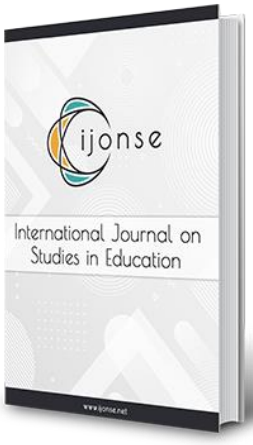

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There Is Another Room on the Other Side of the Screen: Learning via Zoom in a Hybrid Context

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Abstract

The tradition of physical presence in higher education has existed for years. Hybrid learning designs have emerged in recent years as a complement to the traditional way of teaching. This has created flexibility in education independent of time and place. The increasing number of students underscores an ambition to obtain high-quality education. Hence, it becomes critical understand how distance students residing in other countries perceive online-teaching in a synchronous hybrid-form, interconnected with traditional classroom teaching. The purpose is thus to gain an in-depth understanding of the factors affecting the experience of learning and engagement through Zoom. The data consists of 22 hours' observation of Zoom lectures, supplemented by interviews with two distance students, to enable an in-depth understanding of the Zoom teaching model. The theoretical approach used is Community of Inquiry. The results highlight key conditions for the learning experience in the studied course and show that participation through Zoom in a hybrid classroom affects social and cognitive presence. This limits the interaction between physical classrooms and Zoom rooms and causes limited access to ongoing classroom activities, which slows down the learning process.

Introduction

With more and more students flowing through the education system (Swedish Higher Education Authority, 2024) and increased use of digital tools in teaching, the conditions for meeting others in the classroom are affected (Ekberg et al., 2023). The availability of tools that support synchronous and hybrid teaching enables flexible meeting forms, which is why it may be important to highlight the student perspective. This is a study of how distance students, on syncron-hybrid courses, in this case via Zoom, interact with each other and the teacher online in real time. The study is based on the perspectives of geographically distanced students who share classrooms with campus students via Zoom at a Swedish university.

Swedish higher education has expanded at the same time as the demands on knowledge and divisions between disciplines and specializations have led to knowledge partly falling under different organizational sections (Börjesson & Dalberg, 2021), but also that it leads to a greater focus on the development of subject specialization than pedagogical approaches. This may mean that pedagogical knowledge for teaching in higher education risks ending up in the periphery. Classroom teaching in higher education has a long tradition of emphasizing physical

presence and this has persistently been a matter of course. Technological development and the pandemic have given the development of online teaching a boost and various possibilities for flexible course design and teaching have emerged as a complement to the traditional learning environment (Olstedt & Lönnheden, 2005). Recorded lectures, distance learning or mixed forms between the physical classroom and distance in "the same room" (Temple, 2008) are some examples. In recent years, hybrid learning has been used as a means of teaching. This allows for flexibility in the design of the system, regardless of the time and location. The increasing number of students underscores an ambition to obtain high-quality education. Much of this was also due to Covid and the government's recommendations that teaching should be conducted remotely, which led to an explosive increase in the use of digital options, where Zoom became a commonly used software at Swedish universities (Swedish Research Council, 2020). This has created accessibility in relation to time and space, regardless of where the students are or when they want to study. It is an environment that allows flexibility and is functional (Collins & Callaghan, 2022), but also the opposite.

A limited and reduced study environment where interaction between students and teachers is made difficult and where the experience through the technology's function of sound and image can be stressful (Ekberg et al., 2023). The transition to online education has increased the interest in social and digital presence and has drawn attention to the importance of the social dimension in teaching and learning. We know that physical presence involves participation in a social context that provides opportunities for community (Garrison & Cleveland-Innes, 2005), but what does technology do with the individual's sense of presence in educational contexts? Here you need to consider the form of distance learning, whether it is synchronous or asynchronous. Whether the teaching is connected or based on each student taking part in pre-recorded lessons also affects the students' ability to create a community with each other. Technology is available, but the pedagogical tools may need to be considered. This raises questions about the importance of instructional design, but also about what it means for the students' experience of learning.

Students' Experience of Distance Learning

As teaching moves online, universities have started to use different forms of hybrid distance learning solutions. When teaching changes form (moves from classroom to online/distance or where both forms are combined) it is necessary that learning situations are adapted to support the learning situation in the best way. Studying students' experience of teaching through course evaluations is difficult as the response rate is often low and has decreased over time when course evaluations have moved from paper to digital versions (Chapman & Joines, 2017). Regular evaluations are carried out, but these do not provide sufficient or more underlying answers about what works or does not work at different moments of a course. Course evaluations are based on common questions, and the students are anonymous, making follow-up impossible. Research shows that distance students are less satisfied than campus students regarding factors such social interaction. They sense a distance to others, but also like the flexibility, which enhances and balances their experience (e.g. Gherhes et al., 2021; Owens et al., 2009; Zheng et al., 2021). So, it depends on what they are asked in the evaluation. This also shows that there are factors that play a role in the experience of a course, factors that have nothing to do with the content of the course. It may therefore be important to identify situations that can improve the circumstances for distance students, providing them with

good conditions for studying and achieving their learning objectives.

Factors affecting the Experience of Learning

The factors identified as significant for distance students were already apparent in prior studies (e.g. Owens et al., 2009). The studies examine common factors that at first glance may seem obvious, such as interaction and communication, but which have proved to be crucial to how teaching is experienced. Specifically, the method of communication and the relationships between individuals (between students or between students and teachers), but also the technology used, all affect the quality of education.

The Physical Environment's Importance for Participation, a Sense of Belonging and Interaction

It can be stated that the learning environment needs to be given greater attention, which raises discussions about adapted learning environments – a discussion about what these situations can be, and hence, the focus is directed towards exploring them. Participation, active engagement, and the sense of belonging are important. Teaching methods must be more consciously directed towards organizing learning that can lead to achieving the course objectives, regardless of whether the teaching is at a distance or on campus (Garrison & Cleveland-Innes, 2005). Thoughts about the physical design of the room must be seen in light of the students' perspective, where social interaction, communication and other interactions occur under different/new conditions. Locational constraints do not affect all aspects of teaching. The interaction, as just mentioned, requires a committed thought process, leading to knowledge, regardless of whether teaching takes place online or on campus.

There is a great interest in research on distance learning and online learning, where interaction is a central issue in these contexts. Already in the late 1980s, Moore (1989) developed a reputation around the importance of interaction in distance contexts. Distance was described as the separation between teacher and student and thus also a lack of communication, which is also the basic problem with doing something separately as a student where teachers and school are not as involved in the learning process as when learning takes place jointly with others (cf. Collins & Callaghan, 2022; Ekberg, 2023; Peimani & Kamalipour, 2021). For instance, interaction through eye contact may be something that was missing in synchronous distance learning, which Peimani and Kamalipour point out in their study. The room's full capacity is not used for interpersonal relationships, and there is a challenge in not losing what can otherwise help to build trust and trusting relationships (Ekberg et al., 2023). Difficulties to create community through connected synchronous contexts can also be affected by different time zones (Owens et al., 2009).

We can play with the idea of removing the room, as a decisive fact and idea of good teaching, and instead focus on communication and interaction between individuals as a crucial part of understanding. If these factors are not there, what is left? Especially in higher education, interaction and reflection have been seen as a necessary part of academic conversations, as well as the development of the individuals involved in them (Garrison & Cleveland-Innes, 2005).

Community and Community-building for Learning through Participation

Research shows that community and a sense of belonging are important for learning regardless of whether it takes place in formal or informal contexts for learning. For instance, it is known that a sense of community in working life is an important prerequisite for problem solving and informal learning (Lave & Wenger, 1991). Doing something together with others can be a driving force for learning. For instance, it is clear from a study by Seitl and Eriksson (2023) that a certain task showed that the progress made by the staff could clearly be seen in light of community-building factors, since they are a prerequisite for learning. Another example of informal learning in a social context is a study on volunteer work (Arden, 2023). In a community, people interact with each other and communicate thoughts, which leads to development. The same happens in more formal learning contexts, such as teaching in the classroom. Social belonging and community help to create a permissive climate and are also an important prerequisite for a safe study environment as well as motivation in studies (Pedler, 2021; Garrison & Arbaugh, 2007). Attendance and commitment are also affected by the sense of participation. The feeling of learning together with friends, belonging to a social context where interest is shared has positive effects on the will to complete one's studies (Maunder, 2017) even in online contexts (Shea et al., 2006).

A Statement that More Research is Needed

It can be stated that interaction and the learning environment need to be given more attention in hybrid teaching environments, where Zoom and campus students share classrooms. More research is needed on what these new opportunities mean for students' experience of learning.

This study has arisen from a curiosity about students' experiences and perceptions of study at a distance, where the lectures are connected via Zoom to the lecture hall where campus students sit, the so-called hybrid variant. The student's perspective is thus studied via Zoom as an environment for learning (Olstedt & Lönnheden, 2005) where international distance students experience teaching independent of space. The study is placed within the framework of formal learning, learning for future work, and the teaching approach is highlighted through conditions for learning when distance students through Zoom mingle with campus students to receive the same instruction. This is a critical step in the development of a hybrid learning model that combines traditional classroom teaching with online learning. To deepen the understanding of these dynamics, this study examines what a hybrid/course in a hybrid context (combined form of campus teaching and distance) can look like and how it can be experienced by those who participate via Zoom.

Purpose

The purpose of this study is thus to gain an in-depth understanding of the factors affecting the experience of learning and engagement through Zoom participation in hybrid contexts and how this can be understood. The methodological approach of the study is expected to capture the perceived situation from distance students' perspective, when the classroom is shared with students on campus. The research questions are as follows:

- RQ1: What elements of presence are there and how are they distributed? (presence and distribution of

different aspects of the instances of interaction)
- RQ2: What facilitates or complicates the experience of presence in Zoom?
- RQ3: How can the importance of these elements be understood in a hybrid context of learning?

The goal of exploring the experience of learning in a hybrid context is to benefit the understanding and development of conscious working methods in hybrid settings, ultimately helping students to achieve better conditions and opportunities for learning.

The Study's Delimitation and Context

The study is related to the context of higher education and is delimited to a course within the framework of a master's degree at a Swedish university. The course comprises 7.5 HE credits, second cycle, and is a specialization for engineers specializing in electricity, in Engineering Science. The students taking the course have had the opportunity to apply either for campus (on-site) or distance learning. This has meant that there are two groups of students taking the same course and sharing the same classroom, but not sharing the same physical room. The course is popular among foreign students as it provides the opportunity for synchronous connection (real-time) through an application, Zoom, in a hybrid classroom at the university. This means that campus students study courses together with distance students. One group (program students admitted to a campus course on the regular program) participate through physical attendance and the other group (admitted as distance students, many from countries outside Sweden) are connected via Zoom to the same classroom.

In addition to the lessons, all students share the same learning platform, which means that they receive the same information. They also complete the same coursework: lab work and examinations. The learning outcomes are, for example, that the student must, upon completion of the course, be able to demonstrate an understanding of the function of design parameters, knowledge of trends, and so on. Students are also able to demonstrate their skills in different abilities. The course is a combination of three courses, so that it introduces electrical engineering and safety in electrical work. Students who take this course can therefore be assumed to have good study habits and experience of previous academic education.

Concepts

The Swedish Higher Education Authority (2024) writes that there is no uniform definition of distance education, but that they have developed a definition that will be presented in the autumn of 2025. In this study, distance education and distance learning are defined as follows. Distance learning is described as “a form of education in which the main elements include physical separation of teachers and students during instruction and the use of various technologies to facilitate student-teacher and student-student communication” (Simonson et al., 2024). Zoom is a commonly used application/software for distance learning. Distance learning is synonymous with distance education, e-learning, and online learning (Simonson et al., 2024) and the terms are used interchangeably here. The term “long-distance student” refers here to students outside Sweden's borders. The students take the same course as campus students and the teaching in the hybrid classroom is online, via Zoom, for distance students

and in real life for campus students, which means that it is synchronous. Here it is described as hybrid synchronous to mark the classroom and Zoom room as contemporaneous.

Theory of Teaching Presence – Community of Inquiry

The theoretical approach used is Community of Inquiry (CoI). CoI is a theoretical description of what are perceived to be the most important elements for achieving immersive learning in an online context and provides a framework for how learning communities can be created and maintained to support the learning process. CoI helps to describe how higher education can be understood as a context for knowledge seeking and development through presence. The framework developed by Garrison et al. (2000) is based on previous studies on social, cognitive and teaching presence. Some parts of the theoretical model are based on Dewey's pedagogical theories. In a study by Garrison and Arbaugh (2007) this framework has been further explored through literature review and is the basis for the theoretical framework of this study (see Figure 1).

ELEMENTS	CATEGORIES	INDICATORS (examples only)
Social Presence	Open Communication Group Cohesion Affective Expression	Risk-free expression Encourage collaboration Emoticons
Cognitive Presence	Triggering Event Exploration Integration Resolution	Sense of puzzlement Information exchange Connecting ideas Apply new ideas
Teaching Presence	Design & Organization Facilitating Discourse Direct Instruction	Setting curriculum & methods Sharing personal meaning Focusing discussion

Figure 1. Community of Inquiry elements, categories and indicators (Garrison & Arbaugh, 2007, p. 159)

The group and the social context are part of the climate that affects learning and knowledge seeking, in a teaching context. Individual students striving together for understanding can be reflected and described in terms of presence - also described in terms of elements that promote learning. Participating in discussions, exploring, asking questions and seeking answers, but also reflecting on one's own learning process are important ingredients in the learning process. Critical thinking, reflection and dialogue are important for students' development, but this also requires their involvement.

With CoI as a framework for the study, the opportunity is given to discuss the students' perspectives on the challenges and opportunities of distance learning. Communication, interaction and relationships, as parts of the learning process are something that takes place in Zoom participation in hybrid contexts. CoI consists of three elements of presence in its framework that together describe a deeper dimension of learning through online presence: social presence, cognitive presence and teaching presence. These dimensions of presence can be seen

as particularly important in distance learning, where students and teachers are not in the same physical space. To promote distance/online learning, these three elements must be integrated. It is also a prerequisite for community learning where students engage in reflection and critical thinking (Garrison & Cleveland-Innes, 2005; Garrison & Arbaugh, 2007).

Social Presence

Learning requires social involvement (Garrison et al., 2000). To achieve this, the conditions for presence and community must be created. Community allows students to benefit from each other and each other's knowledge (Picciano, 2002) and unite in a common purpose and common sense of wonderment (inquiry), to have a curiosity about something, to learn new things and to know more. For this, the students need to interact and cooperate. Collaborating on activities/assignments is important as they invite these opportunities. It provides the opportunity for greater social presence as well as a greater sense of online engagement, so that the students will cooperate and interact with each other. This affects the students' social and emotional well-being, which in turn leads to a more positive experience, a higher sense of satisfaction. Benbunan-Fich and Hiltz (2003) argue that this satisfaction is about both the learning itself (the content of the teaching) and the technology as a support tool or medium for teaching. When teaching is mediative, like information transfer, where the teacher speaks and the students listen (information acquisition), it is not certain that there is any learning because such occasions lack social activity and conversation. In such contexts, social community is considered less important.

Garrison and Arbaugh (2007) write that there are three categories of social closeness that characterize relationships and create conditions for a supportive climate. These categories are open communication, group cohesion and emotional expression. Open communication is based on superficial acquaintances, and it is the feeling of belonging to a context that is important and that arises in online situations. This feeling can be developed but it is about creating contact with others and then deepening these relationships. One starts from a superficial acquaintance with others (*Open communication*). Then, the relationships are deepened through a more open discussion and exchange of thoughts and ideas (*Group cohesion*), to finally achieve a sense of camaraderie with those you belong with (*Affective expression*). The third stage requires active communication and involvement in what others are doing (Brown, 2001). Based on Garrison and Arbaugh (2007), the element social presence (S) has three categories:

1. Open communication
2. Group cohesion
3. Affective - expression of emotions

Cognitive Presence

Cognitive presence is shown by the ability to confirm meaning through reflection, which can be noticed through feedback via questions, for example. The degree of understanding that participants can achieve through communication, reflection and critical thinking in an educational context is dependent on cognitive presence. Being cognitively present means also being interested and engaged in what is happening in the room. Curiosity

creates questions that require a critical approach and scrutiny. One needs to be able to pose probing questions, seek answers and solutions, and have an investigative attitude - an openness to criticism and humility. In turn, this leads to reflexivity and clarifications. This is also what characterizes higher education, a system of examining ideas with a critical eye and looking at the answer with interest. A result of cognitive presence are students' reflections, affirming and creating meaning. (Garrison & Cleveland-Innes, 2005; Garrison & Arbaugh, 2007).

In higher education, cognitive presence is important, almost essential, to inspire critical thinking, the range of thoughts and in-depth discussions that develop higher knowledge and bring about an environment of community between individuals with the same interest in knowledge. Cognitive presence should involve interaction of various kinds, between both teachers and students (Garrison & Cleveland-Innes, 2005).

Garrison and Arbaugh (2007) explain cognitive presence as a process of reflection using a model that concretizes four stages, running clockwise, where an event first triggers curiosity, for example, a problem that is identified and becomes the subject of inquiry. This is what Garrison and Arbaugh call a "trigger" (see Figure 2). The problem is explored (*Exploration*) through reflection and knowledge, in the form of new solutions, answers etc. that are integrated into a context where the answers create meaning (*Integration*). In the final phase *Resolution*, the acquired knowledge is applied. The cognitive presence (C) element is divided into four categories (according to Garrison & Arbaugh, 2007):

1. Trigger event
2. Exploration
3. Integration
4. Resolution

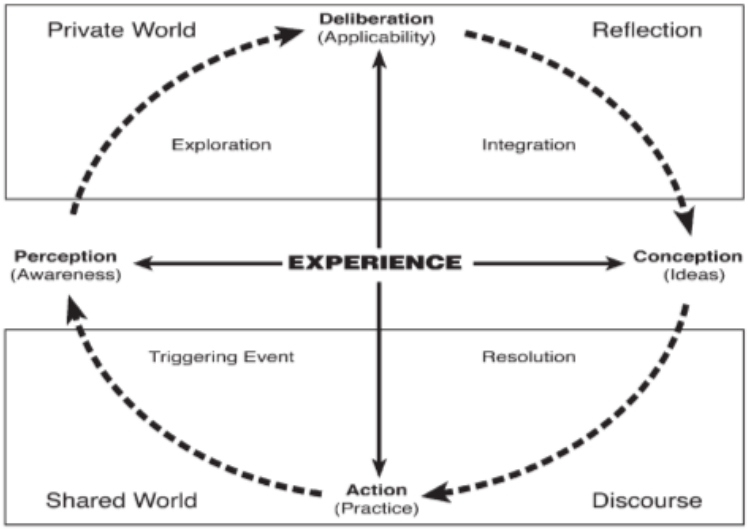

Figure 2. Practical inquiry model (Garrison & Arbaugh, 2007, p. 161)

Teaching presence

Teaching presence shows focus towards a direction, for example course goals. The course objectives are examples

of parameters that are part of the teaching presence, laying the foundation for requirements, structure direction etc. For example, the course objectives (shown in the syllabus) indicate the direction the course should take. Within this element there are several formal, but also less formal, factors that affect outcomes. Garrison et al. (2000) explain that teaching presence depends on the content of an educational design, such as a curriculum with a content that supports cognitive and social processes - everything from curricula, course structure to schedule and teaching situations, and what these contain, characterizes teaching presence. The teacher's documentation and communication with the students, such as presentation materials, course materials and structure of content and of the university's platform, are also included. Course evaluation is also part of this element where students have the opportunity to express their views. Therefore, it is also an understandable tool to use in the development of teaching. Garrison and Arbaugh (2007, p.163) refer to Anderson et al. (2001) who have described teaching presence through three components, which means that the element of teaching presence (T) has three categories:

1. Design and organization
2. Facilitating discourse and offering an? opportunity to gain understanding
3. Direct Instruction/The teaching and instructional situation

In teaching presence, the importance of the teacher's work is highlighted, as it is the teacher who creates the conditions for the course activities and discussions that start among the students and that should support learning.

Method

The study has a flexible design. From the start it was evident that the data might not be sufficient to answer the research questions with certainty. The study uses quantitative and qualitative content analysis (inspired by Elo & Kyngäs, 2008) to examine factors/elements of presence and perceived presence/participation from a Zoom perspective (in hybrid teaching where distance and campus students share classrooms). The research questions ask which elements contribute to or make the experience of learning and participation in Zoom rewarding and how the importance of the factors can be understood in a hybrid context. The questions benefit from being studied in a complementary way. The approach can be linked to pragmatism in the sense that it is aimed at finding answers to complex questions in a practical way and provides an opportunity to reinforce the results (Bryman, 2018).

In this study, CoI has been used as a theoretical framework, and was used to guide the data collection, in that the data had been quantified already in connection with observations. The research questions (RQ1 and RQ2) seek answers that are descriptive in nature. RQ1 asks which elements are present in the course and requires identification and quantification. RQ2 addresses what can be considered to facilitate or hinder the experience of presence in Zoom. RQ3 seeks to understand the importance of the elements for learning. The descriptions quantify the observations within three categories (based on the CoI model) where the occurrence of the elements is counted in numbers. As the experience of presence cannot be measured solely in terms of quantitative content, such as amount of interaction (Garrison & Arbaugh, 2007), the quantitative parts of the observations have been combined with qualitative ones. A code manual and observation scheme were used as aids, along with text and image documentation where the qualitative aspects have been taken into consideration.

Participants

The participants in the study are distance students taking courses toward a master's degree at a Swedish university. These are often referred to as long-distance students as they sit scattered in different locations and in different countries, connected to the hybrid classroom on campus via Zoom. At the time of the study, there were a total of 33 students on the course. Of these, 18 distance students are included in this study. These students only attended classes that were taught over Zoom. Four students (also admitted to distance learning) have not been active on the course and have therefore not been included in the study.

Data Collection

The data collection in this study is based on qualitative methods, such as observations and interviews to highlight "what it is like to participate via Zoom." To capture an authentic picture of the phenomenon, several perspectives, first-order perspective (emic) and second-order perspective (etic), have been used. In short, there is data material that mainly consists of ethnographic observations, supplemented by interviews with elements of self-reflection.

Observations

The research data was obtained from 22.5 hours of observations of lectures in Zoom classrooms. In addition, there are observations of chat communication. The observations have been conducted via Zoom, to get closer to the experience of what it means to participate in this type of classroom teaching and experience what the students experience. The observations are semi-participatory (participant observation) in the sense that I as a researcher sat in the same Zoom room as the distance students, engaged in the students' ongoing learning group, and followed the lessons via Zoom and online chats to capture the experience and interaction between students, and between students and teachers. It has been about following the students in the classroom to see their activity, i.e. observation of participation (Teldock, 2011).

My focus has been directed towards the participants' engagement and I have participated but not been active. I have not completed any of their lab work or been engaged in the in-depth content of the tasks. In this way, the observations have two perspectives: one takes a student perspective, and one is from the researcher's point of view. The observations are not recorded, which has required my attendance and notes to study the students' experience of a Zoom classroom and teaching. Hence, I have experienced the same situation they did, heard what they heard, etc. The observation material has, in addition to the code manual and observation scheme, provided observations of the occurrence of elements according to CoI, as well as a narrative element to enrich the experience perspective. I have interpreted the observations based on the theoretical grounding of the study: CoI. The elements of social presence (S), cognitive presence (C) and teaching presence (T) follow the division according to Garrison and Arbaugh (2017). In contrast, I have developed the observation scheme within the element of teaching presence, which has meant that the element has been divided into more indicators (a total of 10) than the original three, according to Garrison and Arbaugh, (2007). This is to capture the details in design and teaching.

Interviews

The observational data have been supplemented by 4 interviews with two long-distance students, from two European countries. The interviews were conducted during the autumn semester of the 2021-2022 academic year. The interviews were done to provide individual perspectives on and understanding of the social context in which the teaching takes place. This means that first and second order perspectives have been combined.

The function of the interviews was to enable an in-depth dimension of understanding the Zoom experience to get a broader description of the experience (Bryman, 2018). The interviews have served as a help to understanding the underlying thoughts and contribute to reconstructing a story where different events/situations can be paused and highlighted to be understood in context.

The interviews were initially semi-structured to have something to start from when I wanted to obtain individual students' subjective experiences and perceptions. The students were given a lot of space to tell their own stories and the questions were adapted more openly to what came up. What was discussed were related to the course but focus on observed parts: specific moments, teaching situations, communication, participation and what facilitates or complicates the distance mode. The interview questions concerned the experience of studying from a distance and how this contributed to meaning creation and their professional development. The conversations had a clear relationship to the lessons, as a concrete situation to relate to, and feedback regarding early expectations and experiences during the course, specific moments and the course as a whole.

Data Analysis

In this study, the Community of Inquiry (CoI) framework has been used as a point of departure for the coding of the data. Using the central elements of presence (social, cognitive and teaching), factors that contribute to, or make it difficult to experience, learning and engagement through Zoom participation in hybrid contexts have been identified and examined from a student perspective.

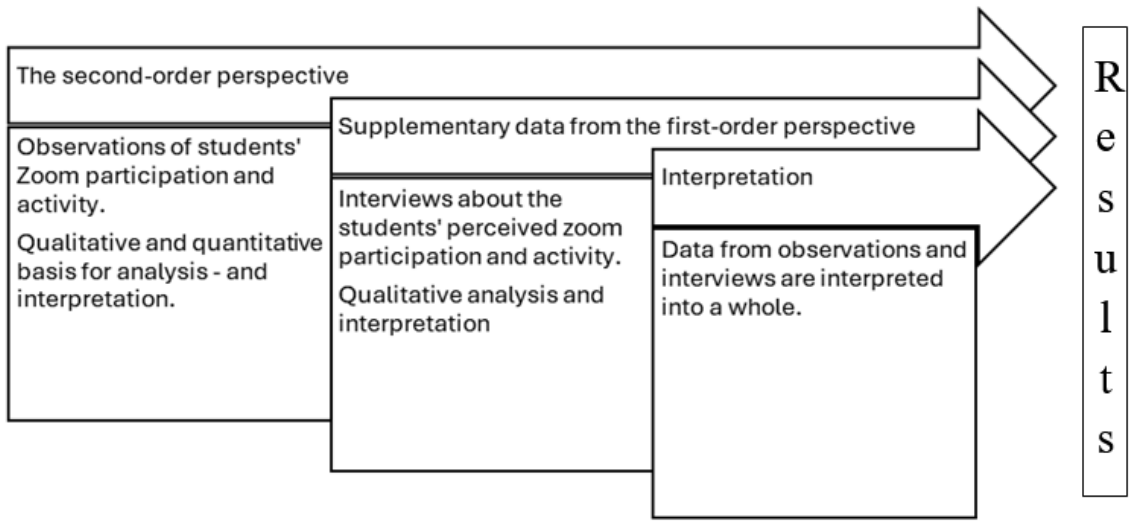

Figure 3. The Process of Data Collection and Analysis

Figure 3 shows the process from data collection to analysis and interpretation. The figure is a simplification and divided into three different moments that finally merge into what is the result of the study.

Second-order Perspective

The observations are central and are somewhat of a starting point for the study. I have created a code manual based on Garrison's CoI-model, incorporating elements, categories and indicators (Garrison et al, 2006). Building on this, I developed an observation scheme with the same, but also additional, indicators to those Garrison indicates to specify the need linked to the purpose of this study. The indicators are linked to the content of the different elements. I have used the code manual as a basis for the construction of the observation scheme that I created and used for data collection. In interpreting what was happening in the interaction, the code scheme served as a support for noting frequency (Bryman, 2018). The perspective is second order (etic) since I as a researcher am not a part of the observed environment but have an interest in finding out more about the students' situation. Mine is an outside perspective where I have interpreted their environment from my theoretical point of view and my categorizations. The observations have been documented through sentences/quotes, but primarily by converting the data into quantifiable content. The actual analysis process has consisted of counting the occurrence of these codes.

It was difficult to predict which indicators would be suitable codes in the context studied. Sometimes it was a question of interpreting quickly. For the most part, the interaction was quite calm, which made the observation work feasible. Aligned with the description provided by Garrison et al. (2006), I have coded what appears to be clear, i.e. the most prominent interaction. Additionally, I made notes that would enable me to navigate back to situations I considered important. My notes have also helped me in understanding the material from a time perspective on the course. Some questions recurred, creating a connection between the content of the course sessions. An example of this is the connection between lecture no. 1 and no. 4, when a teacher, during the introduction of the course (lesson 1), presents a task that generates a discussion [some concern]. The sequence has been coded as *Trigger - Cognitive presence (C1).* The incident triggers questions, but it is obvious that the students are not satisfied with the answer they receive. The same teacher will come back to this in Lesson 4 to follow up on the discussion, which has been coded as *Direct instruction - Teaching presence (T3),* and the continued interaction where the students try to create meaning, coded as *Exploration - Cognitive presence (C2),* using information and the answers they receive from the teacher as *Integration - Cognitive presence C3).* In the conversation between students and teachers, it is apparent that the students have discussed the task in between the lectures, i.e. processed it, which has helped them progress. The conversation unveiled the development process. This also demonstrates the teachers' openness and willingness to foster discussion since they allowed it to happen (*Facilitating discourse - Teaching Presence –T2*). The prerequisite for students' understanding has been coded as *Exploration - Cognitive presence (C2).*

Technical issues related to Zoom teaching belong to the Teaching presence element, and concern technical prerequisites that exist thanks to the use of Zoom. The indicators are about technical issues where the picture or sound does not work.

Supplementary Data from the First-order Perspective

Step two is what I call the students inside perspective which has been studied through interviews where they told based on their experience (emic). The interviews were transcribed, and the text was coded according to the same code manual that is the basis for the observations. The unit of analysis for the coding has been coded sentences and paragraphs.

The Interpretation of the Whole

This was the part where the data from observations and interviews was interpreted as a whole. The interpretation of the whole has been made against the context in which the study took place, i.e. the specific course. Here, the indicators of the third element have been particularly helpful in identifying what can be considered important. Furthermore, as a researcher, I have interpreted the course platform, documents, course structure and clarity in the layout from a perspective of participating in a context, in this case teaching.

Ethics

I did not teach the class or assess the students, whom I did not know. The advantage of not working at the same institution or teaching the course is that I can remain impartial. As a researcher, I have met the students that participated in the study, nothing else. My only relationship to the instructors on the course was through this research project, and those who were part of the teaching team have not been part of the study. No interaction has taken place with the teachers other than information about the study – all to ensure that the students could feel confident in my role within the context and that it was clearly restricted to the research project only. In accordance with the ethical code (Swedish Research Council, 2017), the students have on repeated occasions received written and oral information about participation and the content of the study. The observations have been open where the participants have been aware of my presence. I have been clear that I was not assessing the students' performance or had any other connections to the teaching. After the course finished, the interviews were compared, which separated them even more clearly from the course. No teacher or other staff knows which students have been interviewed.

Research Context

The study's context is connected to teaching in higher education. It is an environment I am familiar with, but the content of the lessons, the subject itself, is unfamiliar to me in the sense that it is different from my area of knowledge, which has both advantages and disadvantages. Difficulties may be in assessing what is important in teaching content or specific subject-related discussions. However, my limited understanding has been an asset as the engagement was not directed in that direction, but instead towards the form of teaching, which links to the purpose of the study. In the focus on the pedagogical aspects, interaction, communication and the teaching aspects have been important. This has also been the case in the trust and relationship with the students. They knew from

the beginning that engineering was not my subject and that I was not assessing their presentation, nor did I have any influence on their grades or opinions. This has been a crucial factor in building trust between me and the students.

The interviewed students' geographical location and cultural background characterize their experiences of the course. This was clear and permeated part of the vision they conveyed during the interview. For instance, this concerned how Swedish teachers are easy to talk to, kind and accommodating. This positive experience may influence their attitude toward interaction and create a permissive climate in the classroom.

Since I have conducted observations of synchronous hybrid teaching sessions, not all parts are fully transferable in practice, which makes the use of the CoI-model difficult. One thing highlighted in Garrison and Arbaugh (2007) is that the context and research question can affect which unit of analysis becomes the study's subject. Quantification was used in the observation where the codes were the units of information that were isolated early in the analysis process but were linked to the context in connection with interpretation. The fact that the units of analysis have consisted of codes that were developed from CoI early on, has made the basic idea of the model helpful as a tool in the study. However, it is problematic and difficult to predict, as early as at the coding stage, which indicators will be suitable codes in the context studied, because these are isolated. Levels of contextualization and the decoupling of the units of analysis from their context, either in words or socially, affect the data and the interpretation of it, through the degree of isolation (Denscombe, 2018). The use of a particular model with divided elements already in the data collection stage could imply that I may have missed out on some information, that which I chose not to see. Garrison et al. (2006) discuss this in an article that focuses on the methodological aspect of the use of CoI in studies. The most difficult element has been teaching attendance, as this element has consequences for the other two elements, the social and cognitive. I have allowed this element to have a holistic approach in relation to the context when effects of teaching attendance are reflected in social and cognitive attendance. Course documents, course structure etc. have been available via the course learning platform and have aided in the interpretation of the analyses that were derived from the observations and interviews.

Results

The results highlight elements in CoI and the key conditions that facilitate and hinder the learning experience on the studied course, as shown in the results report presented below. This means that the occurrence of the various elements is presented first (results from RQ1), then what facilitates or hinders presence and how this can be comprehended from a learning perspective in hybrid contexts (results from RQ2 and RQ3 are presented together).

Occurrence and Distribution of Different Elements

It can be stated that all groups of elements of presence (social, cognitive and teaching) were activated at some point during the course as a whole. Sometimes during one or more lecture sessions, other times not at all. For example, there are no or few notes about social and cognitive presence at the first lectures. There, most notes are concentrated on teaching presence. The students were generally quieter at these lessons, but the shortcomings of

technology were clearly apparent and may therefore have overshadowed other interests. Initially, the lecture content was also more about introducing the course, the required tasks and the design of the course, as part of teaching presence.

The number of interaction occasions varies during the observed lectures, which are mainly lessons for mediating pedagogy. What has been captured through observation are the times that interaction occurs, as an interruption which usually occurred in connection with the teacher's lecture. The length of the lecture can vary and has led to different notations per observation. Additionally, the number of students per lesson varies, which also impacted the number of marks made in the observation scheme. The results of the activities are not presented per observation, but per element, where the distribution between the categories is presented. The occurrence of interactions is shown based on Garrison and Arbaugh's (2007, p.157) distribution of categories per element (Table 1-3 below).

Table 1. Categories and Indicators for Social Presence (S)

	Categories	Indicators	Interaction events
1	Open communication	Risk-free expression	6
2	Group cohesion	Encourage collaboration	4
3	Affective expression	Emotions	4

Table 2. Categories and Indicators for Cognitive Presence (C)

	Categories	Indicators	Interaction events
1	Trigger Event	Sense of puzzlement	13
2	Exploration	Information exchange	13
3	Integration	Connecting ideas	6
4	Resolution	Applying new ideas	5

Table 3. Categories and Indicators for Teaching Presence (T)

	Categories	Indicators	Interaction events
1	Design and organization	Setting curriculum and methods	41
2	Facilitating discourse and offering an opportunity to build understanding	Sharing personal meaning	21
3	Direct instruction/ The teaching and instructional situation	Focusing discussions	29

The distribution of the number of interaction occasions within the three different elements is quite clear. What could be interpreted as social presence is lowest in the number of interaction occasions (measured to 14 occasions).

Cognitive presence has slightly more interaction opportunities (37) and the most interaction opportunities are noted in the element for teaching presence (91).

Presence through Social, Cognitive and Teaching Elements

At some lessons, the questions have predominantly been about the technology and technology problems, while in others, the focus has been on content. The students' interest and commitment has been directed towards trying to understand what the teacher conveys, whether it was about media use (whiteboard, image and sound) or the understanding of theory. On a few occasions, the discussion has been more profound and dynamic. More people have been involved and sometimes questions and answers have bounced between several students and the teacher, like an open dialogue. The results from the observations and interviews are presented through the categories that appear in Table 1-3 above, where the categories are considered as conditions for learning over Zoom.

There are lessons that stand out in terms of this type of interaction, where the activity is characterized by interesting content. Students are interested in what the teacher is saying, while the lesson is free from distractions. These lessons are characterized by open communication and cognitive presence where students are triggered to communicate. Cognitive presence is also characteristic when the teacher invites to activity. This can be done through exciting or challenging questions, small dramatic breaks, a critical approach, or something that interests the students a bit extra. In the observation scheme, these elements have been noted more in the fields related to cognitive and teaching presence.

> The teacher explains, recapitulates, and outlines the tasks for the upcoming lab. The students are listening intently. Initially, questions are asked about the task itself and its format, which then transitions to more content-related questions where more students get involved. (Observation note, Lesson 4)

Of the interviews, this is a category that is sometimes considered overshadowed by disturbances and a sense of isolation. The technology is a clear example of a recurring disturbance. Emotions related to social or cognitive presence can be affected by the fragmentation and isolation that technological interruptions and difficulties lead to. The disturbances are sometimes perceived to arise because the teachers do not fully master the technology.

> Zoom rooms were actually very good when the teachers knew what they were doing, and they were able to use them well…. And they remembered to do things, kind of. (Zoom student A)

The feeling arises in technical disturbances, but can also arise by accident, when Zoom students sometimes are forgotten, which does not speak for the prerequisites for group cohesion. Being forgotten in connection with a disruption, such as when the image does not work or when the view that the students see is not clear, is also a phenomenon that is discussed. In such cases, the students unmuted themselves, thus interrupting the session.

> …we would just have to shout out… it´s just those little things that overall, you know, sure we learned what we learned, but my experience as a distance student… (Zoom student A).

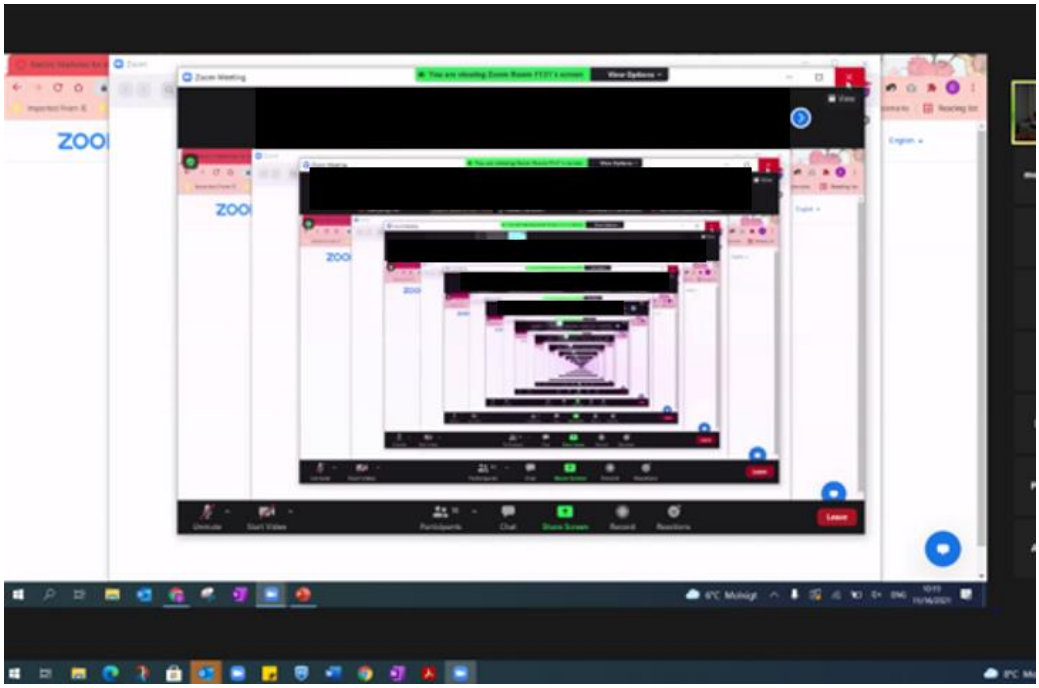

Figure 4. Example of Image Noise

Another way to deal with the number of distractions was to start writing in the chat. To avoid shouting in the classroom and disturbing others, Zoom students communicated via chat.

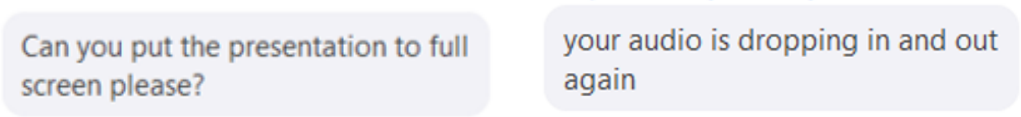

Figure 5. The Chat is used to alert the Teacher (Examples from Observation 5 and 8)

It could sometimes take a while before the Zoom students were alerted by the teacher, as a result they missed out on parts of the lecture that was being given.

Lack of cohesion is an aspect that is also highlighted by the Zoom students. Students who get close to each other can discuss difficulties and solve problems together. Not feeling that community is described as a challenge in the studies. The conditions for distance learning are more difficult and there is more resistance.

> It is much better when you feel involved in the classroom. (Zoom student B)

Examples of feelings of isolation can also be found in a situation where communication between the students and the teacher seems to be handled separately, as if it did not affect the rest of the class. This situation arises when a Zoom student asks the instructor a question. When the teacher answers it is almost difficult to hear as there seems to be something else going on, parallelly, in the classroom among the campus students. In the observation notes, there is the following note:

> In the background, students in the classroom can be heard. The students are not allowed to speak, and the teacher is only able to speak to the students who are attending the class via Zoom. (Observation note, Lesson 3)

It is not a surprise that the campus students forget that there are other students in Zoom, since the screens are always turned off. The same applies for the contrary, where distance students are unable to see the faces of campus students when the camera is placed at the back of the classroom, as illustrated in the picture below.

Figure 6. Zoom Camera Angle

The camera placement at the back of the room became a typical view for distance students. Although the classrooms changed, the camera was always directed at the campus students from behind, which neither gives rise to a sense of community, nor invites open communication. In the interviews this is discussed as a deviant situation, a distance. One of the students compares traditional classes with the division they are in, where Zoom is perceived as separate.

> Normally you get so much face-to-face time with lectures and other students on campus that you can talk to them. You can talk to them after class. (Zoom student A).

The impression of sitting behind a screen is to be outside, in another room. The feeling that there is something more, something else on the other side of the camera is clear.

> … there´s a bit like we´re just watching and we constantly have to say oh, what did you say or you´re out of focus you know… (Zoom student B)

The distance learning perspective captures the perceived situation in a divided room, between campus and Zoom students. The hybrid classroom is a delimited example of learning conditions where social and cognitive presence are also important for the experience of the learning process. The results of the examples above show how different

assumptions are strengthened or weakened depending on where the students are located. A Zoom perspective to a hybrid room does not give full access to the synchronous room.

Discussion

The purpose of the study was to gain an in-depth understanding of the factors affecting learning and engagement through Zoom participation in hybrid contexts and how this can be understood. This has been investigated through questions that deal with which elements of presence appear in the course, what facilitates or complicates the experience of presence in Zoom, and how the importance of these factors can be understood in a hybrid context. There is potential in supporting *critical thinking*, *reflection* and *dialogue* in these hybrid contexts. For the distance students, communion with others was particularly challenging as the form of teaching overshadowed the content. The different rooms were perceived to have a divider, i.e. Zoom, between them. The hybrid idea, with Zoom as a bridging tool between distance students and campus students, would need to be improved to avoid the risk of it being seen as an obstacle. It is evident that interferences in sound and image can occur in any online context. However, in the decision to combine groups of distance and campus students, stricter requirements on considering the various group settings should be considered. The existing difference is a contributing factor affecting distance students' prerequisite of learning, which is constantly disrupted.

The placement of the camera in the back of the classroom does not make it easier for the Zoom students to communicate or build friendships with the campus students, as they lack the importance of eye contact that can help in interaction during synchronous distance learning (cf. Peimani & Kamalipour, 2021). A sense of belonging and community is a motivating force for students, especially distance students, to build open communication and group cohesion (Garrison & Arbaugh, 2007) and to not lose the willingness to study (cf. Mauder, 2017; Shea et al., 2006). Therefore, it is especially important for this group to engage in what happens on campus. For example, engagement can be facilitated by distance students being given the opportunity to participate in discussions, ask questions, and explore issues together with campus students. As Garrison and Arbaugh (2007) point out in their study, facilitating discourse (see Figure 2) is an opportunity to build understanding. In these cases, a conscious approach is needed from the faculty to consider the hybrid approach in the course design, which means that distance and Zoom students are in different rooms. As an example, Zoom students in laboratory sessions often complete course assignments and reflections on their own, after Zoom has been turned off, resulting in a significant amount of energy being invested in solving problems in solitude. However, the forced space for deliberation and reflection can be interpreted as cognitive presence (see Figure 2) and a space for learning, i.e. private time for exploration according to Garrison and Arbaugh (2007). Since the activity is not planned and does not always occur at the desired stage, it leads to dissatisfaction. Garrison and Arbaugh argue that one should design learning activities, which also applies in this case. Some of the Zoom students formed their own communication groups to support each other outside classroom time. This may contribute to a desire to develop a design for hybrid spaces where the social dimension is included and prepares a good basis for future research. The integration requires fusion of the two rooms into a *ClassZoom,* for the experience of a unified room that provides the conditions for knowledge development together with others.

The results show that teaching presence is a critical element that has effects on teaching. Common issues often concern problems with sound and image not functioning properly when the teacher shares information. Furthermore, research shows that factors such as shortcomings in technology affect students' participation, communication and learning (Garrison & Arbaugh, 2007; Brown, 2001), which becomes clear in the situations when Zoom students communicate with each other, within the screened Zoom room, while other activities are going on campus. This will be confirmed when the errors are fixed, and they are back in the same room as the campus students. This is, according to Garrison and Arbaugh (2007), a question of design and organization, as it largely depends on the teacher's development of the course, the underlying thoughts, and how the studies are planned (Garrison et al., 2000).

In the course studied, distance students can participate at the same time as campus students, in synchronous lectures, and have the opportunity to communicate with each other in the same way as if they had sat in the same classroom, but this does not happen when participation is lacking (Garrison et al., 2000; Piccino, 2002). The interesting aspect I would like to point out here is that, despite digital opportunities and new technology that enables synchronous distance learning, there is still a gap of factors that distance the Zoom students from the classroom, the so-called second room. The student group that logs in via Zoom forms its own group. They experience the teaching from a Zoom perspective and have in their own Zoom context experienced that there is a room on the other side of the screen – a real room where important things happen. The Zoom students remain in the background in a double entendre, partly because of the camera's position, and partly because of Zoom as a spatial divider, which means that they are sometimes forgotten and overlooked. Regardless of how greatly one wants zoom students to be a part of the classroom community, the risk of Zoom groups being separated, almost non-existent, from the rest remains. The feeling of camaraderie with those you belong to (Affective expression, according to Garrison & Arbaugh, 2007), i.e. campus students, becomes difficult to reach. It needs its own educational design, adapted for Zoom. For this, support can be obtained from the CoI framework (Garrison & Arbaugh, 2007) where social, cognitive and teaching presence are made visible. They communicate with the teacher and within their Zoom room, but not with the campus students, which further increases factors that contribute to their disengagement from the campus students, but also the need to communicate with others.

Conclusion

Physical presence is not always a prerequisite or key factor for being considered present, as presence can be achieved in ways other than being physically present. However, there is a lack of sufficient sense of social, cognitive and teaching presence. The study shows that presence has more and deeper dimensions, which provides for many opportunities, but that these are not always taken advantage of. Factors such as belonging and communication are essential components of the presence dimension, and of social, cognitive and teaching presence, and for the learning process. The study shows that Zoom students' prerequisites for social and cognitive presence are hindered in a hybrid classroom, affecting their process of learning. This also limits the interaction between physical classrooms and Zoom ones, providing selective access to ongoing classroom activities, which is to be considered a separation of physical classrooms and Zoom rooms. Attendance can be enabled in Zoom, but it requires great awareness to organize courses in hybrid form, where the framework for community of inquiry

(CoI) should be able to be helpful as early as in the design stage.

To overcome the spatial obstacles that the Zoom room creates and that are assumed to affect the learning process in hybrid synchronous contexts, an integration between the two spatial arenas – physical space and digital Zoom space – is also needed. A fusion of classrooms and Zoom rooms requires a teaching presence where online participation is not hindered by the application or technology but focuses on designing cognitive activities, e.g. spaces for shared reflections, which I have decided to call *ClassZoom* to denote the importance of two integrated rooms: the physical hybrid classroom and a virtual Zoom room. *ClassZoom* as a concept is intended to emphasize the merging of classrooms and highlight dimensions of presence that otherwise do not receive attention. Furthermore, it highlights the importance of a conscious and carefully planned design, including all elements of presence that otherwise do not receive attention.

Recommendations

The study provides a basis for further research where the CoI framework is applied in education in hybrid contexts. To investigate this further, more observations may be needed, especially on how hybrid contexts affect distance students' experiences of learning when mixing groups of students. Another aspect to consider could be to investigate if hybrid courses, like the one observed, affect the grades of campus and distance students. This should generate a variety of examples from different fields and contribute to a broader scope of knowledge.

Even though *ClassZoom* is just a concept, its use can generate both curiosity and attention towards the critical situation of merging two teaching environments with entirely different conditions. Approaching the phenomenon can help bridge the gap between two separate contexts when teaching synchronously. Alternatively, the teaching should be divided so that it takes place separately, either on campus or in Zoom. Thus, taking advantage of the possibility of combining campus with remote connection via Zoom is not always the best solution. There may be courses or teaching situations, besides technology teaching, that can benefit from being separated, which would also require more research.

In higher education, discussions are ongoing about the best possible teaching practices, where different ideas can stand in opposition to each other and either-or-, but also for-or-against-discussions can arise regarding different teaching methods. What meetings between students in hybrid synchronous contexts mean for teaching within different disciplines, the development of disciplines, and the development at universities should be further discussed.

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