose of the study is to investigate the impact of COVID-19 on student teaching and learning in the context of Malmö university. Furthermore, the study proposes recommendations for sustainable post-pandemic education at Malmö University. The study includes ten semi-structured interviews with students followed by a workshop with ten senior lecturers teaching bachelor's and master's courses. The study uses snowball sampling to select students for the interviews and senior lecturers for the workshop. A qualitative data analysis technique, thematic analysis, is used for data analysis on the data collected from interviews with students and the workshop with senior lecturers. The results from the study suggested that online education leads to several benefits for students, such as better time management, higher lecture attendance, flexibility, and discipline in their studies. However, the shift to online education has caused a communication deterioration between students and teachers. Less social interaction with other students leads to depression, anxiety, and stress. The recommendations for post-pandemic education include the unified selection of digital learning tools across courses, a designated budget for digital learning tools, training support, and hybrid learning methods. In conclusion, the study proposes blended and hybrid learning to improve higher education at the university, requiring digital tools to minimize students' communication barriers.

Keywords: COVID-19; digital education; teaching and learning; sustainable education



Citation: Munir, H. Reshaping Sustainable University Education in Post-Pandemic World: Lessons Learned from an Empirical Study. *Educ. Sci.* **2022**, *12*, 524. <https://doi.org/10.3390/educsci12080524>

Academic Editor: Ching Sing Chai

Received: 8 July 2022

Accepted: 28 July 2022

Published: 2 August 2022

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1. Introduction

Coronavirus disease, also known as COVID-19, is a highly contagious disease caused by the SARS-CoV-2 virus. COVID-19 was first discovered in late 2019, and the World Health Organization (WHO) declared a pandemic on 21 March 2020 [1]. The effect of COVID-19 was significant across all sectors, and the Education sector was no different [2]. Governments worldwide have restricted people from working or studying in quarantine to stop the spread of Coronavirus as it became an existential crisis for humanity [3]. Education institutions worldwide decided to move from on-campus education to distance education temporarily [4,5]. According to UNESCO, 10,481,082 learners worldwide have been affected by education institutional closures [6]. Based on the public health authority in Sweden, the Swedish Government also announced on the 18 March 2020 that higher education institutions such as high schools and universities should provide distance education [7]. This shift from on-campus to distance learning occurred instantly, which led to significant changes for teachers and students in teaching and learning methods [8,9]. More recently, governments around the world have started easing off COVID-19 restrictions. The Swedish health authority has announced the end of COVID-19 restrictions from the 9 February 2022 [10]. Consequently, the universities in Sweden have gradually resumed on-campus teaching and learning activities. The scope of this study is limited to Malmö university and there are two main objectives of this study which are as follows.

- Investigate the impact of COVID-19 on teaching and learning due to the forced transition from on-campus to digital education at Malmö University.
- Propose recommendations for sustainable post-pandemic university education.

To address the objectives, the paper is structured in the following sections. Section 2 explains the related work, and Section 3 highlights the research questions, research methodology, and data collection methods used in the study. Furthermore, Section 4 presents the results and analysis followed by Section 6, which presents the conclusion of the study.

2. Related Work

Educational programs where teachers and students are not present at the same place are referred to as distance learning or distance education [11,12]. The idea of distance learning is not new in itself as the roots of distance learning can be traced back to the 1800s [13]. However, the adoption of distance learning accelerated in the 20th century significantly with the much-improved communication technologies [14]. Many researchers are cautious in comparing the current shift to digital education due to COVID-19 with the traditional digital education [15]. The difference can be highlighted in the speed of this forced transition with little planning, technological infrastructure, content copyright and learning outcomes.

Loton et al. [16] investigated student success and satisfaction during the pandemic and discovered that there was a dip in student satisfaction with minor improvements in the grades during digital education. Debose et al. [17] conducted a study at Midwestern university France to investigate the impact of COVID-19 on student learning during the pandemic. The findings revealed that 84.2% of beginner level students did not feel prepared for the transition to online education, and 58% of higher-level students, such as post graduate students, responded that they were reasonably prepared because they had the prior experience of taking online courses. In addition, Boggiano et al. [18] conducted a study in several English universities to reveal that the quality of education has declined in online learning due to the pandemic. However, all those institutions with stronger digital learning tools and training support for both staff and students encountered a smoother transition. Nambiar et al. [19] surveyed students' perception and experiences with digital education in colleges and universities. The results showed that students experienced a lack of interest (59.3%), lack of motivation (60%), and inability to concentrate (62%). Several other studies conducted have found a similar pattern with self-discipline also highlighted as a common problem for students during digital education [20–22].

One of the most severe consequences of a pandemic for students is self-isolation which contributes to mental health issues [23,24]. These mental health issues include anxiety, insomnia, depression, and social dysfunction in the daily life of 73% of students [23]. Unger et al. [24] conducted a study with undergraduate students in Wingate University and showed that 76% of students expressed anxiety over finishing the online semester quickly. However, the same survey was repeated after three weeks, and 53% felt less anxious. Bergdahl et al. [15] conducted a study with 153 teachers in several cities of Sweden and found out that the majority of the teachers have struggled to engage students in digital learning.

In contrast, several studies reported that digital transformation for students has been successful [21,25] despite the sudden forced online learning transition, half of the students prefer to continue online learning in the future. The key reasons attributed to this opinion are well planned semester schedules and course activities [25]. However, students who struggled with technical difficulties did not want to continue online learning. Hassan et al. [21] performed a survey, and results showed that 67% of participants strongly agreed that it is more convenient to take online classes as opposed to physical classes. The debate around how to make post-pandemic higher education has already started among researchers and university policymakers. Therefore, this study attempts to investigate the impact of COVID-19 on student learning and provide strategies for sustainable post-pandemic higher education.

3. Research Methodology

This section explains the research questions, research design, data collection method, and data analysis method. The study design steps can be seen in Figure 1. The study has followed the guidelines for designing the semi structured interview and workshop from Runeson et al. [26]. This study included twenty participants, ten students, and ten senior lectures adhering to existing literature suggestions on sample size in qualitative studies.



Figure 1. Research stages including thematic analysis.

3.1. Research Questions

We have formulated the following research question based on the objectives of the study mentioned in the introduction (see Section 1).

RQ1: What is the impact of switching from face-to-face to digital learning on student learning at Malmö University due to COVID-19?

RQ2: What recommendations can be proposed for the sustainable post post-pandemic education at the university?

3.2. Semi-Structured Interviews

The study included ten student interviews from bachelor's in the system development program at Malmö university. The recruitment of interviewees was performed using the snowball sampling method. Initially, two students were selected to be included in the sample, which in turn referred to additional participants to be included in the interviews. All interviews were performed online using zoom. Furthermore, all students involved in the interviews were given a unique ID (I1 to I10) to keep the interviewees anonymous, and their unique IDs were used to reference them in the analysis (see Table 1). All the interviewees are third-year students who experienced the transition from on-campus education to digital education during the pandemic. The semi-structured interview guidelines from Runeson et al. [26]. were used to develop the questionnaire and divided into the following parts:

- Demographics;
- Digital education experience ;
- Pandemic impact on students and university education;
- Future of university education and recommendations for improvement;
- Concluding remarks.

We performed two pilot interviews based on the initial set of semi-structured questions derived from the related work studies and further refined the questionnaire after pilot interviews. The aim was to identify the student's perception of shifting from on-campus to digital education at the university and propose improvement suggestions for post-pandemic university education. The semi-structured interview guide to conduct interviews can be found in Appendix A.1.

Table 1. List of interviewees.

Interviewee_ID	Discipline	Level
I1	System Development	Bachelors
I2	System Development	Bachelors
I3	System Development	Bachelors
I4	System Development	Bachelors
I5	System Development	Bachelors
I6	System Development	Bachelors
I7	System Development	Bachelors
I8	System Development	Bachelors
I9	System Development	Bachelors
I10	System Development	Bachelors

3.3. Workshop Design

The study included an open-ended workshop design followed by student interviews. The workshop was primarily geared towards recommendations and finding the best practices of higher education teaching in post-pandemic education to improve student learning. Ten senior lecturers from the computer science department participated in the workshop discussion held on zoom. These senior lecturers are responsible for teaching courses at the bachelor's and master's levels in the department. The workshop lasted for one hour and thirty minutes, and the author was responsible for moderating the zoom session. These senior lecturers teach a wide range of bachelor's and master's courses, including programming software engineering, research methods, and game development. All workshop participants were presented with an open-ended question about the best possible teaching practices that could be adopted going forward in post-pandemic education in the context of their experience and student learning. All participants were informed that participation is voluntary, and they could withdraw from the workshop at any given time. All participants were kept anonymous, and their data was kept confidential in the research process. The workshop guide to facilitate the discussion can be seen in Appendix A.2.

3.4. Qualitative Data Analysis Using Thematic Analysis

All interviews were recorded and transcribed as mentioned in Table 1. Afterward, thematic analysis was performed on the qualitative data obtained from the interview transcriptions [27,28]. The process for performing thematic analysis entails the following steps:

1. Familiarization with the qualitative data from interviews and workshop;
2. Coding of the qualitative data;
3. Define the initial set of themes based on the qualitative data;
4. Reviewing themes;
5. Defining and naming themes;
6. Finalize the distinct themes to answer the research questions.

The qualitative data analysis tool NVivo was used to perform the thematic analysis in the study. The first step involved transcribing the audio, reading through the text, taking initial notes, and looking through the data to get familiar with it. The second step contains coming up with the short labels or codes based on the statements from the qualitative data. The third step entails combining several codes into one theme. The fourth step included defining and reviewing each theme distinctly to make it more understandable. Finally, the analysis identified distinct themes in the qualitative data, as shown in Figure 2.

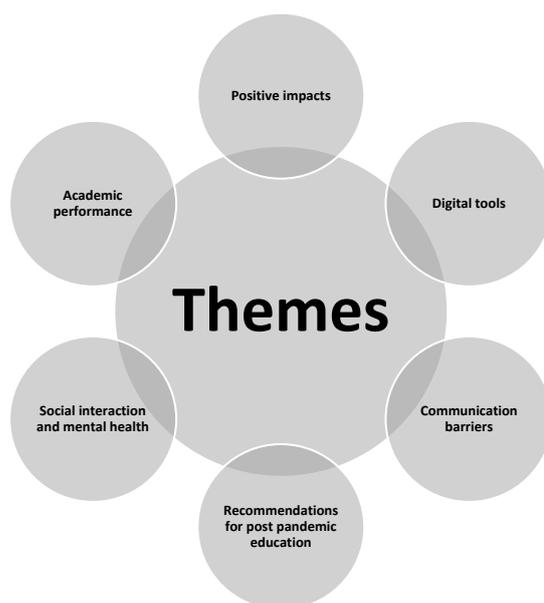


Figure 2. Distinct themes from thematic analysis.

4. Results and Discussion

This section presents results and discussion from thematic analysis performed on the qualitative data collected from the interviews and workshop. We have found seven distinct themes and reflected upon each theme in the sub-sections below.

4.1. Digital Tools

This theme refers to the digital tools used by the universities to switch from on-campus to digital teaching. Furthermore, the theme highlights the experiences of teachers and students using these digital tools for teaching and learning. Several digital tools are used for digital teaching and learning, including Zoom, Google Meet, Google Classroom, Microsoft Teams, Google Drive [15,19,22,24,29–33]. However, many tools were missing some key feature of recording introductions and instructions for students to watch lectures later [15]. Students and teachers have emphasized tools that could facilitate asynchronous and synchronous communication. Modern digital tools must allow the interaction between students, between students and teachers, and one-to-one with teachers. Several studies have reported that digital tools play an important role in convenience and good quality digital education [22,32,33]. However, these tools require some technical learning curves to work with them. Therefore, there should be a support process to handle the technical issues arising from using them in digital education. Technical difficulties have been highlighted as the most common challenge in the existing studies [15,19,22,25,29,31,33,34]. Figure 3 shows the use of digital tools used during online learning. Most of the interviewees in this study are familiar with the digital tools used at MAU. However, some interviewees struggled with technical issues. Below are a few examples of quotes related to the technical issues.

My mic does not work whenever there is an update, and I could not figure out why—(15).

Once I had a presentation during the course, but I couldn't connect and needed to install some client to make it work, which caught me by surprise just before the presentation.—(18)

Sometimes, students have trouble joining break-out rooms created by the teachers.—(12)

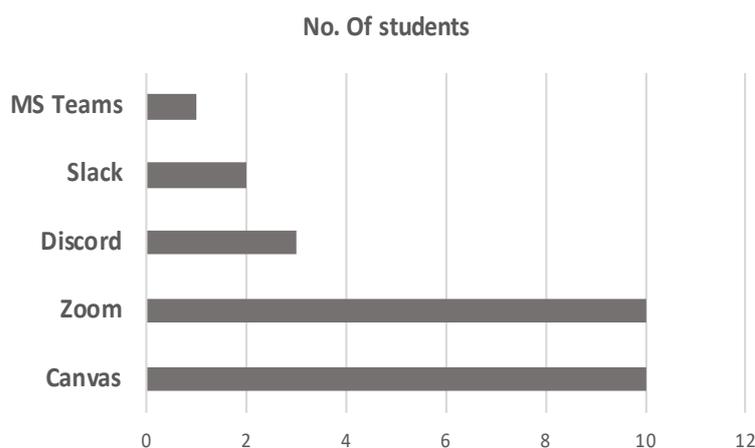


Figure 3. Students' reported use of tools for digital learning.

4.2. Positive Impacts

This theme refers to the positive impacts of distance learning because of the pandemic for students. The literature review identifies several studies reporting the positive effects on students [19–21,30,35]. First, the time-saving factor turns out to be the most important factor highlighted in the studies as the students manage to reduce the commute time to the university and utilize that time for their studies [19–21]. To further substantiate the literature evidence, most of the students mentioned in their interviews that online education saves time and is thus perceived to be more convenient. Convenience was mentioned by most students who live far away from the university, but it was not uncommon among students living nearby. Below are examples of some quotes from the interviews.

My lecture at the university starts at 8 AM and it takes me about 40 min to reach the campus. Now when the classes start at 8 AM during a pandemic, I can just wake up 10 min before, switch on my PC, and I am ready to attend my class—(I1).

It saves a lot of time for me because I live in a different city, and it takes me 70–80 min back and forth, so it saved me like an hour every time. However, even if you live in the same city, it saves you some time—(I5).

I have more time to study and free time. Taking the bus and train takes time, and it adds up, so I feel like I have more time now—(I2).

Furthermore, the time-saving factor has contributed to a healthier lifestyle as the students found more time outside the university.

I have more time for other things like working out, which positively affects me. So, I would say my health is better.—(I6)

Second, digital education led to economic benefits as well (S2). Third, shifting to online education led to flexibility for students in terms of better time management. This allowed the students to attend classes anywhere and whenever they wanted to learn more effectively at their own pace (S2, S7, S14).

There are occasions when I would skip a lecture in the middle of the day because it would require me to travel three hours back and forth. So, it is much more flexible to attend since it is online.—(I7)

Fourth, the online classes have given students complete autonomy over their learning, which contributed to enhancing the quality of the learning. Students can absorb information better and perform better than they would otherwise [20]. The explanation for that is that the student can read quickly through the course they are comfortable with and take more time for the parts they find difficult to understand. Finally, digital learning is often more student-centered, which puts more pressure on students to develop a more disciplined study schedule [21]. Students have developed more disciplined self-study habits as the

pandemic forced contact deterioration between classmates and teachers in physical campus settings [21,30]. Students also feel that online education has positively affected their attendance rate due to the convenience aspect of online education.

I think I am more likely to go to the lectures when it's online because it's way easier for me. I think my attendance rate in lectures has improved to online lectures".—(I1)

I feel like my attendance has improved because I attend my lectures on my phone or the computer. So, I would say it has affected my learning more positively because it is more convenient now".—(I5)

4.3. Communication Barriers

This theme addresses the communication barriers in teaching and learning because of switching from campus to digital education during the pandemic. The majority of studies have reported that the students believe that communication between students and teachers has deteriorated [17–19,33–36]. Eight out of ten interviewees think they have lost some or all interaction with other classmates and would much rather have more face-to-face interaction. Below are a few examples from quotes from the interviews.

It was easier to talk to classmates I did not know in a physical classroom environment since we were sitting close to each other, but now with the online situation, I only speak to classmates I know well.—(I1)

Yes, of course. Now we only communicate when we have assignments or similar things that you feel is important to ask".—(I2)

Most definitely, I have lost contact with many classmates, and it makes sense to have less communication because you do not see them very often now.—(I9)

Similarly, the interviewees mentioned the communication challenges between teachers and students as well. Five out of ten interviewees felt no significant communication difference between teachers. Two students believed that online education made it easier to communicate because they are shy and find it challenging to raise a hand to ask a question during a physical learning environment. However, three interviewees believed that pandemic has made communication between teachers and students more difficult. Below are a few quotes from the interviews.

It was relatively easy to ask questions during or after the lecture, but now we are forced to use emails. So, it takes longer to get an answer.—(I1)

I am less likely to ask questions in an online environment because I feel like I am interrupting the lecturer. It was easier to ask questions in physical classrooms because it didn't feel like you were interrupting the lecturer.—(I4)

One of the biggest changes must be the communication part of online education. It is difficult to communicate whether it's a classmate or lectures"—(I10)

4.4. Social Interaction and Mental Health

This theme addresses the social and mental health aspects of transition from physical to online education due to COVID-19. The majority of the interviewees believed that online education is less engaging as opposed to the on-campus education. The interviewees empathized that sharing a computer screen does not have the same value as attending the lecture on campus. Moreover, several studies have reported the impact of online education on student mental health [17,18,23,24]. Governments all over the world have imposed self-isolation to stop the spread of COVID-19. However, these self-isolation guidelines came at the expense of psychological health such as anxiety [23,24], depression [23] and stress [17,18] effects on university students. Below are a few quotes from the interviewees.

It feels like university is not a big part of my life anymore. I use to spent a lot of time at the university even when I am waiting for classes in between lectures and hanging out with my classmates. Now that everything is online it takes away the university student feeling—(I1).

Although the lectures run smooth on zoom, but it does not present the same feeling of attending a lecture. I feel more like a passive listener rather than an active participant—(I7)

Socially, I do not feel very involved which makes school less fun and motivating—(I10)

4.5. Academic Performance

This theme refers to the impact of online learning on students' academic performance. Several studies have reported positive [16,20,30,37] and negative effects [33,38,39] of online learning on the academic performance of the students. The students have reported having a hard time grasping course contents online as opposed to on campus classes [21,29–31,40]. There are several reasons mentioned for not understanding the concepts in the course such as environmental distractions at home [15,17,18,22], lack of self-discipline [22,30,32,40], lacking hands on experience with the labs in the course and limited online help from teachers. The majority of interviewees believed that it is more difficult to perform during online education due to lost communication with the classmates and slower response time from teachers on emails. Therefore, this affected the academic performance of the students negatively. Below are a few quotes from interviewees expressing the negative effect on their academic performance.

School is not going as very well anymore because I do not have the same communication as it was before. It is very difficult to meet new people on zoom and I do not know who I shall talk to seek help from—(I3)

It is difficult during group assignments to engage all group members because you do not see them all and cannot force anyone to turn on their camera. It is a challenge to have an engaged group and make everyone talk. In contrast, it was easier to communicate and hold someone responsible for their work during face-to-face meetings—(I6).

I think the switch to online education has a bad impact on my performance. I use to talk to my classmates and hear new things about a course assignments and exams which made me better prepared for the exams. This information has been lost and you just never know what will happen next. You just wait for a new announcement on Canvas. It is also awkward to send my classmate a message and ask for help—(I9)

The communication with the teachers has become worse as we do not get assignment reminders as they used to be in face-2-face lectures.”—(I10)

I have a big problem in getting the feedback from the teacher on labs. Before pandemic, I could usually ask the teacher during a lectures or lab and get instant feedback. But now you just send an email and hope to get a response before the deadlines.”—(I7)

Some interviewees also highlighted that online learning has made it easier to go back to lecture recordings if they need a clarification regarding the lecture contents. Furthermore, online learning has also made it easier to focus on exams and perform better.

I feel it is less stressful and easier for me to do exams at home—(I2)

Lectures are recorded by teachers, and you could watch the lecture later as well if you missed something in it. I liked that very much—(I5)

Finally, neither students nor teachers were prepared for this transition from on-campus to digital education, and therefore, everyone struggled with this forced transition in the short space of time [15,34,36]. There was no strategy in place from the university for teachers regarding how to approach digital education. Therefore, everyone adopted strategies that suited them instead of a one common strategy from the university.

4.6. Recommendations for Sustainable Post-Pandemic Education

This theme explains the possible recommendations to improve the post-pandemic teaching and learning experience at the university.

4.6.1. Unified Selection of Digital Tools

This theme highlights the need for a uniform selection of tools in teaching and learning. It includes both communication and collaboration tools. Interviewees and workshop participants agreed on the lack of university guidelines or support for choosing the same communication and collaborative tools. From a teacher's perspective, there are too many communication tools used in several courses, making it difficult to monitor all the communication channels and respond to student queries in a timely manner. Therefore, it is essential to limit the solutions geared toward catering to the needs of individual students and adopt a more unified approach to the selection of communication tools. It is also important to highlight that Canvas is a well-accepted tool for course content collaboration [41]. However, this problem is more evident in choosing communication tools such as Discord, slack, Miro, etc. Another critical dimension related to using non-approved tools from the university may result in GDPR infringement as it involves student data [42,43]. The data collected from the workshop with teachers suggest a lack of clear understanding regarding data privacy and the use of the non-approved communication tools. Most of the students and teachers agreed that universities need to have a clearer strategy regarding using communication and collaboration tools. This also makes it possible to co-develop courses in collaboration with other universities using the same set of digital tools.

4.6.2. Blended and Hybrid Learning

This proposal of having blended and hybrid learning is gaining traction to improve the teaching and learning experience [44]. Blended learning deals with the combination of online and offline instructions in which students interact with teachers, classmates, and the course material through physical classrooms and online learning platforms [45]. Hybrid learning is a form of education where some students attend the class virtually while others attend the class on campus [46]. Both students and teachers have expressed their interest in adopting blended learning. Teaching activities such as lectures, labs, and seminars could be in person, while student supervision meetings can be online. It allows students to make physical interaction with other students in the class. However, hybrid learning has mixed views among teachers due to its challenges. Table 2 shows the challenges along with the possible solution to address the challenges in blended and hybrid learning.

Table 2. Possible solution to challenges in blended and hybrid learning.

Challenge(s)	Solution Recommendation(s)
Technical difficulties with the digital equipment	IT support for students and teachers
Cost of acquiring equipment	Support from university to acquire digital equipment at a lower cost
Communication barriers	Integration of communication tools with Canvas to improve teaching and learning experience
The geographical distance between teachers and students	On-campus and online streaming of lectures
Student learning	Availability of online recorded lectures
Learning curve in the transition to hybrid and blended learning	Training courses for teachers

These challenges include installing equipment (e.g., camera, microphone) to have the possibility to stream lectures online and on-campus simultaneously. Many interviewees emphasized that technical equipment required for online education is expensive, and a structural change is needed from the university to lower the cost of acquiring equipment for the students, which is in line with the findings from existing studies [32,47]. Further-

more, it requires more training regarding the use of streaming equipment and support for technical challenges that arise at the run time. These tools shall also be integrated with digital communication tools such as Canvas to improve the teaching and learning experience. As it stands, this integration of digital tools with Canvas needs improvement. From students' perspective, hybrid learning seems promising since it allows students to attend lectures from anywhere, as many students were stuck in their home countries due to the pandemic. It is also important to highlight that teachers believe that students at the beginning of their programs need more on-campus activities in relation to those students who are further in their study years.

Teachers have also struggled to cope with online education transition, and therefore, it is important for the teachers to go through training for online teaching and learning such as the adoption of new tools [21]. One possible suggestion for teachers is to opt for blended learning where online classes are combined with physical classes to improve student learning [22,40]. Furthermore, teachers can provide more flexible deadlines for assignments to allow students to have more time to complete their courses [17]. Interviewees suggested that teachers can be more motivated and should continue recording lectures and have them available on student platforms to facilitate online learning for students. Interviewees also felt the need for additional lab assistance to address their queries and rapid feedback. Below are the quotes from interviewees regarding future perspectives on university education.

I am attending a course right now, and the teacher is not willing to set up a discord server where students can feel more connected and share their thoughts regarding the course contents. It is quite possible that the teacher is not familiar with Discord and is unwilling to set up the server for the class to share their experiences and thoughts regarding the assignments and labs.—(I3)

It is nice to have the recorded lectures available if you missed a course, you could still catch up with the rest of the class.—(I7)

It is essential to set up more time for questions or help. For example, the teachers can set up designated zoom sessions for labs assistance. (I1)

It will improve student learning if the teachers plan a few activities in the course on campus.—(I8)

4.6.3. Designated Budget for Digital Tools

The use of digital tools to shift from on-campus to digital education came to the rescue for all educational institutions during the pandemic. However, the selection of these tools was dependent on individual preferences. This led to the purchase of a subscription of tools for selective courses requested by the teachers. It is quite expensive to buy the tools subscription to deal with the individual requests. Therefore, it is important to have a designated budget to buy a collective subscription of thesis digital tools for teachers to improve the teaching and learning experience [48].

4.6.4. Continuation of Recorded Lectures

One of the most appreciated learning activities of online teaching and learning was the availability of the recorded lectures online from the teachers [49,50]. Therefore, most students in the interviews expressed their desire for the continuation of recorded lectures and making them available online as it facilitates asynchronous learning. Moreover, it allows teachers to reduce their course budgets as well.

5. Limitations of the Study

The scope of the study is limited to Malmö University since the participants included in the study for interviews and workshops are a subset of the population from the computer science department. The students from the computer science department are considered more familiar with digital tools. They may find it easier to adopt digital tools than other disciplines in the university. This study laid the foundation for identifying challenges expe-

rienced by students and teachers and potential solutions for sustainable higher education going forward.

Furthermore, the study was designed based on the recommendations of ethical review guidelines involving human test subjects. Therefore, the interviews and workshop do not collect sensitive data (e.g., age, gender, etc.) related to participants in the study. A voluntary informed consent was taken from all participants before conducting the interviews and workshop.

6. Conclusions

This study focuses on investigating the impact of COVID-19 on student learning at Malmö University. We performed a case study using semi-structured interviews with students. The study contributes to existing knowledge on the impact of the pandemic on the teaching and learning of students. The study uses a thematic analysis technique to identify seven distinct themes from the interview transcriptions to answer the research question. These themes include digital tools, positive impacts, challenges, communication barriers, social interaction and mental health, academic performance, and recommendations for future education. The most used tools in this transition from on-campus to digital education include Zoom and Canvas. The majority of the interviewees did not experience many technical difficulties using the digital learning tools, with a few exceptions. One possible explanation for it could be that all interviewees were from the department of computer science with reasonably good prior digital skills. Many students welcomed the switch to digital education as it helped them increase the lecture attendance rate due to the convenience of attending digital lectures. The recorded lectures gave students the flexibility to go through the contents of the lectures at their convenience. However, students struggled to grasp the course contents in digital learning. Major reasons include lack of self-discipline in students, procrastination, lack of motivation, long feedback time from teachers, and less communication with classmates. The lack of self-discipline, motivation, and procrastination are reported by previous studies as well [20–22]. Furthermore, this study confirms the findings of previous studies that many students experience anxiety and stress due to self-isolation during the pandemic [23,23,24,51]. Students also believed that teachers were not prepared for this shift, and therefore, all teachers opted for teaching strategies that suited them better. Students suggested that teachers focus more on motivating and engaging students in digital education. Finally, students gave recommendations for future teaching and learning at the university. These suggestions include a blended learning method in which students would have some activities such as labs at the university to interact with classmates and teachers. The right balance between on-campus and digital education is the most desirable outcome.

As for future work, there is another survey study in progress. The findings of this study served as an important input in designing the survey. The survey will be distributed across many universities worldwide to address the limitations of this study related to the limited sample size. Consequently, the study will improve the generalization of results and implications of digital learning for teachers and students in post-pandemic higher education.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: All participants in the study were volunteers and informed consent was taken prior to interviews and workshops.

Data Availability Statement: The data collected in the study cannot be shared publicly due to the privacy of the participants. The data is handled under the Data Protection Act (2018:218).

Acknowledgments: The author would like to thank Ali Menhem and Adam Joulak for assisting in data collection during the study.

Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Appendix A.1. Semi-Structured Interview Questionnaire

All interviewees were informed that participation is voluntary, and the interviewees' data will be kept anonymous and confidential in the research process. The data collected during the research process will only be used for research purposes.

- What program are you studying?
- Which year are you in?
- Do you have prior experience with online education?
- How has the shift in education affected your attendance rate?
- What digital learning tools are you familiar with in digital education?
- What digital learning resources are you using for distance education, and how do you find them helpful in your education?
- What challenges do you experience with digital tools used in the university?
- How does the switch to online education affect your health? Could you elaborate on how and why?
- How has the online education due to COVID affected your motivation to learn in a new learning environment?
- What is the impact of online education on you and your classmates (e.g., performance, communication, etc.)?
- What difference have you noticed in lectures before and after the online transition, and how does it impact you?
- What was the most significant change you noticed after transitioning to online learning?
- Could you explain what went well with the transition to online education?
- Could you explain what did not work with the transition to online education?
- What challenges did you face in digital education from the pandemic?
- What did you do specifically to overcome or adapt to these challenges?
- What improvements or recommendations can you give to students to improve digital education?
- What recommendations would you give to teachers to improve the online learning experience?
- Concluding Remarks: Is there anything you would like to add more to what I have discussed?

Appendix A.2. Workshop Guidelines

The moderator of the workshop has presented the following discussion points. However, these points were provided to facilitate the discussion. The participants were allowed to express their experiences and recommendations for university education in a post-pandemic world.

- Digital tools;
- Budgeting for the tools;
- Choosing the best of the two worlds (Online vs. on-campus learning);
- Existing Challenges faced by teachers ;
- Possible solutions to the challenges ;
- Recommendations for the university;
- Concluding remarks.

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