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Hybrid work models:

Digital tool usage in a hybrid

higher education environment

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Abstract

The changing environment during the COVID-19 pandemic has led to an increased demand for hybrid work formats. However, the research field merely focuses on hybrid work formats that were planned for. Generating knowledge regarding hybrid learning and how it can help those who intend to integrate it into their organizational settings is the purpose of this study. With this qualitative study we aim to make contributions to this research gap by exploring the research question "How are digital tools used for hybrid learning in higher education environments and how does it change the conditions for learning?". The method used is a case study, in which we interview five respondents with differentiating experience of conducting hybrid learning. We found that digital tools are used similarly in both hybrid and non-hybrid higher education environments and that there had hardly been any kind of investments made towards hybrid work methods. We also found that hybrid learning works well for the traditional one-way communication lecture form but not as well for interactive lecture forms. Because this lecture form is important for deeper learning, in the context of this study hybrid learning is not perceived as an adequate lecture form. In addition to contributions to this research field, we aim to contribute to the practical usage of digital tools within hybrid work models.

Keywords: digital technologies, digital tools, digital transformation, hybrid learning, hybrid work models

1. Introduction

The traditional education model of meeting in a physical place with an instructor has been used for a long time (Xiao et al., 2020). Research shows that this learning method might lead to issues such as a lack of motivation and negative performances for the students. This model began to shift during the 1990's when information technology was being integrated into the classroom. Digital tools freed the learning from its physical constraints of having to meet in-person, since it now was possible to learn through distance- and e-learning. Digital tools are resources that can be used to assist completing tasks more easily. Examples includes computers, cameras, and digital meeting platforms.

There is a difference between the definition of learning, and education. Learning can be described as a process aimed to increase an individual's skills or knowledge, while education refers to the approach or activities that aim to develop said skills and knowledge. (Masadeh, 2012). However, within the literature that we have explored (Snart, 2010; Xiao et al. 2020) 'hybrid learning' seems to be the most established term and does at times include the concept of education. Because of this distinction within the literature, we use the term hybrid learning as well when discussing hybrid lecture formats. Xiao et al. (2020) explains that offering lectures online without making students physically transport themselves to the lectures increases the possibilities to get an education. Two reasons for this are that online lectures are usually less expensive and less time-consuming. However, there are benefits of getting a lecture

in-person. These include an increased likelihood of completing the course, the guarantee of direct communication (Xiao et al, 2020), less distractions during classes, and better opportunities for academic development (Curtis, 2021). Therefore, students can benefit from a mix of these two methods, such as hybrid learning. Hybrid learning is defined as a learning situation in which students are participating both in-person and online simultaneously (Snart, 2020). The author mentions that hybrid learning can enable benefits from both online and in-person learning, which allows students to choose how they want to participate depending on their personal preference and ability (Xiao et al, 2020). This is important as it can lead to increasing opportunities for learning, meaning that these opportunities are becoming more equal. There are a variety of reasons as to why online learning can help more people get an education. One example is that people in rural areas do not have access to universities (Statistikmyndigheten SCB, 2021), meaning that they must move to another city if they want to get a higher education. Online learning also gives people with different physical impairments better opportunities to get an education that would not be possible in a physical setting (Coleman and Berge, 2018). Learning conducted online tends to be cheaper for the students (Carius, 2020), meaning it can give people with economic difficulties better learning opportunities. Hybrid learning is not exclusively used within schools, as it also has potential within the workplace. The pandemic has led to more companies looking into hybrid work environments as their future approach to working (Borg and O'Sullivan, 2021). The future workplace might thus be characterized by more hybrid work methods, as well as work-related hybrid learning and training. Therefore, the hybrid model is not only connected to educational settings, but also IT management within organizations that are looking into hybrid work methods.

Hybrid learning is not a new phenomenon, as it has been around at least since the year 2000 (Tritsch, 2021). However, the requirement of change that came with the COVID-19-pandemic, has put a whole new perspective on hybrid learning. Because of the health risks that the pandemic brought, all teachers and students were not able to meet on campus for their lectures. Suddenly hybrid learning was forced upon schools to offer students the opportunity to participate in the lectures. However, conducting hybrid learning without prior knowledge, experience and planning is reckless since it rarely leads to the lectures being designed with a pedagogical approach (Snart, 2010). Conducting lectures with unfamiliar lecture forms and without adequate planning affects the students' learning outcome and would mean that the students are at risk of not being able to achieve learning at the needed level (Löfström et al. 2007). Because of this, there is a lack of knowledge within the research field regarding how unplanned hybrid learning affects the learning outcome for students. The research has rather focused on the cases in which hybrid learning was willingly implemented and planned for. Thus, there is a gap when it comes to the cases in which hybrid learning was not planned for, but rather used out of necessity during the changing environment that came with the pandemic.

With this study we aim to contribute to the previously mentioned gap that we identified within this research field to better prepare future users of hybrid work models. Based on this, the research question we aim to answer with this study is "How are digital tools used for hybrid learning in higher education environments and how does it change the conditions for

learning?". This study considers hybrid learning for higher education, meaning education that takes place on a university level. We also limit the study to the learning occasions in which a lecturer and students are both actively participating, such as lectures, workshops, seminars, and examinations. We do not include processes such as individual assignments, sharing information through a course platform, grading examinations, and reporting grades. In summarization, with this study we aim to contribute to the research field of hybrid learning. Our research has the purpose of generating knowledge regarding hybrid learning that can be of help for those who intend to integrate it into their organizational settings. This means that our study not only aims to contribute to the previously mentioned research field, but also the practical usage of digital tools for those who are working with or towards hybrid work models. Our study is conducted within an educational setting, but this research phenomena is similarly affecting other types of organizations and work environments as well. Our study regards the usage of digital tools in a complex environment and therefore we do not see our findings as restricted to the studied environment, but also including a variety of organizational environments in which digital tools for hybrid work models are considered.

2. Related Research

Within this section we present research related to our research question and field. This section is divided into three parts: "Education", "digital tools for hybrid learning", and "Bloom's taxonomy".

2.1 Education

2.1.1 Learning process and educational structure

What is substantial within learning for students is that they in group and on their own actively choose and construct, create and process the information given during a teaching opportunity in such a way that it becomes meaningful for them (Biggs, 1996, 2003). This means that learning is done by active cognitive activity by the student and not by receiving information passively just to learn that information by memory (Tynjälä, 1999). To this conclusion, students are supposed to have their own intentions, assumptions, motives, and earlier knowledge with them when they enter a teaching opportunity which then will affect how and what they will learn (Biggs, 1996).

In terms of learning, a teacher should direct their attention to what the students are supposed to learn and in what way this can be done by choosing the right learning and evaluation methods as well as setting up different goals (Biggs, 1996, 2003). This is based on three different areas that overlap to create a constructively coordinated teaching. The areas are goals for learning, teaching implementation, and learning evaluation. Goals for teaching refers to the educational planning which originates for example from the university's overall educational plan and examination goals. Teaching implementation refers to the chosen educational methods which have the goal to make the students achieve an in-depth understanding of what they are studying. Learning evaluation refers to choosing evaluation methods to support the learning process throughout. The purpose of this is to give the teacher

important information about how and what the students are learning and to use this information to give the student feedback on their knowledge (Löfström et al., 2007).

When structuring the learning environment that includes online learning it is important to decide in what way the online environment will be used during a course. What is deemed as important here is not the number of functionalities used but rather the implementation of a few important functions that will work as a support for the students' learning process to achieve high quality. Additionally, something that is noteworthy is the importance of having learning conducted in-person as well for several reasons. Some of these reasons are to get the chance to know fellow students and the teacher in a better way to heighten the group affiliation. This is something that demands a lot of time and is hard to achieve, at least to the same extent, online (Löfström et al., 2007). Another thing that is important when it comes to the construction of a learning environment that includes an online environment is to take different forms of interaction into consideration. Interactions included in this are both between students to teacher as well student to student. Examples of this could be the teacher leaving feedback on a student's examination, answering questions being asked during an online teaching opportunity, or when students work in groups where they discuss or create a text because of the former discussions. What is good about a well-structured learning environment that includes online elements is that the teacher can prepare beforehand by adding important links or other useful tools such as instructions and resources that will help the students' learning. The thing that an online environment brings that is considered the most important is the flexibility in terms of time as well as the physical space needed to hold a certain number of students. This option is flexible since it allows for the students, if they have all the tools needed, to decide themselves when and where they want to conduct their studies. Important to note however, is that if the online environment is not sufficiently equipped to give the students what they need to conduct their studies it will burden the students in terms of time and resources (Löfström et al., 2007). Miller, McNear and Metz (2013) explains that different forms of lectures can vary in their levels of interactiveness. Research shows that more interactive lecture forms lead to students gaining a better understanding of the lecture material and feeling more confident in their abilities for future examinations of said material. In other words, lectures that encourage active learning among students can be beneficial for the learning outcome. There are several ways to construct an interactive lecture. According to Miller, McNear and Metz (2013) one way of doing so is taking breaks from passive listening during a lecture to allow discussion, brainstorming or problemsolving related to the material. Another way is to let students work in small groups. Sadeghi, Sedaghat and Ahmadi (2014) also mention seminars as an example. Non-interactive lectures are typically done with a monologue that students mainly listen to (Miller, McNear and Metz, 2013). Therefore, different lecture forms require different types of preparation from both teachers and students.

2.1.2 Hybrid learning
There are many definitions and views on what hybrid learning is. According to Snart (2010) the definition of hybrid learning is educational situations in which students are participating both in the physical classroom and online simultaneously. Xiao et al. (2020) further adds that for hybrid learning there are no clear boundaries between the physical classroom and the online lecture, as students and teachers participating from both sides can interact with each

other. Gagnon, Young, Bachman, Longbottom, Severin, Walker (2020) says that hybrid learning combines the methods of in-person and online learning with the aim to enhance both learning environments. Within this study we are using the combination of these three authors' statements as the definition of hybrid learning. Snart (2010) claims that if hybrid learning is used in a sufficient manner, it can be cost efficient and give more students the opportunity for learning. Hybrid learning can also help eliminate challenges such as a limitation of classrooms and lack of on campus resources. Baser, Pandya and Polkowski (2017) mentions that combining traditional and digital learning in a hybrid way can lead to increased levels of interest, engagement, and resourcefulness. It can also help to improve the participants' innovative thinking. According to Snart (2010) there are differences regarding how hybrid learning is performed within different institutions. Examples of differences that can occur are which technological tools are used and the motivation behind why the school is offering hybrid learning to its students. The author explains that because hybrid learning can offer a variety of benefits, a lot of schools within higher education are looking to include it. However, if not researched and planned with dedication beforehand, it is an unfamiliar situation difficult to manage. There are many examples of hybrid learning being developed quickly and used within too large scales. This unplanned and unknowledgeable approach is not beneficial for the learning context since it rarely considers pedagogical aspect. Both teachers and students can be negatively affected by poorly planned hybrid learning (Snart, 2010).

Hybrid learning is not yet that well-understood in higher education or even described consistently in the existing literature (Gagnon et al. 2020). Methods that combine in-person learning with IT-based learning are trending within educational settings among organizations (Söllner et al. 2018). Within Umeå University hybrid learning has been practiced to some extent on institutions within all faculties (Svedmark et al. 2021). However, the results and opinions regarding hybrid lectures vary. Some institutions mentioned that there was an increased flexibility for both students and teachers, which was seen as positive. But others mentioned challenges such as a changing role for teachers and how it might affect the students' experience. Some said that they viewed hybrid lectures as acceptable if it was temporary during the pandemic but would not consider it beneficial to use in the future.

2.1.3 Organizing and giving hybrid lectures

Successful hybrid learning classes/sessions on university level requires that the learning activities enable students to achieve the expected learning outcomes of the course. Therefore, these learning activities should be constructed with careful consideration regarding how it affects the students' learning possibilities. The teacher must make decisions regarding where the learning sessions should be, including both the physical and digital space. The decisions made regarding how these activities should be designed are dependent on factors such as time limits, course content and the student groups size. The size of the class is relevant since each student must get the possibility to be centered and engaged with the learning material. For example, when discussing scenarios from the course material, each student should be given enough time for this assignment. This is also affected by the time limitations that the course faces and should be calculated with consideration of this. This means that the lecture, in this case the number of scenarios, should be adjusted to the number of students participating. A class of 12 students could probably discuss 20 scenarios during one lecture, while a class of 100

students would not have enough time to do so. This can be solved by dividing the class into smaller groups and decreasing the number of scenarios discussed. The course content and its field may have an impact on which tools and methods are available for hybrid courses. Courses like statistics and calculus are often associated with straightforward learning occasions, such as lectures and demonstrations. But other courses, such as those within organizational practices or communication, can benefit from indirect approaches like letting the students conduct case analysis. However, the author argues that even within the straightforward methods, there should be room for student engagement such as discussion. Within hybrid learning, it is important to give students the opportunity to discuss the learning material with each other, and to interact with the teacher. Discussing with other students, allows students to gain a deeper understanding of the course concepts. Allowing students to discuss the material with each other digitally, can help them gain an even deeper, efficient, and more valuable understanding than if the discussions were taking place in-person. This is because the students have better opportunities to look at the course material simultaneously while discussing with each other online, in contrast to in-person discussions. One important aspect of making hybrid learning work is making sure that the online and in-person learning activities are integrated during the sessions. This means that they should not be seen as separate activities, where students participating in-person or online are separate groups. But rather one class, whose learning activities are united (Caulfield and Aycock, 2011).

The physical world has limitations regarding how to share and manage objects, which is much easier in the digital world. But the digital world is usually characterized with a limitation for how rich the social interactions can be. Therefore, it can be beneficial to use the virtual space as a space in which you can digitize and share the real-world objects, but not completely disregard the physical world. In other words, you should enrich both worlds with the help of each other's strengths. This can be done with the help of everyday technology. For example, a physical sticky note can be represented by online notes, and a smartphone can digitize a physical object by photographing it. To make the merging of the physical and digital room seamless, there is a requirement for sufficient digital tools, including both hardware and software. Knowledge is important regarding how digital tools can enhance the learning situation, and not use digital tools just for the sake of it (Kohls, 2017). However, Dogadina et al., (2021) argues that involving elements of online learning in education can come with limitations regarding which school activities can be performed and not. This can affect the overall quality of the lectures and therefore also the students' results.

2.2 Digital tools for hybrid learning

It is important for organizations to consider how they view factors such as education, the roles of teaching and learning, time and space, and management. The answers provided from the institutions of Umeå university were all in agreement that the digital infrastructure and related support is necessary for successful practice of hybrid learning (Svedmark et al., 2021). Kohls (2017) mentions that there are different ways of enabling students to use digital tools during hybrid lecture courses. The course can rely on students bringing their own devices, as well as providing so-called device cabinets with all the necessary digital tools. If students bring their own devices, usually smartphones or computers, they are responsible for installing required

software. But, if the institution provides device cabinets with standardized tools, all students will be provided with the same configuration of software. An example of this is a computer room, in which there is a setup of computers with installed software, that the students can use.

2.2.1 Digital tools for cooperative work

One way that digital tools can be used to transform the educational setting, is by increasing the possibilities of collaborative learning (Sancho-Gil and Rivera-Vargas, 2016). As mentioned in the chapter above, there are several ways of designing a lecture for hybrid learning. These lectures have some requirements regarding how students should interact and participate in the different processes, which places requirements on the digital tools used for the session. The previous section shows that the digital tools that are used should allow the students participating in-person to communicate with those that are participating online, preferably done in such a way that the students can look through the course material at the same time. All students should also be able to interact with the teacher during the hybrid lectures. Another important factor is that the teacher using digital tools should be able to section students into smaller groups, especially for large classes.

Kohls (2017) lists several digital tools and methods that can be useful for hybrid learning. One of these is shared digital workspaces, in which students can make work on a document simultaneously. It also allows students to make comments and post their ideas to each other. This means that students can work together or individually in the shared working space, to create an object which can then be presented as a collective work by the whole group. There are no specific limitations to which software programs can be used for this if they allow the students to create and edit documents in the described way. Examples of tools that could be used are large interactive walls, virtual whiteboards, or Google Docs. The large interactive walls are another example that Kohls lists as beneficial for hybrid learning. These are interactive digital workspaces that are being projected to the physical world via examples such as big whiteboards, screens, or walls. This is like a projector showing content on a wall, with the exception that it is interactive. This means that the interactive walls should be filled with digital content that can be manipulated and edited in the physical world, for example with the hands or pens. These walls should be used by the students by working in groups and like the shared digital workspaces, it should be seen as a collective effort. A third example of how hybrid learning can be conducted is with the help of interactive tangible objects. This means using physical objects and connecting them to the digital world by equipping them with input devices such as sensors, cameras, microphones, or keyboards. These input devices can trigger commands such as opening a website or creating a digital worksheet. Examples of tools that can be used like this are 3D-scanners with an interactive display and projection.

2.2.2 Digital meeting platforms

When using the term digital meeting platforms, we refer to platforms in which several participants are communicating in a visual, vocal, or written way. Digital meeting tools such as Microsoft Teams can be helpful for students' learning atmosphere during times where on campus-learning is not available (Al-Maroof et al., 2021). The author further mentions that using a sufficient online platform can enhance the learning's effectiveness, communication availability and relationship creation among students and teachers that otherwise do not meet.

There are several different digital meeting platforms that can be used for online and hybrid lectures (Singh and Awasthi, 2020). Three of the most popular ones are Zoom Meetings, Microsoft Teams, and Google Meet (Sevilla, 2020). Mahr et al. (2021) mentions that Zoom is the primary used tool that is used for communication and conducting business online. These types of platforms have become increasingly important for schools during the pandemic, and during this time its number of users increased tremendously. In December 2019 the daily users on Zoom were around 10 million. In March 2020 this number had increased to 200 million. After this, the number has passed the 300 million mark (Mahr et al., 2021). Grandinetti (2022) claims that Zoom has been used by 90 percent of US universities and during 2020 the platform was used by 90,000 schools (Yuan, 2020). Similar growth has been observed for other digital meeting platforms (Singh and Awasthi, 2020).

There are some differences between the digital meeting platforms, but overall, they function similarly (Singh and Awasthi, 2020). The main function is that it allows participants to use their camera and microphone. They can be used with devices such as computers and smartphones (Gunawan et al., 2021). There are also functions that enable group conversations to work more smoothly. For example, when participating in a Zoom meeting, you will see a grid with the other participants' videos and names. When someone speaks, the square with their video will be marked with a yellow border and presented first in the grid, to show other participants who the active speaker is. Other functions that these platforms typically include is a chat, sharing your screen (Spathis and Dey, 2020) and using a reaction such as clapping or raising your hands (Laili and Nashir, 2021). The authors explain that these reactions can be done by students to get attention from the lecturer, just like in a real classroom. According to Laili and Nashir (2021) one of the benefits of using digital meeting platforms is that it somewhat simulates what an "in classroom"-lecture would look like, since it enables participants to see and discuss with each other. The different functions allow the participants to engage in online activities such as lectures, seminars, meetings, or discussions. There is also the possibility to divide participants into smaller groups, for example when doing group exercises and discussions. A recently implemented feature that Smith (2021) mentions on Zoom is the digital whiteboard that can be used during meetings. This whiteboard allows participants to collaborate both inside and outside the meeting. The whiteboard feature lets the participants draw and write information, use sticky notes, add comments, and see a history of the whiteboard. This function also simulates work that could be collaboratively done on a physical whiteboard in a classroom.

2.3 Educational objectives

Andersson, Krathwohl and Airasian (2001) presents a revised version of the pedagogical framework called Bloom's taxonomy of educational objectives (see Picture 1 in Appendix.). The objective of the framework is to present a model in which intellectual skills can be measured. It can be used with a focus of three different domains (Ruhl, 2021), and we focus on what is called the cognitive domain. According to Bloom (1956) this domain is primarily used within educational settings. Furthermore, the domain and its hierarchical structure is common and well established within the field (Ruhl, 2021). Andersson, Krathwohl and Airasian (2001) explains that the revised framework includes six different categories that are called remember,

understand, apply, analyze, evaluate, and create. The framework consists of a pyramid shape, with the complexity of the categories ranked from top to bottom. The more complex a category is, the higher it is positioned in the pyramid. To move upwards in the pyramid, the student needs to master each level below it. However, as Ruhl (2021) mentions, when working with a task a student might conduct processes within different pyramid levels simultaneously. Andersson, Krathwohl and Airasian (2001) explains that the category remember refers to whether students can memorize material and later retrieve it from their long-term memory. The category called understand means that students can create meaning from incoming information, for example by paraphrasing it, translating it, categorizing it, or making comparisons to other theories. Apply refers to if students can execute and implement the learned objectives. This can be done by using mathematical formulas or using a method to solve an unfamiliar situation. Analyze implies whether students can gain a deeper understanding of the material, for example by distinguishing which parts are more relevant and which are not. Furthermore, it can be done by analyzing the material within different structures and by deconstructing it when exploring potential perspectives or intentions behind the material. When reaching the category evaluating, students can critique and judge the material in different ways. Examples of how this can be done is by identifying its weaknesses, considering the most suitable method out of several options, or by exploring the effectiveness of an implemented solution. The last category, create, is the most complex. By reaching this category students can use the material in a way that helps them understand the full picture. This can be achieved when creating hypotheses, designing a method for completing a task, or by constructing and inventing new objects (Andersson, Krathwohl and Airasian, 2001).

According to Andersson, Krathwohl and Airasian (2001) an important aspect of Bloom's taxonomy is the difference between the learning outcomes that the authors refer to as retention and transfer. Retention means that students can memorize the learning material, and at a later point remember it almost exactly as it was presented to them. Transfer means that students can use the memorized material to solve new problems and situations that differ from the initial learning situation, or to support future learning. While retention focuses on what was learned in the past, transfer allows students to gain knowledge that will be of use in the future. The authors refer to transfer as meaningful learning. They define meaningful learning as learning in which students gain knowledge that lets them understand their experiences. An example of how this can be done is to analyze incoming information and mentally relate it to one's existing knowledge. The revised framework aims to help teachers design course content/educational activities that enables transfer. The authors emphasize that even though retention might not be the most beneficial learning outcome, it is still of importance. Especially since it is the base on which transfer is built on. Because of limitations in terms of time and resources for this thesis, we only consider a surface-level of this framework. Theories around the framework are many and complex, and if we wanted to explore its full picture we would have to do so with an entire thesis. An example of how this is executed is that we merely focus on the categories themselves, and not their internal subcategories.

3. Research Methodology

In this chapter we will provide explanations for our selected research methodology, as well as arguments for these choices. The chapter includes reasoning behind the research perspective and method, the data collection and -analysis, a section for method criticism and the ethical considerations that were done during the research.

3.1 Research Perspective and Method

Within qualitative studies, the researcher aims to interpret reality. This differs from quantitative research, in which the aim is to generate countable and statistically verifiable results (Fejes and Thornberg, 2015). This research is of qualitative character since our aim is to explore our respondent's perceived reality and base our findings on our interpretations. According to Myers (2013) there are three types of approaches to research, including positivist, interpretive and critical. The interpretive research perspective assumes that reality is a social construct, and research done within this perspective analyzes the assumptions about this reality to find meaning within the researched case. By doing interpretive research a common method is analyzing language to access the respondents' views and thoughts. According to Walsam (2006) interpretive research is often based on theories and research that is related to the research objective and its field. One of its benefits is that the interpretive perspective allows for the researcher to choose from a variety of methods, as there are no strict rules for how to conduct it. This research is done with an interpretive research perspective. The reason why we chose this perspective is because it seemed appropriate for our research question, meaning that our findings will be based on our respondent's perceived reality and expressed language regarding hybrid learning. Another benefit is that it provides us with freedom to choose a method we see as appropriate. According to the usage of interpretive study our research is based on other theories and research, these were presented in section 2.

Myers (2013) mentions case studies as an example of a research method that can be used for interpretive research. Case studies are according to Eriksson and Hultman (2014) used as a method when the research phenomenon is linked to a specific context. When conducting case studies, the researcher analyzes one or a few selected cases. An example of such is an organization or a smaller division of an organization. According to Myers (2013) there is no clear definition regarding what defines a case, but one commonly used is that it consists of a single social unit located in a physical place with distinct divisions between the people within it and others. The research findings are based on empirical data extracted from the people within this organization and their perceived reality. Examples of data sources that can be used are according to Eriksson and Hultman (2014) interviews, surveys, and databases. Myers (2013) writes that the aim of case studies is to generate knowledge that will contribute to a specific field of research. This is done by creating a summary of research within the chosen field and basing the research case on this, to integrate the findings and make contributions to said field. One way of conducting case studies is in an explorative manner, meaning that the purpose of the study is to discover phenomena, rather than test theories. Eriksson and Hultman (2014) mentions that this method generates reliable knowledge as the results are closely integrated with reality and gives an explanation to the research phenomena's context. The authors further mention that because of this, the research question used for case studies

should open questions of the "how?" and "why?"-kind. Myers (2013) mentions that the selected cases are often specific, but the findings and conclusions are usually broader and describe greater phenomena that are relevant outside the selected case. In other words, when conducting case studies, the generated theories should be applicable to a greater mass and not only those who participated in the study. Our research is done with case study as a method. One of the reasons as to why we chose case study as a method is that it is theory generating and not theory testing. As mentioned earlier, our aim of this research is to generate theories that can be beneficial when implementing hybrid learning into an organizational setting. Our research question is also an open-ended one, meaning that case study is an appropriate way of answering it. Another reason is that it correlates to how our findings are based on data extracted from our respondents, as well as discussed in relation to the related research presented in section 2 to make conclusions and generate knowledge. The case that we are looking into will be described in the following section where our respondents are presented.

3.2 Data Collection and Analysis

This section provides description regarding our conducted data collection and data analysis, as well as our reasoning behind these choices.

3.2.1 Data collection

An interview is defined by Eriksson and Hultman (2014) as a situation where a person (the interviewer) orally asks questions to another person (the respondent). Interviews can be conducted in different ways. These are structured, unstructured, or semi-structured. Structured interviews consist of pre-decided questions which are read exactly as they are written, and the interviewer only documents the answers. Unstructured interviews are more like a conversation between the interviewer and the respondent since it is more informal and does not have pre-decided questions. Semi-structured interviews contain some elements of both. The unstructured interviews are harder to conduct and demand more effort from the interviewer and the person interpreting the answers. The most fundamental advantage of interviews as a data collection method is that it does not only give the interviewer answers to the questions but also an opportunity to interpret the situation, respondents body language, and other things that cannot be captured through other methods, such as surveys. The point being that an interview allows the interviewer to adapt and clarify questions being asked, as well as being given access to a broader spectrum of answers and reactions compared to other data collection methods. In this study we prefer getting deeper answers from the respondents rather than a higher quantity of answers. Therefore, we have decided to use semi-structured interviews as our data collection method. We argue that it will give us benefits from both structured and unstructured interviews. We use the benefits of structured interviews by deciding our questions beforehand to allow us to compare the answers from the respondents. We created a document with our interview questions (see Interview Questions in Appendix). Benefits of the unstructured part is that we can ask follow-up questions to clarify uncertainties and get exhaustive answers. Additionally, Eriksson and Hultman (2014) mentions that using interviews as a data collection method is advantageous for case studies. Due to the current COVID-19 pandemic we conducted the interviews online through video meetings on Zoom. Since we planned to transcribe the interviews, they were recorded. The reason for transcribing

them is that it will make the data analysis easier to conduct (Fejes and Thornberg, 2015). This thesis is written in English, but our respondents are Swedish. To make sure they feel comfortable answering questions fully without being inhibited by a language barrier we decided to conduct all interviews in Swedish and translate them into English during the transcribing.

When selecting respondents, we used a sampling method called convenience sampling. Taherdoost (2016) describes this method as when the researcher chooses respondents based on willingness and availability. The author further mentions that this sampling method is time-efficient, easy to conduct, and commonly used among students because of their limited time and expertise. Before conducting the data collection, we had several meetings with different persons who had information regarding hybrid lectures within the university. From these meetings we got suggestions of institutions and people within them that could be potential respondents. Since our research question regards how digital tools are used for hybrid learning, we asked only for suggestions of respondents that have practiced hybrid learning. After getting a great number of suggested respondents we contacted them. After that, it was willingness and availability from these potential respondents that determined whether they would participate in an interview. All respondents we interview are working as university lecturers and have held at least one hybrid lecture (see Table 1 in Appendix). Table 1 presents which faculties our respondents teach within. There is a mix within the faculties regarding which institution our respondents are tied to. To protect our respondent's anonymity, we are not stating their institutional connection or which university the study was conducted within. The case we study is these five lecturers that are working within the same university, and our study is limited to one Swedish university.

3.2.2 Data analysis

Thematic analysis is not restricted to a certain research method and is used in a variety of such. One of the research methods that thematic analysis can be used for is case studies (Mills, Durepos and Wiebe, 2010). According to Braun and Clarke (2006) thematic analysis is defined as a data analysis method of which the aim is to identify, analyze and describe patterns within a data set. The result after conducting thematic analysis is often a structured data set, as well as detailed description of it and its underlying values. A factor often viewed as beneficial with thematic analysis is its opportunity for flexibility. Since the use of thematic analysis does not require usage of a particular theoretical approach, such as a theoretical framework, it allows the researcher to gain a broad and flexible understanding of the data set unaffected by a particular theoretical approach. This means that it is also a more accessible method, which is suitable for inexperienced researchers. Because thematic analysis is suitable for case studies, we have decided to use it as our data analysis method. We also see the benefit of it being a flexible method suited for inexperienced researchers, because we do not use a specific theoretical approach and are performing the research as students. Braun and Clarke (2006) present a six step-guide for how to conduct thematic analysis. The first phase is called "familiarizing yourself with your data" and refers to how the author needs to read through the data to gain an overview of it. This can be done while transcribing it. The second phase is "generating initial codes". During this phase the researcher should find sections of interest within the text, and mark these as codes. The marking could for example be done by color-

marking. The third phase, "searching for themes", begins when all codes have been created. During this phase the codes are sorted into themes based on their similarities and relations. It is beneficial to be generous and create a great number of themes initially, since this step does not include revising or deleting themes. The fourth phase is called "reviewing themes" and during this phase the created themes are being sorted and prioritized. This means that the themes are finally determined, and those that do not seem as suitable for the results will be discarded. Examples of why themes can be revised is that they are not supported by enough data, the codes within are not closely related enough, or two themes might be combined into one. Step five is "defining and naming themes", meaning that final adjustments are made to the themes and their essence is being documented. The sixth and final step is writing the analysis into the document it will be published in. Our data analysis approach followed these six steps, to ensure that we did it in a controlled and research-based manner. Examples of codes that we created are "physical space". Our codes were then organized into themes, examples of these include "conditions based on material/equipment". Conducting this data analysis was beneficial for us in several ways. It helped us understand the meaning behind our respondents' answers and see similarities and differences between our different respondents' answers, so we could identify patterns within the material. Finally, it helped structure the written report within the results- and discussions sections.

3.3 Method Criticism

In the following sections we provide some criticism to our selected methods and explain how we are taking these into consideration when conducting the research.

3.3.1 Research Perspective and Method

Qualitative studies can be difficult to conduct since they require that the researcher has a reflexive approach. This means that the researcher must actively and continuously reflect over their choice of methods and approaches, their starting points and perspectives, their pre-understandings, and values, as well as how they influence, or get influenced by, the actors participating in their study (Fejes and Thornberg, 2015). As stated in this method chapter, we have made considerations and decisions regarding all these requirements. We are transparent with all our choices and how they can affect the study, as well as how we see that this might happen. For example, when presenting interviews, we mention its strengths, weaknesses, and potential effects on our results. The way we affect our study, and how our study affects us, is related to our study being interpretive. Myers (2013) mentions that interpretive studies are double hermeneutic, which means that they affect the research object and are affected by it. Therefore, there is no way of distinguishing the studied case from the study being conducted, since there is a risk that we are affecting our respondents, as well as being affected by them. Therefore, it is likely that our presence in the study will influence the results. However, we argue that this is true for any social studies where the researcher is interacting with respondents. Even during observations there is no way of being completely objective since the respondents and research object can affect the researcher. This is something that we are aware of and taking into consideration when forming our results, analysis, and conclusions.

As previously mentioned, the results of case studies are often applicable on more situations than the one studied. According to Eriksson and Hultman (2014) it is therefore important to

be careful when drawing conclusions, to ensure that they are not too narrow. Case studies within the field of social studies are commonly describing complex societal phenomena and leave room for interpretation. It is also of importance to be aware of the selected cases' surroundings and how these can affect the results. The authors further mention that this is especially crucial for the studies in which conclusions are aimed towards an entire population (Eriksson and Hultman, 2014). We do not aim to generate results that can be applicable to entire societies with our studies, meaning that this challenge is not as prevalent in our study as in many other social studies. However, we are taking this challenge into consideration when drawing any conclusions based on our results. Since we are using case study as our research method, it is a possibility that our conclusions are too narrow to be applicable and relevant for other contexts. Therefore, we continuously reflect over how our respondents' surroundings may affect the results, as well as how our interpretations affect our view on these results.

Another challenge that comes with case studies, is that it is difficult to know what to focus on. Myers (2013) explains that it can be tricky to draw the line between the research phenomena and its context, meaning that it is difficult to know what is relevant for the study and what not. When doing case studies, the researcher should not disregard the context completely, since it is affecting the research phenomena. However, inexperienced researchers often take too much of the context into consideration and thus end up with too much and irrelevant data. Since we are students and not experienced researchers, this is a challenge that is likely to affect our work. We do include the research context in our study, since we believe that it is relevant for our results. Therefore, it is difficult to determine whether we should have included more or less of the context when conducting our data collection and creating our results. One way we tried to work around this challenge is to include our supervisors view on the interview questions to ensure that they were relevant.

Myers (2013) further mentions that a challenge with case studies is that they are time-consuming. There needs to be a lot of time invested in gaining access, collecting data, and writing the final report. This affects even the most experienced researchers, and therefore case studies require commitment and eagerness from the researchers. Because our study only is conducted during a limited number of weeks, we have made several alterations and considerations to ensure that we are able to finish on time. This includes accessing material, conducting the data collection as well as writing the report.

3.3.2 Data Collection and Analysis

Interviews as a data collection method is costly in terms of the amount of time it requires compared to other methods, such as surveys. However, the goal of interviews is about getting a deeper understanding of your research phenomena in comparison with surveys where the goal is to get many answers (Eriksson and Hultman, 2014). Since we have had limited access to respondents as well as deemed the research phenomenon more suitable for a deeper understanding, we argue that, even though the interview method consumes more time, it is still the most suitable option for this research. In addition, we have used Eriksson and Hultman's (2014) checklist of ten common pitfalls when designing an interview. This checklist includes asking the respondent several questions at the same time, putting values, negations, or buzzwords in the question, asking overloaded questions, mixing words for states with words for events, talking instead of listening, having too abstract questions, or involving unspoken

conditions, and not explaining indistinct terms well enough. Using this checklist when creating the interview questions minimized uncertainties during the interview. Additionally, we adjusted and provided explanations during the interviews when needed. Another thing that might have affected our results is that we conducted the interviews in Swedish and that some details of the respondents' answers were lost in translation. However, we argue that since our respondents could answer the questions in their native language, the answers are a lot richer and detailed which is of greater value than minimizing potential loss when translating. Lastly, because we conducted the interviews in video meetings instead of in-person, there are restrictions for our potential to analyze social cues. However, we argue that our choices were limited because of the pandemic, and by conducting the interviews through a video meeting we increased our chances of picking up such cues compared to if we would have done audio interviews through a phone call.

In addition to common pitfalls Eriksson and Hultman (2014) writes about three different factors that can occur during interviews. These are called "the interviewer effect", "the halo effect", and "the central tendency". The interviewer effect happens between the interviewer and the respondent. During the interview some form of interplay will arise, and this can have an undesirable impact on the results. The halo effect refers to the interviewer's tendency to be affected by something about the respondent that does not matter for the research. Examples of this could be that the respondent has a fancy title or is famous. The central tendency refers to how respondents tend to give more neutral answers rather than being extreme in any direction. We argue that being aware of these three factors enables us to reduce the risk of it contaminating our data. For starters, we used pre-decided questions during the interview. This helped us to reduce the amount of interplay and thus also its undesirable impact. However, we did semi-structured interviews which allowed us to ask questions that were not decided beforehand. In these parts of the interview there is a greater risk of the interviewer effect taking place. There is also a risk of the halo effect occurring. But with this knowledge we were able to navigate the interviews to minimize the risk of falling victim for this effect. Lastly, the central tendency was the hardest thing to counteract. What counts as extreme differs from each respondent and it is hard to tell if you are exposed to this during an interview. However, since we made it clear that these respondents were to be anonymous and never would have to defend their answers to anyone, we believe that we counteracted some of the fear of not answering with extreme honesty if needed. But this is of course hard to truly verify, and therefore we do not consider ourselves completely unaffected by this effect.

Taherdoost (2016) mentions that convenience sampling includes some challenges. One of these is that there is a selection bias since the researchers select respondents themselves. Using convenience sampling could affect our study, and our results could be different if other contacted people would have been available. However, we argue that it would have been difficult for us to choose respondents based on anything other than willingness and availability, since we do not have access to that many respondents within this field.

Braun and Clark (2006) list several pitfalls that researchers conducting thematic analysis might run into. The first pitfall is not actually analyzing the data, and merely describing it. This means that the researcher will not understand the data's underlying meaning, making the analysis inadequate. The second pitfall is using the interview questions as base for the themes.

This means that it is not an interpretation of the collected data that represents the themes, and thus no analysis was conducted. Another pitfall is creating insufficient themes, meaning that the codes within are not related enough, or that the themes are too closely related to each other and overlapping. By being aware of these pitfalls during the data analysis, we were able to actively work towards avoiding them. We made considerations to ensure that we analyzed the interpreted and underlying meaning of the text, and not only stated what was said. We also made sure that our interview questions were not the ground for our themes. Lastly, when overviewing our codes, we ensured they are coherent within and differentiated from each other enough to be considered separate themes.

3.4 Ethical Considerations

When conducting our study, we did some ethical considerations. These are based on Vetenskapsrådet's (2002) four principles regarding research ethics. These four principles include the information requirement, the consent requirement, the confidentiality requirement, and the usage requirement. The information requirement regards how the researcher should inform all respondents about their participation role as well as the study's purpose. The respondents should also be informed that participating in the study is voluntary and that they can stop participating at any given moment without motivating why. It is important to ensure that the respondents have all information that could affect their willingness to participate in the study. The consent requirement refers to how actively participating respondents have the right to make decisions regarding their participation. This means that the researcher should ask for the respondent's consent before involving them in the study. The respondents should also have control over if, for how long, and under which circumstances they are participating. There should be no consequences for them if they want to cancel their participation. The confidentiality requirement includes guidelines regarding how information about respondents should be handled. All information about the respondents should be treated with confidentiality and stored in such a way that no outside parties can access it. This also includes censoring sensitive information about the respondents in the written report and all discussions about it. Sensitive information involves everything that could reveal the respondent's identity. Finally, the usage requirement regards how collected data is used. This requirement ensures that all data collected for the research, is only used for this research and no other purposes. There are also rules against using the collected data against the participants in a way that would affect them. During our research we follow all guidelines for these four principles to ensure ethical treatment for our research and respondents.

4. Results

Within this section we will present our results regarding conditions for learning. This part starts with a summary of the educational settings we identified, and is after that divided into three main sections: "Conditions based on physical space and digital tools", "Conditions based on lecture forms and interactions", and "Managing conditions for learning". These sections were three of the themes that were constructed during the data analysis. They are used as headlines in our results to present clustered codes related to each other.

There were differences regarding educational settings in terms of class sizes, but for the time and reason for hybrid lectures our respondents answered similarly (see Table 2 in Appendix). Most respondents were forced into the hybrid format during the COVID-19 pandemic, except for respondents 3 and 5 who also encountered it voluntarily. Respondent 3 says that they were allowed to conduct all lectures on the university campus, but because there were students who did not live close and who were in risk groups of the virus. This led the respondent to choose the hybrid option to meet everyone's needs. This respondent was the only one who preferred hybrid lectures. They say that from a teacher perspective conducting in-person learning is better, but still choose the hybrid format since they think it is the best solution for students because it increases their possibilities to study. Respondents 1, 2, and 4 tell us in different ways how difficult it is to know what is learned on the other end using digital tools. This is much easier to notice when educating in-person.

4.1 Conditions based on physical space and digital tools

Respondents 1, 2, 4, and 5 say that they have access to specialized Zoom rooms on campus. Respondent 2 says these rooms contain both hardware and software necessary for Zoom meetings. Examples of this include big wall-mounted screens, iPads with Zoom installed, and a camera that overviews the classroom from the back wall.

We identified a total of eight digital tools mentioned by our respondents (see Table 3 in Appendix). All respondents mention Zoom Meetings as the main digital tool that was used during lectures. Respondent 2 mentions that in the beginning of the pandemic they tried several programs. They considered Zoom to be the most useful and it also ended up being the most popular one at the institution. The respondent explains that Zoom has been developed and has changed a lot since the beginning of the pandemic. It has become more functional with new functions added. The respondent further says that during some courses, there has been a requirement for specialized software programs such as the analytics tool Microsoft Power BI during lab exercises. They solved this by giving the on-campus students access to the computer labs, and the at-distance students could participate from home. Digital tools that respondent 3 mentions are Zoom, cameras, microphones, and projectors. Respondent 4 says that they have not aimed to use any special digital tools for their hybrid lectures and have used the ones they are commonly using. Therefore, when being in the classroom, they did not require any specific equipment, and have used their laptops built-in microphone and speakers. They further mention the poll tool Mentimeter as a tool that was used to do different types of interactive exercises. The respondent explains that this tool can be seen by all participants regardless of where they are participating if the teacher shares their screen on Zoom and projects it in the classroom. According to respondent 5 Zoom's digital whiteboard is a usable function and there has been a lot of pressure and requests from teachers to get more collaborative tools.

Overall, respondent 2 says that using Zoom has led to new possibilities that better suit their needs of conducting distance learning. Respondent 3 says that if you have access to flexible equipment, hybrid learning costs little and is easy to conduct. According to respondent 4 using Zoom has worked well overall, but sometimes they would move out of the picture so that the Zoom-students could not see them. Respondents 1 and 3 say that their lectures have not had any difficult requirements regarding digital tools. However, respondent 3 have encountered

issues, such as technical ones when students did not have a functioning camera. Regarding technical issues respondent 1 says "As soon as you start to not hear the others, or not being heard yourself, it does not matter how good the video quality is. The sound is the important thing." Another challenge mentioned by respondent 5 is that a lot of digital software programs are American and can therefore not be used by Swedish authorities since they do not meet the GDPR requirements. Another challenge mentioned by respondent 2 is that there is no guarantee that you will see the students participating on Zoom, since they can choose to turn off their camera. Most students do not use a camera during lectures, meaning that there are a lot of social interactions that are lacking. One example is that the teacher is not able to read faces and body language to interpret whether the student has understood the material or not. The respondent further argues that "What comes naturally when you are in the same room, is not natural in Zoom or Teams".

4.2 Conditions based on lecture forms and interactions

4.2.1 Lecture forms

"When you run classic teacher-led lectures where students only ask occasional questions it suits very well. And there is quite a lot of that in mathematics, there is a lot of one-way communication when you are standing at the board. This is easier to do hybrid than what a more interactive study form is" - Respondent 3

Respondent 3 says that their lectures have not had any difficult requirements for their hybrid lectures. They tried to do their lectures as close to normal as possible, meaning that they used a traditional board in the classroom, and aimed a camera towards it to stream it. If they were to do more group exercises, they would have to invest in more cameras but as of now with the traditional education model, it has not been problematic to access the necessary tools. The respondent teaches courses within mathematics and says that this is probably a reason as to why their traditional lectures have worked so well. The lectures usually include one-way communication, from the teacher to the students. This learning form is easier to conduct in a hybrid format than more interactive ones. All respondents agreed and said that conducting hybrid learning in lectures where there is primarily one-way communication, works well. Respondent 4 explains that as soon as a lecture contains interactive elements such as group projects, discussions, case-exercises, or other tasks that are solved and presented in groups, hybrid lectures become difficult. Respondent 2 mentions that hybrid lectures with a workshop format did not work as well as the lecture did when they held it completely on campus. A reason for this is that the teachers were not able to supervise and help the students participating from home in the same way, meaning that the workshop-characteristics of the lectures were restricted. This influenced the learning outcome for the students at home in an undesirable way. Respondent 4 also says that because of how bad it has worked on their institution, they have completely stopped doing hybrid lectures for lectures with workshop, lab, and other computer intensive formats. However, all respondents were able to divide students into smaller groups during hybrid lectures. Respondent 3 also says that they wished that they had done it more than they did, since the communication usually flows better within these groups.

Respondent 2 says that dividing students into smaller groups works okay and is one of the least troublesome areas of hybrid learning.

According to respondent 5, within higher education they encourage lectures with student active forms and any other forms than lectures with one-way communication, because they know that these lecture forms are better for students' ability to learn. This makes the hybrid format difficult since you have to choose between conducting hybrid lectures successfully or work pedagogically. This means that more teachers would conduct traditional one-way communication lectures, even though they are not most suitable for students' learning abilities, just because it is what the hybrid format allows. Respondent 2 argues that hybrid lectures are hopeless as a format, since they require two different material foundations, two different logics and two different pedagogical models to work. To combine these, and find a way that suits both participant types, is practically impossible. The respondent further explains it is difficult for them as a teacher to find a pedagogical model that makes it fair, reasonable, fun, and informative for students both in the classroom and on Zoom. Respondent three concluded based on their students' results during the pandemic that conditions based on lecture forms are more important for the "low performing" students that are not as self-propelled as the top students. This is because the latter will find their own study techniques and ways to learn and assimilate information to achieve the expected goals, something the "low performing" student cannot do to the same extent.

4.2.2 Interactions

All respondents say that they gave all students the ability to discuss with each other, no matter where they were participating, during the hybrid lectures. However, respondent 1 says it has not functioned flawlessly, as the technical equipment has not been working well in some lecture halls. Respondent 2 also mentions that even though they can, students are not interacting between the physical and digital classroom. Respondent 4 mentions they have tried to divide students into groups and mix participants in the classroom with those on Zoom and do presentations this way. This worked fine while presenting but was very difficult during discussions. It was difficult for participants on Zoom to partake in the discussions being held in the classroom, and therefore these students said almost nothing at all. The respondent specifies that "For discussions between students, it was 95% of those in the classroom [who spoke] and only maybe 5% with the students on Zoom". Respondent 1 also experienced that lecture containing elements of discussions were not suitable for hybrid learning because those on Zoom talked less than those in the classroom. In relation to mixing on-campus and online participants within groups, respondent 2 considers it too cumbersome and argues that even if it is doable, it does not add value, and makes it worse for all participants. It must be arranged in another way structurally from how they are doing it now. Respondent 5 agrees that there are difficulties involved and not mixing is therefore more common. Respondent 5 adds that if students in-person are expected to communicate with those on Zoom, the teacher needs to plan for this and communicate it to students so that they are prepared and have brought a computer.

When it comes to interaction between students and teachers, respondents 4 and 5 say that it is doable. Our first respondent says that this is possible if the sound quality is good enough. Respondent 5 says that it can be done both by talking into the microphone, and by writing in the chat. Respondent 3 agrees and adds that they adjusted the volume from the Zoom meeting

so it would match the volume of the in-person students. Respondent 2 says that this depends on the lecture, teacher, and tools. For example, if the teacher is holding a lecture in which they are talking in front of a screen and not next to their computer, they will not see any messages that are being posted in the chat. This works better when students are asking their questions with their microphone instead, since it will be heard through speakers in the classroom. Respondents 1, 4 and 5 also say that they urge students to use their microphones rather than the chat function, because of the difficulties that come with trying to keep up with both discussions in-person and the chat. However, respondent 2 says that this also comes with its own challenges. One being that it is difficult to know which student asked a question or had a comment, if you do not run quickly to the computer to see which Zoom-square is being highlighted. Respondent 2 and 4 mentioned that sometimes students announce that there are new chat messages. This solution has worked okay. The fourth respondent says that this is something they would have arranged differently if they were to continue with hybrid lectures, because they believe that there are better ways of doing this.

A limitation mentioned by respondent 2, is the inequality that comes with hybrid learning. The on-campus students are offered the lecture itself, but also discussions and questions that are taking place before and after the lecture. This is something that the participants on Zoom are missing out on. As a teacher it can be difficult to remember which students have gotten which information, since you may only remember talking about it, but not when or with whom. The respondent further explains that these discussions affect the student's ability to learn, and therefore students on Zoom will not have the same ability as those in the classroom. This inequality between on-campus students and online students is something that respondent 1 also mentions and that this is something that is particularly noticeable when some students are participating online and others in-person, as it is not as prevalent when all students are joining the lecture online. Furthermore, because of how divided the groups are, it is difficult as a teacher to be sufficient for any of them.

4.3 Managing conditions for learning

Respondent 5 mentions the importance of considering how digital tools will enhance the lecture, and not just using it because you can. Furthermore, the respondent relates this to hybrid learning and says that the main argument they have heard for why hybrid learning should be conducted is "because we can". Specifically, the respondent says that "There is a lot you can do digitally because it works, but it is not certain that you should do it just because it works". This is not reason enough. However, they think that hybrid learning, and work models will be more prevalent in the future and that hybrid meetings can work well. The respondent is currently involved in a research project regarding hybrid learning and says that they hope to generate knowledge on how it can be better conducted. They conclude this by saying that it probably works better for short meetings, rather than for programs that last years.

Respondent 4 argues for the importance of investing time and resources to make decisions and organize for hybrid learning, saying that they have not done this. Respondent 5 thinks that choosing the right pedagogical approach is crucial regarding if hybrid lectures will work or not. They further explain this by saying that you must consider what a learning occasion should include and that they must provide equal opportunities for all students, no matter if they

participate in the classroom or online. Since they are unfamiliar with the hybrid format, they do not know how it affects learning possibilities. This makes hybrid lectures challenging and the respondent says that this is a question of both qualitative education and accessibility, which can be difficult to combine. Respondent 2 also says that the teacher's view of learning and pedagogy affects the education. The respondent believes that to make a student grasp a concept, you must explain it in relation to the student's views so that they can concretize it. This is easier done in a physical classroom since the teacher can read students body language to anticipate if they have understood the material and not. Because lectures with one-way-communication are what works best in a hybrid format, the hybrid lectures will not be able to capture these interactions. Especially when students do not use a camera.

Respondent 2 also mentions that the decisions regarding if courses are held on campus or not can come at the last minute and says "And to change then becomes... What the hell do we do now? We had to say in that situation, do the best you can". This puts pressure on the teacher to make quick decisions, often without the necessary knowledge regarding how they can do it as suitable as possible. The fourth respondent argues that because they view hybrid learning as a temporary, rather than a long-term lecture form, they did not feel a need for further investment of time and resources. They also state that if they knew that they would do hybrid lectures again in the future, they would have arranged it differently. The respondent also says that they believe that if you do not ambitiously organize and allocate resources, hybrid learning will not be beneficial for all participants. They state that to conduct successful hybrid lectures you must both develop the thought processes and behaviors for it. When conducting lectures digitally, the approach needs to be different. The entire course and all its lectures must be designed with this in mind, to ensure that interaction and relationship-building is encouraged, that students are able to absorb information during lectures and pass examinations. In other words, the quick change to a temporary state of hybrid learning led to lectures being held without allowing teachers to plan for students' ability to learn.

5. Discussion

Within the discussion section we have three sections in which we discuss our results and their correlation to our presented related research. Lastly, we include a section for reflections about our study's results, contributions, and limitations.

5.1 Relation between lectures and conditions for learning

5.1.1 Digital tools and environments

Löfström et al. (2007) mentions how flexibility in terms of time and physical space is the most important thing that an online environment provides, given that it is sufficiently equipped. Respondent 3 mentions this when talking about how hybrid learning is easy to conduct, at least in the form of traditional one-way communication lectures, when you have digital tools that allow for flexibility. However, even though hybrid learning can help eliminate some challenges regarding limitations and resources (Snart, 2010), most of the respondents have experienced both technical issues such as non-functioning cameras and microphones. In addition, respondent 2 argues that there is a lack of social interaction with the online students. The

example given is that they can turn off their camera, thus making it impossible for the teacher to read body language or other physical cues that are important to fully decide if a student has understood the given information or not. This goes along with what Löfström et al. (2007) says about the importance of having in-person learning conducted as well to heighten the group affiliation since it is very hard to achieve to the same extent online. Because of this, we argue that hybrid learning has failed in this instance since the aim of hybrid learning is to enhance both the physical and digital learning environment (Gagnon et al., 2020). According to our findings it has not been able to do so. Rather it has allowed for a higher quantity of students to take part during the learning occasions through a digital environment, but at the cost of quality.

Kohls (2017) argues that hybrid learning can enhance both the in-person and the digital elements of a lecture, if using their strengths and weaknesses in a complementary way. The author further mentions that to do this you need to possess knowledge about how digital tools could enhance the lecture, and that they should have a purpose and not be used for the sake of it. This is something that respondent 5 also mentioned, when saying that just because something could be done digitally, does not mean that it should. We argue that our respondents did not meet the requirement of planning the digital tool usage for successful hybrid lectures. However, as previously mentioned some respondents viewed the hybrid format as temporary and this could be a reason as to why no bigger investments have been made. But in contrast to this, other respondents believe that hybrid work formats will be more prevalent in the future. Thus, indicating that it would be beneficial to invest and develop knowledge about it to achieve the aim of hybrid learning. The seemingly inadequate digital tools meant that there were bad conditions for lectures, which is further discussed in the next section.

Sancho-Gil and Rivera-Vargas (2016) mentions that collaborative learning can be beneficial for educational purposes. Kohls (2017) gave several examples of digital tools that can be used for this during hybrid lectures. These included digital workspaces for documents, large interactive walls, and interactive tangible objects. Our results were that none of these tools were used during the hybrid lectures. However, some tools, such as digital workspaces, are mainly used by students meaning that our knowledge regarding their usage is limited. Large interactive walls were not specifically mentioned, but tools like it were. Kohls (2017) describes large interactive walls like big whiteboards that are digital and projected onto a wall. Participants can work simultaneously with these, using either computers and smartphones, or the physical wall in the classroom. Respondent 5 mentioned that digital whiteboards can be used on Zoom and that they are a requested tool among teachers. None of our other respondents mentioned that they have used Zoom's, or any other, digital whiteboards. But respondent 5's answer indicates that teachers see this type of tool as beneficial. Integrating the Zooms whiteboard into lectures should not be too difficult since all respondents were already using the application. Integrating and using this type of tool might have solved the problem with integrating digitally participating students with in-person participating ones, as well as using digital tools with a purpose. In conclusion, we see the lacking usage of collaborative digital tools might be one reason why our respondents did not see value in hybrid lectures.

The size of the classes that participated in our respondents' hybrid lectures varied between 25 to 100 students. As mentioned by Caulfield and Aycock (2011), the size of the class can affect the outcome for hybrid lectures. A bigger class means that students have less time to participate

in different lecture activities. The authors further explain that dividing students into smaller groups is a beneficial solution during hybrid lectures. All respondents said that they were able to divide their students into smaller groups when needed. One also said that they wished they had done this more during their lectures, because of the benefits for communication between students and lecturers. Respondent 2 also said that out of all the areas to manage within hybrid learning, dividing students into groups was the least troublesome. The digital tool that was used by all our respondents was Zoom. Since all respondents were happy with the outcome of dividing the students into smaller groups using Zoom, we conclude that dividing students into groups using Zoom was both unproblematic and beneficial during hybrid lectures. We believe that dividing into smaller groups is something that our respondents are used to doing during in-person and digital lectures as well, since too large class sizes is not a problem exclusive for hybrid lectures. And as respondent 3 and 4 mentions they tried to work in similar ways during the hybrid lectures as during other lecture forms. This relates to what Laili and Nashir (2021) says regarding that digital meeting platforms are beneficial when they simulate regular classroom-lectures. Dividing students in hybrid lectures could be done on Zoom in similar ways as in-person lectures that our respondents are used to, and the digital tool did not add any further barriers. Therefore, it is probable that this worked especially well.

5.1.2 Lecture forms and interactions

Löfström et al. (2007) argues for the importance of teachers planning their lectures to enhance learning abilities and methods. According to the author this can be done by choosing the right educational methods, or lecture forms, with the goal of enabling students' deeper understanding of the course material. Caulfield and Aycock (2011) also argue for the importance of planning lectures so that they enable learning among students. This places requirements for how the lectures are planned and conducted. As previously mentioned, our respondents are conducting lectures within the faculty of mathematics and natural science, and the faculty of social sciences. Within these faculties the respondents are tied to different institutions. Caulfield and Aycock (2011) mentioned course content and field as a factor that can affect the digital tools and methods available for hybrid lectures. The authors further explain that courses characterized by straightforward methods require different tools than those which require more student participation. Our respondents confirm this since they mentioned that courses within subjects that use more one-way communication seemed to work better with hybrid lectures. Respondent 3 mentions that within their mathematics courses Zoom worked particularly well for hybrid lectures. The respondent argued that these courses mostly require one-way communication from the teacher, and that the lack of interactive activities was the reason behind the lectures' success. They state that if they wanted to conduct more interactive classes, they would have to invest in more digital tools. The respondent was the only one conducting non-interactive lectures and was also the only one that preferred hybrid lectures out of the three presented alternative lecture forms. All other respondents claimed that the interactive parts between students and other students, as well as between students and teachers, was troublesome during the lectures. The less interactive a lecture is, the less it requires different functions in the digital tools. For our third respondent, a camera and microphone aimed at a blackboard was enough to sustain their lecture as usual. But for those who conduct interactive lectures, the demand for a variety of functions is higher, which

became clear when our respondents said that interactive elements barely worked. Dogadina et al. (2021) argues that online elements within lectures can limit which activities are doable and not. Furthermore, even with sufficient digital tools there were challenges such as a limitation for social interactions during the interactive lessons. The author further states that this affects the students' learning outcome. This is worrisome, since respondent 5 argues that within higher education interactive lecture forms should be used, because of its positive effect on students' learning abilities. In terms of interactive lectures, Miller, McNear and Metz (2013) agrees that interactive lecture forms lead to students gaining deeper knowledge about the lecture material. The authors mention discussion, problem solving, and group projects as examples of how this can be done. Since our respondents, and our presented literature, argue for the importance of interactive lectures, this is troublesome. It is important to plan lectures so that they enable learning among students, which is done best with an interactive lecture form. However, during hybrid lectures the interactive formats have not worked well, and therefore we argue that non-interactive lectures work better in a hybrid setting. Our findings indicates that hybrid lectures cannot support the optimized way of enabling learning. In other words, most of our respondents teach within courses and programs that require interactive methods, and it is also the most beneficial lecture form in terms of learning outcomes. Since all respondents used Zoom and their experiences of hybrid lectures varied, we see course content and field as a factor that has significant effect on hybrid lectures'. Furthermore, we draw the conclusion that the non-interactive lecture forms do not seem to be sufficient as a lecture form. This means that hybrid lectures should not be used within lectures that aim to optimize students' ability to learn.

As mentioned by Baser, Pandya and Polkowski (2017), hybrid lectures can increase the levels of interest, engagement, and innovative thinking of participants. However, respondent 2 argues that it is difficult as a teacher to find a pedagogical model that can make hybrid lectures both fun and informative for both participation groups. Thus, our results are not in agreement with the literature.

As Caulfield and Aycock (2011) mentions, hybrid lectures should include activities in which the participants online can communicate with students and teachers in the classroom. All respondents say that their lectures allowed students to communicate with each other and the teachers regardless of where they are participating from. However, this has not worked faultlessly since there were problems with both digital factors and participation. Some digital audio equipment did not work as intended, making communication between the classroom and online students difficult. Our results also found that even though students could communicate with each other, they did not. Two of our respondents tried mixing groups of students participating from home with those in the classroom, with varying results. The other respondents avoided it because of the difficulties it would involve. Caulfield and Aycock (2011) argue that for hybrid lectures to be beneficial they should erase the boundaries between the students in the classroom and online. The authors say that this can be done by letting them participate collectively in learning activities. Laili and Nashir's (2021) further states that digital meeting platforms are beneficial for communication because they allow participants to see and discuss with each other. During the hybrid lectures our respondents conducted this was not reflected since connecting the digitally participating students to the in-person participating

students seems to have been difficult. Several respondents considered it too difficult because they were participating from different places, meaning that Zoom as a digital tool lacks in its ability to connect the different groups. This problem did not seem to be prevalent within groups whose participants were all in the same space, either in-person or online. Thus, strengthening the indication that the problem lies within connecting the two participating groups. This indicates that Zoom as a digital tool is not functional for hybrid lectures, since these lectures benefit from collaboration between the two groups, which Zoom could not deliver in a satisfactory manner. However, one function on Zoom seemed to have worked better for this. Several respondents said that chat messages on Zoom are difficult to keep track of as a teacher, in contrast to when students on Zoom used their microphone to communicate. This audible communication could be matched with the in-class volume to make the barrier between the two worlds smaller. But even though using audible communication seems to have worked better, it did not always work as intended. Our results showed that students participating online did not talk as much as those in the classroom, meaning that these students did have the same opportunities to participate in the classroom discussions. Kohls (2017) states that a downside of digital meetings is that social cues are more difficult to read. For example, when someone is about to start a sentence you can tell by their body language, but because of how difficult body language is to read on Zoom, participants more often interrupt each other. These inequalities regarding which students get to read the groups social cues might be a reason as to why students participating online talks less. If they cannot predict their classmates' behaviors, the barrier to participate in the social context might be bigger. In conclusion, it was mostly troublesome connecting the two classrooms. For student to teacher communication the contrast between the physical and digital classroom seems to be smaller when students are communicating audibly, and bigger when in writing. However, because Zoom and its functions did not work well for communication between students, it does not seem to be functionable enough for communicating during hybrid lectures. According to Löfström et al. (2007) it is of great importance to enable communication both between students, and between students and teachers. Caulfield and Aycock (2011) argues for the importance of allowing students to discuss the lecture material together and interacting with teachers. The authors argue that this is important because it enables deeper understanding of course content and thus better learning abilities. Because of how poorly discussion worked between students, it affected the learning outcomes negatively for students. We conclude that since hybrid lectures complicates interactions that favor the learning outcomes, it can be perceived insufficient as a lecture form.

5.2 Ability to manage conditions for learning

Our respondents argued for the importance of planning and performing education, based on how learning should be conducted. Biggs (1996) says that learning among students is based on their own intentions, assumptions, motives, and previous knowledge. This relates to what respondent 2 said regarding that they view learning as something that occurs in relation to the students' views so that they can concretize it. As earlier mentioned, our respondents deemed this difficult in digital environments. This was explained by the lacking social capabilities that come with digital meetings, especially when students do not use their camera. When teachers are not able to read body language and other social cues, it is difficult for them to anticipate

whether students have understood the material or not. This means that the hybrid lecture format is not beneficial since teachers cannot assure that their students have managed to learn.

Achieving learning must be done with careful consideration of what students should learn, and how this can be done with a selected method (Biggs, 1996, 2003). Löfström et al. (2007) discuss how the entire overlapping process of a course relates to this, with three specific steps in mind. The first step is establishing goals for teaching by planning the education. The second step is to conduct lectures that enable students to learn. The last step is giving students feedback on their learning outcomes. It is important to consider this entire process when discussing abilities of learning, since learning does not occur as an isolated step. Even though our study focused on the conducting of lectures, we see and argue for the importance for teachers and managers to consider the entire process and not just the lectures themselves. As Snart (2010) mentions, conducting hybrid learning without adequate planning is extremely difficult because it does not give teachers enough time to plan for and consider the pedagogical approach and learning outcomes. This affects both students and teachers negatively. This is something we could see among our respondents as well. Almost everyone was forced into the hybrid work format without previous knowledge or experience, and the lectures were not deemed successful. Furthermore, different lecture forms require different sorts of planning in terms of activities and pedagogical approach. Thus, a last-minute decision is never beneficial no matter the lecture form. This relates to what respondent 5 said about how choosing the right pedagogical approach is crucial, and that all students must get equal opportunities. Furthermore, they are unfamiliar with the hybrid work format and therefore lack knowledge about the best pedagogical approach. Respondent 2 further argues that if a course and its lectures is not developed with this knowledge, the learning possible outcomes for students will be affected. This was deemed especially crucial for low performing students since their results were more affected by this than the high performing students. Thus, we conclude that because the respondents could not plan for an optimal learning environment, it was difficult to conduct successful hybrid lectures.

5.2.1 Hybrid learning in relation to Bloom's taxonomy

Our respondents have stated that there was only one lecture form that worked well in the hybrid format and that was the traditional one-way communication lecture. Looking at Bloom's taxonomy (Andersson, Krathwohl, Airasian, 2001) this type of lecture is sufficient for the first two steps, remember and understand. However, Tynjälä (1999) describes how learning is done by active cognitive activity by the student and not by receiving information passively for the sole purpose of learning that information by memory, and Miller, McNear and Metz (2013) agrees that interactive lecture forms results in a deeper knowledge. Caulfield and Aycock (2011) also says that interactiveness gives better opportunities to discuss learning material with other students, and the teacher. Because of this, we argue that hybrid learning is more sufficient when used in a non-interactive format and that it is less suitable for education for learning in the higher steps of Bloom's taxonomy (Andersson, Krathwohl, Airasian, 2001).

5.3 Reflections about contributions and limitations

As mentioned in our introduction, we identified a gap within the research of hybrid learning. The field usually considers cases in which it has been an intended investment, and not where

changes towards hybrid learning were done suddenly and without adequate planning for the learning outcome. Our results found that within our case the switch to hybrid learning came during the pandemic, and that the respondents were not prepared for this. They had varying experiences during the hybrid lectures, but overall agreed that it was not a sufficient learning form, and they did not want to continue to work in a hybrid format. This indicates that unplanned changes towards hybrid learning are not favorable among teachers and that the need for planning hybrid learning is significant. The changes that came with the pandemic was the main reason as to why hybrid learning was conducted in this case. Our findings were that the digital tools used during the hybrid lectures usually did not differ from the tools used during in-person and online lectures. This might correlate to how suddenly the pandemic changes appeared and required new work methods, which led to our respondents not being able to develop their methods before courses required it. We also aim to contribute to practical usage of digital tools in hybrid work formats. Our main contribution to the practical field is the importance of planning for hybrid work. We also emphasize to include research about digital tools during this planning, to ensure they are used for a purpose and support hybrid work.

One limitation we see with our study is that universities are somewhat different from other organizations. We mentioned in the introduction that we see our results as applicable to other types of organizations than universities. But there are some factors that are unique for universities, meaning that these could differ from other organizations. One of these is that the university is state-funded, and therefore their financial risks might be smaller than for other companies. Therefore, trying alternative work forms, such as a hybrid one, might not be as risky for a university. Another factor is that because the university is state-funded, it does not have dependency on their customers' satisfaction in the same way as other organizations. Other organizations might be hesitant to take the risk of implementing a hybrid format because of how quickly their customer base might fade, which is not as prevalent for a university. However, universities carry a responsibility to provide their customers with an education. This means that they also should be hesitant to take unplanned risks out of fear of not being able to deliver their perceived value. Because of this, every aspect of our findings might not be fully applicable on other types of organizations. Another limitation we identified with our study is the fact that we did a case study on one single Swedish university. Therefore, we do not rule out that the situation might differ within other universities in Sweden and internationally. We argue that even though there is limited reach for our study we believe that it can be applied to other universities, especially Swedish ones, and other organizations of similar construct.

6. Conclusion

The research question that this study aims to answer is "How are digital tools used for hybrid learning in higher education environments and how does it change the conditions for learning?". Our conclusion is that digital tools were used in a similar fashion in both hybrid, and non-hybrid, higher education environments. The most used tool was the digital meeting platform Zoom Meetings, which was used in a variety of ways. This includes both one-way communication lectures, and interactive learning occasions. We draw the conclusion that hybrid learning works well for some lecture forms, where the most prominent is the traditional

one-way communication lectures. However, hybrid learning does not seem to work well when it comes to interactive lectures, and this is problematic since it has been shown that interactive learning is important for students to reach a deeper learning about what they are studying. In addition, we also conclude that this in part depends on what and how digital tools are used in today's hybrid learning environment. Therefore, we would like to provide a suggestion for future research. Our suggestion is to conduct more studies related to what digital tools are better fit to use when conducting hybrid learning. This could provide new insights about the field and how to improve hybrid work models.

7. References

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8. Appendix
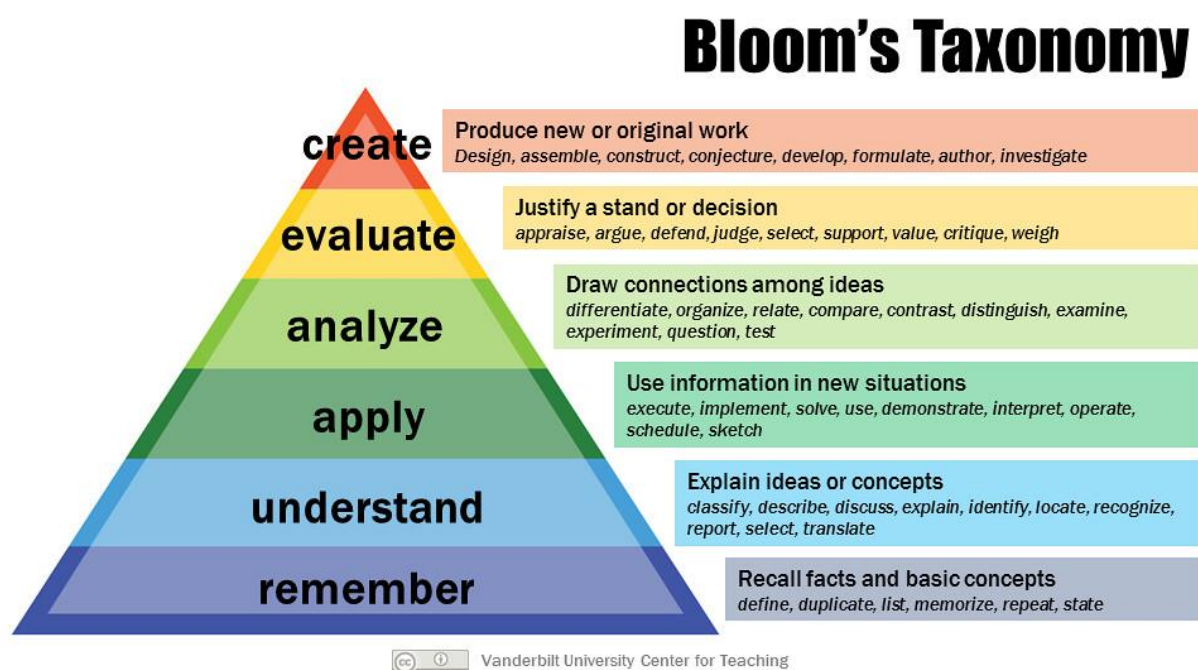
Picture 1. Revised 2001-version of Bloom's Taxonomy of educational objectives

Respondent	Faculty	Roles	Interview length

1	Social sciences	Associate professor and head of department	16 minutes
2	Social sciences	Associate professor	39 minutes
3	Mathematics and natural science	Associate professor	27 minutes
4	Social sciences	Associate professor	29 minutes
5	Social sciences	Associate professor and director	26 minutes

Table 1. Information about respondents.

Respondent	Class size	Time period for hybrid lectures	Reason for hybrid lectures	Prefers hybrid lectures*
1	Up to 100 students	Since spring 2020	Pandemic	No
2	~25−35 students	Since spring 2020	Pandemic	No
3	~40 students	10-15 lectures	Pandemic and voluntarily	Yes
4	~25−35 students	A five-week course	Pandemic	No
5	Up to 150 students	The early 2000's and spring 2020	Pandemic and voluntarily	No

Table 2. Results of educational settings
*Preferred alternative of hybrid-, in-person-, or online lectures.

Name of digital tool	Type of digital tool	Hardware/Software
Camera	Optical instrument	Hardware
Computer (MacBook Air and PC)	Digital device	Hardware/Software
iPad	Mobile device	Hardware/Software
Mentimeter	Poll tool	Software
Microphone	Voice communication	Hardware

Name of digital tool	Type of digital tool	Hardware/Software
Microsoft Power BI	Analytics tool	Software
Projector/screens	Visual display	Hardware
Zoom Meetings	Digital meeting platform	Software

Table 3. Digital tools used during hybrid lectures.

Interview Questions

Generellt om hybridundervisning
• Hur länge har ni bedrivit hybridundervisning?
• Vilka investeringar har gjorts för hybridundervisningen?
  • Var dessa investeringar planerade eller gjorda av nödvändighet (ex. pga COVID-19-pandemin)?
• Inom vilket/vilka ämnen bedriver ni hybrida undervisningspass?
• Hur stora klasser brukar vanligtvis delta på dessa undervisningspass?
• Vilka faktorer gör att hybridundervisning passar/inte passar i ert fall?

Digitala verktyg för hybridundervisning
• Vilka digitala verktyg använder ni under hybrida undervisningspass?
• Tillhandahåller institutionen den digitala utrustningen, eller förlitar man sig på att studenterna själva ordnar det?
  • Vilka verktyg behöver studenter ordna själva/inte? Hårdvara/mjukvara?
• Med de verktyg som används under lektionerna:
  • Kan studenter som deltar på plats, diskutera/prata med studenter som deltar på distans?
  • Kan alla studenter interagera med läraren under undervisningspassen?
  • Har ni möjlighet att dela upp studenterna i mindre grupper om det behövs?
• Föredrar du hybridundervisning, eller att ha undervisningen antingen helt online eller på plats? Varför?