



The effect of the online collaboration  
method on the social presence of students  
at the Dutch teacher training institute.

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Master thesis

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Date: 15-08-2022

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## **Acknowledgement**

This thesis is the result of the research I have conducted during the COVID-19 lockdown in partial fulfilment of the requirements for the degree of Master of Science at the University of Twente. This study, focusing on the mandatory switch to online education for Pabo students, the Dutch teacher training institute led to an amazing learning experience regarding the effect of innovative educational technologies on students. I am proud of the results of this study, important to the development of this study was the support I received from others. For this reason, I would like to show my gratitude for their support.

In the first place, I would like to thank my first supervisor dr. A.H. Gijlers, for her knowledge and valuable feedback. Our meetings were always a source of inspiration for the next phase of the study. Additionally, I would like to thank my study buddy Rohan Budhram, we supported each other during the whole master.

I hope that you will appreciate reading my thesis.

Thomas Colen, August 2022

## Abstract

Most of the educational courses in the Netherlands have been replaced by online activities during the COVID-19 pandemic. Students and lecturers argue that the quality of education has decreased since courses are online, mainly because of the lack of social presence. Although students can collaborate online, they experience feelings of loneliness. Therefore, the current study investigated if and how the social presence of students is affected by online education. The main question of the current study was: *'What was the effect of the switch to online collaborative learning channels on the social presence of students?'* All participants of this study were enrolled in the bachelor's programme of teacher education for primary schools (Pabo) at the Saxion or Han University of Applied or Sciences. The main variable in this study was the social presence, additionally, the collaborative end product, sociability and work perceptions were examined. A questionnaire was administered to measure students' experiences and lecturers were interviewed about their experiences regarding the switch toward online collaborative learning. Gathered data was analysed using a series of independent samples *t*-tests, and results showed a significant decrease in the social presence and sociability experience compared with previous face-to-face education. Thus, lecturers should focus more on these aspects during collaborative activities. Online education will become even more important in the future. Therefore, this study is a good starting point for future research on variables influencing online collaborative learning, to tackle the decrease in social presence.

Keywords: Online learning, distance education, social presence, sociability, collaboration

## Introduction

During the COVID-19 pandemic, face-to-face meetings and lectures have been reduced to a minimum (Teräs et al., 2020). It became conventional for students to follow online lectures and to collaborate online using videoconferencing (Crawford, 2020; Hirsch, 2020). Studies on online education during the pandemic show that in most cases the quality of education decreased (Bisht et al., 2020; Chandra, 2020; Sujarwo et al., 2020). Even though, some students argue that they prefer online education because there is less distraction during the lockdown: they have more time to study since most social activities are cancelled (Netolicky, 2020).

Some students prefer online education however, most students encounter multiple challenges with online education, mostly behavioural (Khalil et al., 2020). Especially, the decrease in social interaction with other students leads to behavioural challenges (Chandra, 2020). Meanwhile, Sujarwo et al. (2020) stated that ‘the social presence’ of university students deteriorated because all education activities were taking place online. This social presence can be described as the extent to which we view other individuals during the interaction as ‘real people’, and as a result the extent to which we view our interactions with them as authentic social interactions (Coussement et al., 2020). The decrease in perceived social presence is logical, as students to student interaction is difficult to achieve in online education since students feel less connected in an online environment. In some cases, the decrease in perceived social presence leads to behavioural challenges such as students who experience feelings of loneliness during online courses (Akcaoglu & Lee, 2016). This is alarming because experiencing social presence is an imperative component of online learning (Sujarwo et al. 2020).

In an online setting it is challenging to have student to student interaction, therefore many lecturers experience difficulties with implementing online collaborative activities that have the potential to increase the social presence of students (Mishra et al., 2020). Moreover, a large proportion of lecturers did not have sufficient experience with online education (Mishra et al., 2020). This in combination with the sudden need to teach online resulted in situations in which teachers were not ‘ready’ to teach online and lacked the skills to create an interactive setting.

Increased levels of social presence are related to positive outcomes on students’ socio-emotional wellbeing as well as their academic performance. Research indicates that social

presence is strongly related to students' levels of satisfaction, students' wellbeing, and also stimulates active engagement with the course materials (Oyarzun, Barreto, and Conklin 2018; Richardson et al. 2017; Zou et al. 2021). Therefore, when turning to online education, lecturers ideally prioritize implementing collaborative activities that have the potential to increase the social presence of students.

Within the community of Computer Supported Collaborative Learning (CSCL) researchers, studies have been conducted that provide insights into the type of collaborative activities that can be implemented in the context of online education and through online learning platforms. These studies provide insight in how to shape active student participation during collaborative work, for instance, discussion boards and non-task interaction among students are found effective to shape active student participation (Richardson et al. 2017a; Zou et al. 2021).

While it is known what type of collaborative learning activities and instruction a positive effect on students' dialogues and their learning outcomes have, less is known about the socio-emotional outcomes. Only, a few studies have focused on the role of social presence in the context of online collaborative education and more specifically these studies focused on social presence as it is perceived in video-based lessons that use tools like Zoom, Microsoft Teams, or other dedicated video channels (Landrum et al., 2021; Lee & Huang, 2018; Swan & Shih, 2019).

Zoom and Microsoft Teams, are relatively new platforms. Therefore, most studies about online collaborative learning are deprecated because these studies were conducted before video-calling became widely used (de Greef and IJsselsteijn 2001; Picciano 2001; Short 1976). The conclusions these studies have drawn need to be evaluated, as call quality, accessibility, and the user interface, were not even close to today's standards (Landrum et al., 2021).

Due to this, little is known about platforms such as Teams might lead to an increase in the amount of social presence during online learning activities. However, it might be assumed that since these platforms allow real-time video interaction with more than one person, it will provide opportunities for rich interaction compared to communication through e-mail or message boards (Park & Kim, 2020; Swan & Shih, 2019). It seems to be important to investigate the level of social presence experienced during these collaborative exercises, because due to the COVID-19

Pandemic most interaction between university students and students and their teachers takes place online through the aforementioned channels.

At the time of this study, there is a lack of existing literature on students' perceived social presence during online collaborative activities on platforms such as Zoom. Therefore, the current study aims to obtain a comprehensive view of the differences in experiences between online student collaboration during the COVID-19 pandemic and the traditional face-to-face student collaboration. The effects of the collaboration method (online or face-to-face) on the social presence of the participants, students of the bachelor programme Pabo, will be investigated through interviews. The participants will be asked, for instance, about their experiences with collaboration activities before and during the COVID-19 pandemic. Finally, two teachers of this bachelors' program will be interviewed to see how they experience the forced switch to online education.

## **Theoretical framework**

### **Effects of the COVID-19 pandemic**

The COVID-19 pandemic and the need for emergency online teaching caught most higher education institutions suddenly and ill-prepared, throwing over well-established teaching and learning practices in institutions that were previously cantered around onsite learning practices (Pelikan et al., 2021). Therefore, it can be assumed that the mandatory switch towards online education made collaborative processes more complex for students. However, little is known about if and how student collaborative processes changed during the mandatory switch to online education due to the pandemic. Though, the higher dropout rate among first-year university students has been associated with the lack of student-to-student interaction (Aristovnik et al., 2020; Eberle & Hobrecht, 2021; Pelikan et al., 2021). Also, Eberle and Hobrecht (2021) state that academic and social integration are essential processes as failure to integrate adequately is strongly associated with high student drop-out rates. The academic and social adjustment depends on students' experiences with the mandatory new educational setting, which includes peer and teacher interactions inside and outside of classroom settings and curricular experiences (Pelikan et al., 2021). These experiences have been different during the pandemic, which influenced student motivation negatively (Eberle & Hobrecht, 2021). Aristovnik et al. (2020) stated that during the pandemic the basic psychological needs satisfaction of university

students which contains the need for competence, autonomy and the need for social relatedness decreased. Logically, this will negatively influence student collaboration. However, deep qualitative research with insight into how the pandemic influenced collaborative processes and collaborative end products is missing. Therefore, the following paragraphs will take a look at the important element of the collaborative processes, 'social presence', the definitions of social presence and the differences between online and face-to-face social presence.

### **Social presence**

With the growing use of online education nowadays, more studies are focused on how students feel online (Eberle & Hobrecht, 2021; Pelikan et al., 2021; Weidlich et al., 2018). Online education is flourishing because the online environment permits participants the opportunity to apply new technologies, collaborate with others, and take advantage of flexible schedules (Ryan et al., 2019). Online learning drives on collaboration and interaction (Eom & Ashill, 2018; Hrastinski, 2009). Therefore, social presence is an important indicator of the quality of collaboration and interaction (Garrison & Arbaugh, 2007).

There are many studies conducted about the effects of social presence on students however, social presence is defined in various ways (Zou et al., 2021). In fact, researchers continue to define and conceptualize social presence very differently (Lowenthal & Snelson, 2017). For example, Garrison (2009) defines social presence as the ability of students "to project themselves socially and emotionally, as 'real' people". Gunawardena (1995) on the other hand, describes social presence as the degree to which people are perceived as "real". Additionally, Picciano (2019) describes social presence as a student's perceptions of being in and belonging to a certain course. Lastly, Tu & McIsaac (2002) define social presence as "the degree of feeling, perception, and reaction of being connected to another person. Most studies conducted around social presence interpret the concept differently. Hence, it is very difficult for practitioners and researchers to come to a corresponding conclusion about the nature of social presence. The technological developments changed online collaboration rapidly, which made it even harder to come to an agreed definition of social presence (Swan & Shih, 2019). For instance, due to the rise of new collaboration channels such as Teams and Zoom, Gunawardena (1995) definition of social presence might be different nowadays.



Even though researchers define social presence diversely, they all state that for a successful online learning experience social presence is essential (Lee & Huang, 2018; Picciano, 2019; Tu & McIsaac, 2002) for example, because it emphasizes relationships with others (Kehrwald, 2008). Social presence is associated with the degree of participation and social interaction amongst collaborative group members (Koh et al., 2007; Picciano, 2019; Yang et al., 2007). Additionally, Ghani and Taylor (2021) state that social presence is a significant predictor of learning efficiency and the final course outcome. Even the degree of satisfaction and motivation of collaborating students is highly affected by the amount of social presence (Garrison & Arbaugh, 2007). Joksimović et al. (2015) stated that certain indicators of social presence (i.e., continuing a thread and complimenting, expressing, appreciation) were significant predictors of final grades in a master's level computer science online course.

Also, the importance of interaction and collaboration in online education is made clear in the process model of online collaboration (Murphy, 2004). The model describes six processes of online collaboration and, because social presence is a prerequisite for the subsequent steps, shows the importance of social presence from an early stage on (Murphy, 2004). The steps of online collaboration are (1) social presence, (2) articulating individual perspectives, (3) accommodating or reflecting the perspectives of others, (4) co-constructing shared perspectives and meanings, (5) building shared goals and purposes and (6) producing shared artefacts.

Nevertheless, researchers and practitioners have concerns about online learning which include student feelings of isolation and disconnection from peers and instructors (Richardson et al., 2017b). Hence, the high rate of dropout among online university students has been associated with a lack of student-to-student social interaction (Hone & el Said, 2016; Masci et al., 2018).

### **Definitions of social presence**

Social presence is a complex behavioural element with many facets; therefore, multiple elements need to be considered when examining social presence during online collaboration activities. Short (1976) defined social presence as the 'degree of salience of the other person in the communication and the consequent salience of the interpersonal relationship. This definition can be split into two parts: (a) the salience of the other in the communication and (b) the consequence of this, namely the salience of the interpersonal relationships. for learning. The Community of Inquiry (COL) framework (Kreijns et al., 2014) is restricted to the first element of

social presence stated by Short et al. (1976). However, instead of naming it ‘the salience of the other in the communication’, they use the term ‘realness’. By ‘realness’ Kreijns et al. (2014) refer to a sense that although participants know that the other is not physically present in the communication, they nevertheless experience the feeling that they are, to some degree. The second part of social presence, the salience of the interpersonal relationships is viewed instead as one element of the social space, which is defined as the overall network of social relationships (Kreijns et al., 2014).

Garrison (2009), entitled social presence into three categories of behaviour namely: emotional expression, open communication, and group cohesion. (Garrison, 2009) described examples of indicators for each category (see table 1).

**Table 1. Garrisons’s (2009) Original social presence categories and example indicators**

<b>Element</b>	<b>Category</b>	<b>Examples of indicators</b>
Social presence	Emotional Expression	Emotions
	Open Communication	Risk-free expression
	Group Cohesion	Encouraging collaboration

Anderson et al. (2019) used on the other hand the categories affective responses, interactive responses, and cohesive responses to describe social presence. Additionally, Anderson et al. (2019) identified specific indicators for each category of social presence as well as definitions of each indicator (see table 2).

**Table 2. Anderson et al.’s (2019) categories and indicators of social presence**

<b>Category</b>	<b>Indicators</b>	<b>Definition of Indicators</b>
Affective Responses (originally ‘Emotional Expression’)	Expression of emotions	Conventional expressions of emotion, or unconventional expressions of emotion.
	Use of Humor	Teasing, cajoling, irony, understatements, sarcasm

	Self-Disclosure	Presents details of life outside of class, or expresses vulnerability
Interactive Responses (Originally “Open Communication”)	Continuing a Thread	Using reply feature of software, rather than starting a new thread
	Quoting from Other Messages	Using software features to quote others entire message or cutting and pasting sections of others’ messages
	Referring explicitly to other messages	Direct references to contents of others’ posts
	Asking questions	Students ask questions of other students or the moderator
	Complimenting, expressing appreciation Expressing Agreement	Complimenting others or contents of others’ messages Expressing agreement with others or content of other’s messages
Cohesive Responses (Originally “Group Cohesion”)	Vocatives	Addressing or referring to participants by name
	Addresses or refers to the group using inclusive pronouns	Addresses the group as we, us, our, group
	Phatics/Salutations	Communication that serves a purely social function: greetings, closures

Additionally, Carlon et al. (2012) derived in their study multiple categories by which the elements of social presence stated by Garrison (2009) can be reflected. Namely, group cohesion is reflected by the shared social identity of the community and its collaborative behavioural intention. Open communication is reflected by to which extent the nature of the communication is purposeful and interactive. And the level of affective expression can be assessed by looking at the socio-emotional components of the communication to form interpersonal relationships (Garrison, 2009). Carlon et al. (2012) also mentioned multiple indicators for the three elements. Namely, indicators for group cohesion are vocatives (i.e., addressing participants by name), using inclusive pronouns (i.e., addressing the group as we, us, our group), and phatics or salutations (e.g., greetings, closures). Indicators for open communications are continuing a thread, referring explicitly to others, expressing agreement, and complimenting or expressing appreciation. Lastly, (Carlon et al., 2012) indicate affective expression by, among other things, to what extent students include self-disclosure (e.g., presenting details of personal life, expressing vulnerability) and the use of humour (e.g., irony, cajoling, sarcasm).

The indicators of the categories by Garrison (2009) and Anderson et al. (2019) are almost identical. Garrison and Anderson both describe the three elements of social presence as 1) group cohesion, 2) open communication and 3) affective expression. These elements can be seen as stages of a process, in which a primary obstacle in the process is the shared social identity derived from the purpose of the course which is later the basis for the formation of interpersonal relationships (Anderson et al., 2019; Garrison, 2009). The elements of social presence described by (Kreijns et al., 2014) are more theory-based in comparison with the other two studies. For instance, no indicators of the elements ‘realness’ and ‘social space’ were presented in the paper (Kreijns et al., 2014). Given the context and scope of the current study, the elements of social presence and their indicators defined by Garrison (2009) are applied since their definition provides tools that can be implemented in the current empirical research study.

### **Predictors of social presence**

In this paragraph, it will be examined which variables in existing research positively influence the amount of social presence experienced by students. It is important, to get a better understanding of the factors that predict social presence because Ghani and Taylor (2021) state that social presence is related to the learning efficiency and the final course outcome of

university students. Even the degree of satisfaction and motivation of collaborating students is affected by the amount of social presence (Garrison & Arbaugh, 2007; Shelton et al., 2017).

According to recent studies, gender is a significant predictor of social presence. (Park & Kim, 2020) reported that female students found online learning more social and more beneficial and had higher learning outcomes than male students. This might be explained by the results of a study by, (Joksimović et al. 2015b) who found out that female students tend to be more social and behave more interactive in an online setting, since they send more interactive messages than male students. The level of activity might be related to the extent to which students find the online interaction beneficial. Based on those findings there can be concluded that gender influences the level of social presence.

Previous online learning experiences also have been reported to have a positive impact on the amount of social presence (Andel et al., 2020; Shelton et al., 2017). Specifically, students who had taken more online courses tend to perceive social presence more positively. Andel et al. (2020) assume that students who had taken more online courses have experienced the processes of online courses. Consequently, students with prior online learning experiences can develop or keep a certain level of social presence and overall satisfaction with the course. In the meantime, students with less online learning experience have higher expectations of the input and support that they would get from the instructor than students with online learning experiences (Brown, 2019). Due to this, inexperienced online learners tend to be more discouraged when those expectations are not met. Therefore, Andel et al. (2020) conclude that students' online learning experiences, as measured by the number of online semesters previously taken are positively related to their perception of the social presence during an online course.

Another variable that influences the social presence of online learners is work status (Kim et al., 2011). It may be assumed that students who have full-time jobs might have less time for collaborative learning in comparison with students who either have part-time jobs or are full-time students. Also, the effective utilization of learning tools such as synchronous chat, streaming video and audio and the asynchronous discussion board can positively influence students' social presence, which as a result compensates for the lack of real contact (Kim et al., 2011). To finalize, various studies indicate that there are multiple variables that can influence the

amount and quality of the social presence of students. In the following paragraph, there will be looked at the differences in social presence in online and face-to-face contexts.

### **Online versus face-to-face social presence**

Multiple studies have demonstrated the positive relationship between students' social presence and their academic achievement in online learning (Hone & el Said, 2016; Lee & Huang, 2018; Masci et al., 2018). These studies about online social presence used different collaboration methods, for instance, forums (Hone & el Said, 2016), email (Lee & Huang, 2018), and spoken messages (Masci et al., 2018). Fish and Snodgrass (2018) stated that most online methods except video conferencing cannot replace face to face (FTF) learning activities since normal communicative processes are disrupted online by the lack of physical presence, which makes social, cognitive, and meta-cognitive learning more difficult. Video conferencing is according to Fish and Snodgrass (2018) seen as 'the best' online method because most communicative processes are still intact, facial expressions, for instance are still visible when having a video conference. Additionally, Zhan and Mei (2013) concluded that FTF students perceive a significantly higher social presence than online students since students can communicate more directly and freely in an FTF environment. Computer-mediated environments cannot assume that students will interact with each other just because the environment makes it possible (Kirschner et al., 2015). However, opponents have argued that online education can provide a more convenient and less stressful environment for communication among students and learning activities (Pei & Wu, 2019). Because online platforms can transfer all the social and symbolic information in human communication (Pei & Wu, 2019).

In conclusion, many studies have shown that online social presence in learning activities is harder to achieve and less effective than in FTF activities (Khalil et al., 2020; Mishra et al., 2020; Sujarwo et al., 2020). Some studies even state that it is impossible to replace FTF activities with online activities (Fish & Snodgrass, 2018; Landrum et al., 2021). Although, video conferencing is seen as a good initiative (Fish and Snodgrass, 2018).

### **Conclusion theoretical framework**

It can be concluded that the way students experience social presence during a course is an important aspect of online learning and has multiple positive effects such as an increase of

student motivation (Eberle & Hobrecht, 2021). However, social presence is hard to achieve in online education (Lee & Huang, 2018; Oyarzun et al., 2018). The communication method that is used highly influences the amount of experienced social presence (Fish & Snodgrass, 2018). Also, research showed that gender, previous experience with online collaborative learning and study track influences the amount of social presence (Andel et al., 2020; Joksimović et al., 2015b; Kim et al., 2011; Park & Kim, 2020). Yet, not much is known about the effect of video and audio tools on the social presence of students since platforms such as Zoom and Microsoft Teams are relatively new (Swan & Shih, 2019). Additionally, little research is conducted about how students experienced collaborative work during the mandatory switch to online work because of the COVID-19 pandemic. Therefore, the aim of this study is to find out how the pandemic influenced the social presence of students during collaborative assignments by looking at multiple indicators such as work perception, sociability, and the level of handed-in assignments. Students will be interviewed about, for instance, their work perception and their level of sociability. Additionally, lecturers will be asked about their experiences with collaborative processes and how they reviewed handed-in group assignments. The collected data will help to answer the following research questions.

### **Research questions and hypotheses**

The main research question of this study is: *'What is the effect of the mandatory switch to online collaborative learning channels on the social presence of Pabo-Students?'*, the Dutch teacher training institute, an institute which offers mostly collaborative courses and therefore a good fit for this study. To answer the main research question, three sub-questions will be examined in this study.

In online learning, most students experience feelings of isolation and disconnection from peers and instructors (Richardson et al., 2017b). Hence, the high rate of dropout among online students (Hone & el Said, 2016; Masci et al., 2018). Therefore, research question one is: *'How does the COVID-19 pandemic impact the collaborative processes of Pabo-students during collaborative courses according to Pabo-lecturers?'* Therefore, it is hypothesized that the pandemic negatively impacts the collaborative processes of Pabo-students.

Multiple studies have demonstrated the positive relationship between students' social presence and their academic achievement in online learning. (Hone & el Said, 2016; Lee & Huang, 2018; Masci et al., 2018). Therefore, research question two is: '*How does the online education during the COVID-19 pandemic influence the quality of the collaborative end product?*' Since online education generally contains less social presence than FTF education there is hypothesized that the pandemic caused a decrease in the quality of collaborative end products.

Many studies have shown that social presence is harder to achieve online and that it is less effective than in FTF activities for university students (Khalil et al., 2020; Mishra et al., 2020; Sujarwo et al., 2020). Therefore, research question three is: '*What are the differences in students perceived social presence before and during the COVID-19 pandemic?*' It might also be the case for Pabo-students that social presence is harder to achieve due to this, it is hypothesized that Pabo-students perceived less social presence during the online pandemic courses.

## **Method**

To gain in-depth insights into students' experiences, a qualitative study based on structured and semi-structured interviews was conducted. The study focused on the experiences of third- year students and teachers of the Pabo (teacher training) program. This program involves a lot of group work throughout the entire program. We opted for third-year students since this group experienced the first year of their program on campus and turned to online education at the start of the pandemic in their second year.

### **Participants**

In total, 15 (12 female, 3 male) students participated in this study. The participants' age range was 18 to 26 ( $M=22.83$ ,  $SD=.945$ ). All participants were enrolled in the Pabo at Saxion University of Applied Sciences (4 students) or the Pabo at HAN University of Applied Sciences (11 students). All the students participated voluntarily; they were not given any reward, and all the participants gave active consent to use the gathered data for the current study. The group consist of students that both experienced online and face-to-face education. Additionally, two lecturers participated in this study both working at the HAN University of Applied Sciences.



## **Instruments**

For this research, a standardized questionnaire and interviews were used. The following instruments helped the researcher to trustworthily extract data from these research methods.

**The sociability scale questionnaire.** To measure the students' perceptions of the collaborative learning activities before and during the COVID-19 pandemic, the sociability scale was used (Kreijns et al., 2003). The sociability scale gave insight into the collaborative processes of humans in a computer-supported collaborative learning environment (CSCL), which is embedded in group structures of norms and values, rules and roles, beliefs, and ideals (Kirschner et al., 2015). Items such as 'The CSCL working environment enables us to develop good work relationships with my teammates' (Kreijns et al., 2003), gave insight into the perceptions of students in the online environment. The collaborative processes are designated to be 'sound' if the social space is characterized by effective work relationships, strong group cohesiveness, trust, respect and belonging, satisfaction, and a strong sense of community. The sound social space determines, reinforces, and sustains the social interaction that is taking place among the group members. For this study, the scale has been translated to Dutch and adjusted to a scale in which they compare the CSCL environment with the traditional FTF environment. To do so, the students answered the 10 items questionnaire twice. Firstly, the sociability scale is filled in for the CSCL environment in which they participate during the COVID-19 pandemic. Secondly, students filled in the sociability scale as a reflection on the collaborative projects before the pandemic.

All the items were answered on a five-point Likert scale, ranging from strongly disagree to strongly agree as suggested by (Kreijns et al., 2003). The data was recoded for analysis to calculate for every student a total score for sociability during online education and during face-to-face education with a minimum of 20 points (least sociable) and a maximum of 100 points (most sociable). The reliability analysis of the items resulted in a Cronbach's alpha coefficient of .75.

**Social presence measure questionnaire.** Due to the complexity and multi-faceted construct of social presence conceptualizations, social presence is examined in various ways (Zou et al., 2021). In consequence, there is no single instrument that takes into account the dimensions the researcher in this study is interested in. Therefore, the current study opts for a combination of items of previous studies to cover the current social presence conceptualization.

To measure the students' perceived social presence before and during the COVID-19 pandemic firstly, the Social Presence Measure was applied. This Social presence measure was created by (Weidlich et al., 2018) and included sixteen items. The measure was based on a uni-dimensional definition of social presence that emphasizes the 'realness' of the other in the interaction. The measure used items like 'I was able to form distinct impressions of my teammates' on a five-point Likert scale (ranging from strongly disagree to strongly agree). Secondly, items of the Networked Minds Social Presence Inventory (Biocca & Gregg, 2001) were applied since these items focused on the psycho-behavioural interaction. These items did not only focus on the realness of the other in the interaction but, also seek to measure the user perception of attention, emotional contagion, and mutual understanding with their partner or participant. Therefore, items such as 'I feel that my point of view is acknowledged by my teammates' were added to the survey.

Calculation of Cronbach's alpha for traditional (face-to-face education) and online education during the lockdown separately did show a difference in reliability, with an alpha of .63 for face-to-face education and .58 for online education. However, after deleting items 4 and 6: 'I had a good working relationship with my project group' and 'I could share my goals with my project mates', the Cronbach's alpha during the lockdown appeared to be .67, which indicates that the social presence measure during the lockdown is more reliable after deleting these two items. For the social presence analysis, the items were recoded to calculate each participants' total score for both settings, with a minimum of 20 (low social presence) and a maximum of 100 (high social presence).

**Group work perception questionnaire.** To measure the influence of the mandatory switch to online education on group work perception, six items in the questionnaire (for each setting) were devoted to the group work perception of students derived from Tolessa, Sorale, and Sultan (2017). For instance, students were asked how motivated they were during group work on a five-point Likert scale, (1 very unmotivated and 5 very motivated). The total score for each setting was summed, resulting in a minimum of 6 points and a maximum of 30 points for each setting per student. A higher score on the group work questionnaire items stood for more positive perceptions towards a specific setting (traditional or online education).

**Interview.** A semi-structured interview was created to find out how online education during the COVID-19 pandemic influenced the quality of the collaborative end product, and

which differences were visible for lecturers at the university of applied sciences in group work courses in comparison with the traditional FTF courses for earlier years. Questions that were asked during the semi-structured interviews about the quality of the collaborative end product were for instance, ‘how would you describe the quality of collaborative work before and during the pandemic?’ and ‘what were the differences between the end products of students that collaborated online and face-to-face?’ Questions that were answered by the lecturers about the collaboration’s activities were e.g. ‘what were the most remarkable differences between lectures online and face-to-face while looking at the collaboration among students?’ and ‘what are the biggest challenges when effectively applying collaboration activities?’

The interviews with the lecturers were transcribed, and the most relevant quotes were used to form a complete understanding of the group work perception of Pabo students during and before the pandemic.

## **Procedure**

This study was approved by the Ethical Committee of the BMS Faculty at the University of Twente prior to the data collection. Due to the COVID-19 pandemic, the data collection of this study was fully conducted online. Participants were recruited with the help of local student associations that distributed advertisements for the study via social media channels. Students who met the requirements filled in the consent form to participate in this study. Thereafter, participated in the survey ‘Group projects: Before and during the COVID-19 pandemic’. After filling in the survey and the participation of the students was finished. Next, two lecturers at the University of Applied Sciences were interviewed. They were recruited via LinkedIn, and both met the requirements for the study since the lecturers had both experience with group work courses at the Pabo before and during the COVID-19 pandemic. Using a semi-structured interview schedule, the teachers were asked about their experiences with group work courses during the COVID-19 pandemic and before the pandemic concerning social presence, work perceptions and sociability. The interviews were recorded so data could be extracted from the conversations more conveniently.

## Results

To examine differences between traditional and online education, a series of independent samples *t*-tests are conducted. This, to determine whether there is statistical evidence that the means of traditional and online education are significantly different for the sociability, social presence, and the group work perceptions of Pabo students. Additionally, correlational analysis for the dependent variables social presence, sociability and group work quality are conducted to see if this could potentially have influenced the results.

### Differences in social presence, sociability and group work perceptions between face-to-face education and online education

In this sub-section, results of the analysis between face-to-face education and online education are reported. Table 3 shows an overview of the descriptive statistics for each of the dependent variables for face-to-face education and online education.

	<b>Face-to-face Education</b>		<b>Online Education</b>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Contact group members.	3.67	.900	3.20	.862
Informal conversations.	3.33	.900	3.20	.775
Well performing team.	3.40	.986	3.00	1.069
Good work relationship.	3.87	.516	3.60	.507
Comfortable during meetings.	3.67	.617	3.47	.640
Identify with team members.	3.40	.910	3.20	1.082
Allowance non-task related conversations.	3.73	.594	3.27	.704

A series of independent samples *t*-tests was used to compare the average of the total scores for the main categories of sociability: Well-performing team, work relationship and comfortable during meetings classified as ‘FTF education’ ( $n = 15$ ) to the average of the total scores of the participants classified as ‘online education’ ( $n = 15$ ). The performed *t*-tests were significant with  $t(11.62) = -0.98, p = .02$  for total of well-performing team,  $t(5.31) = 1.01 p < 0.001$

for total of work relationship and  $t(1.32) = 0.51 p = .04$  for total of comfortable during meetings. Therefore, there is a difference in sociability between FTF education and online education.

In order to get insight in the differences between online and face to face education an independent samples *t*-test was used to compare the mean scores on the social presence survey of the participants in the face-to-face setting ( $n = 15$ ) to the mean scores of the participants in the online education setting ( $n = 15$ ). The *t*-test was significant,  $t(28) = .325, p < 0.001$ , which means that there is a difference in social presence between FTF education and online education. Finally, an independent samples *t*-test is used to compare the mean scores of the participants during face-to-face education and online education on the group work perceptions questionnaire. The *t*-test was significant,  $t(28) = 2.53, p = 0.002$ , which means that there is a difference in group work perception between FTF education and online education. Additionally, the Pearson correlation coefficient was computed to assess the linear relationship between the variable’s social presence, sociability, and group work. There was only found a positive correlation between the variables social presence and sociability,  $r(15) = .49, p = 0.002$ .

**Table 4. Correlation between variables of interest.**

	Sociability	Group Work	Social Presence
Sociability	.		
Group Work	.03	.	
Social Presence	.49**	.04	.

Note. \*\*Correlation is significant at the 0.05 level (two-tailed).

The semi-structured interviews also showed differences between face-to-face education and online education. For instance, the interviewees stated that their students had more complaints during the online education period about their peers concerning the task division. The

semi-structured interview was created to find out how online education during the COVID-19 pandemic influenced the quality of the collaborative end product, and which differences were visible for lecturers at the university of applied sciences in group work courses in comparison with the traditional FTF courses for earlier years. The transcribed interviews resulted in a complete understanding of the group work perception of Pabo students during and before the pandemic. Looking at the quality of the collaborative end product, the two lecturers found out that the level of the end products decreased. The lecturers used the same final assignments for the given courses and applied the rubric in the same way, therefore a comparison between the level before and during the pandemic was easily made. They could not give exact numbers although the lecturers mentioned that there was an increase in retakes during their courses. Looking at the differences between the group work courses before and during the pandemic the lectures were consentient, group work teams experienced more difficulties with collaboration. Especially motivational challenges were mentioned: students who did not hand in their part of the assignment on time was an often-heard problem.

## **Discussion**

### **Summary of results & theoretical implications**

This study aimed to explore the effect of the mandatory switch to online collaborative learning on the social presence of Pabo-students by looking at the level of social presence, their collaborative processes, sociability, and the quality of the end products.

As expected, the results of this study showed that there is less collaboration between students collaborating online than students who collaborate face-to-face when looking at the results of the group work perception questionnaire. For instance, most students mentioned that they were more motivated during face-to-face collaboration tasks. Additionally, the students mentioned that it was easier to contact group members during face-to-face courses. Previous research already showed that face-to-face collaborative processes are in general less complex since students can communicate more directly and freely in an FTF environment (Fish & Snodgrass, 2018; Zhan & Mei, 2013). However, these studies used different collaborations methods than the current study such as forums, e-mail, and audio collaboration, which highly influences the outcomes of online collaboration. Since video conferencing makes it easier to communicate for instance, expressing your feelings can be done by facial expressions and voice

changes, which is impossible on a forum.

Possibly this leads to the positive correlation found in this study between the social presence and sociability of students. The data shows that a significant linear relationship exists between these two variables. However, other results for this study show that video conferencing is not as effective as face-to-face meetings when it comes to effective collaborative processes. For instance, when looking at the differences between the end products of courses that were given online and face-to-face. Students in the current study mentioned that the division of tasks of a group assignment were more complicated in an online setting. Finally, the interviewees both stated that their students had more complaints during the online education period about their peers concerning the task division. Logically, because Richardson et al. (2017b) stated that online students are more likely to experience feelings of disconnection from peers and instructors which makes it more challenging to work together as a well-performing group.

When it comes to the quality of the collaborative end products, the questionnaire results showed that students in online education were less satisfied with the end products than students in the FTF-context. Also, the interviewees mentioned that the level of handed-in group assignment, in general, decreased during the lockdown. Likely since most higher education institutions were ill-prepared for emergency online teaching, throwing over well-established teaching and learning practices (Pelikan et al., 2021). A decrease of the level of handed-in assignments could also have been wrought by the academic and social integration of online students since this is strongly associated with poor students results and high drop-out rates (Eberle & Hobrecht, 2021).

Results regarding the sociability between online students and students collaborating in a face-to-face setting did show a significant decrease in sociability between the two settings. It was hypothesized that the mandatory switch to online education would negatively impact the sociability of group meetings, so this hypothesis can be confirmed.

In face-to-face settings, students feel for instance that they are more connected with other peers (Lee & Huang, 2018) and they feel more comfortable during these face-to-face meetings (Fish & Snodgrass, 2018). Moreover, these researchers made a comparison between two subgroups, in the current study the participants did know each other from face-to-face courses, which might have had a positive effect on the online collaboration however, the students still experienced the face-to-face education as much more comfortable. Most higher education

institutions were not prepared for emergency online teaching, this decrease in sociability was an expected effect (Pelikan et al., 2021). However, some aspects of students' sociability, social presence and students' work perception barely changed, others were influenced heavily.

Therefore, this study provides guidance on how higher education institutions can improve online collaborative learning activities by looking at the aspects of these variables. Aspects of students' sociability, social presence and students work perception which decreased the most should be taken into consideration when creating new online learning activities. Due to the current study, educators will know that according to the students group work perception it is harder for them to divide the group work into equal parts. As a consequence, educators will pay more attention during the online course about the division of tasks. Since the group work perception is negatively influenced by the switch to online lectures, lecturers should review the group work perception as part of the final grade outcome to stimulate students to collaborate better online.

Additionally, educators will know owing to this study that a student's social presence is an important indicator of academic achievement. Especially, since students can experience feelings of loneliness (Akcaoglu & Lee, 2016). When looking at the social presence data of this study, educators will understand that students, for instance, found it quite challenging to form clear impressions of group members. In other studies, it was mentioned that they especially miss the amount of (non-task-related) social interaction with other students (Khalil et al., 2020) therefore this was expected. The results of this study allow educators to understand that implementing tasks which stimulate student interaction is important. For instance, educators could create besides the current lectures also more informal activities such as online quizzes and contests, which will improve the non-task-related social interaction and thereby the social presence of students. An example of online contests can be that study groups are challenged to create the most creative photoshopped Christmas photo of their study group. Such activities have not much to do with the course goals but will improve the sociability, group work perception and the social presence of study groups and through this, it will affect the final course outcome (Crawford, 2020; Mishra et al., 2020).

### **Limitations and future research**

The result of the current study shows that the mandatory switch to online education harmed Pabo students' sociability, social presence, and work perception. However, it must be



noted that the received data about pre-covid education are gathered while students were already studying from home. This could be problematic because students might not have a good representation of the actual situation of face-to-face education. For instance, the struggles students experience with online education might result in more positive reminiscences of 'the good old times' of face-to-face education.

Another limitation in this study was Chronbach's alpha because it was not acceptable for the used questionnaire. After deleting two items the reliability of the questionnaire was still dubious. The low Chronbach's alpha could be explained by the fact that the used questionnaire was translated to Dutch. Furthermore, the applied social presence items in the questionnaire were used with a different target group than before. Namely, in previous studies around social presence oftentimes university students were participating instead of bachelor students at the university of applied sciences. Additionally, in most studies, the social presence measure (Weidlich et al., 2018) is applied to compare the social presence of participants between multiple online tools, instead of comparing online video collaboration with face-to-face collaboration. Possibly, these factors have caused problems for the questionnaire's reliability in the current study. Hence, future studies could develop a new questionnaire that is more suitable to measure social presence for this task and target group or, adapt the questionnaire of the current study. Implementing questions focuses more on the switch from face-to-face meetings to online meetings, to get a deeper understanding of challenges that arise during this transition.

Furthermore, adding qualitative data by interviewing the Pabo students could also give more insight into the group work perception in the two different settings. Since the interviews will give the participants the chance to explain and reflect on the collaboration challenges when switching to online education. Finding ways to collaborate online more effectively is needed because student collaboration is expected to be more common to take place online after the COVID-19 pandemic (Bisht et al., 2020).

To finalize, the current study focused on the social presence while taking only the work perception, sociability, gender, and level of the collaborative end product into account. Since other factors were not taken into consideration, they still could have affected the student's social presence. Next to that, due to limited resources and time, a relatively small sample was used in this study. Furthermore, the distribution of participants according to their gender was not heterogeneous, with only three males participating.

Follow-up research is recommended to increase the generalizability and reliability of this study. Future studies could focus on other samples since collaborative assignments could be perceived differently per study track since the type of courses and characteristics of students from different faculties differ and could impact the social presence. This could provide a broader conclusion on the impact of social presence among students. Additionally, to explore how collaboration can be even more effective, follow-up research could focus on other variables affecting the collaboration such as personality traits. Finally, interviewing more students about their experiences with the mandatory switch to online education in future studies could give an even better understanding of how students perceived the switch.

## **Conclusion**

The current study explored how Pabo students experienced the mandatory switch from traditional face-to-face education to online education, by looking at students' social presence, sociability, and their collaborative end product before and during the COVID-19 pandemic. It can be concluded that Pabo students significantly preferred face-to-face collaborative group work than group meetings using video conferencing. For instance, during video conference meetings students felt less comfortable and less connected with the other students than during face-to-face meetings, additionally, their group work perceptions were more negative. Also, lecturers concluded that the level of collaborative end products was significantly lower in comparison with previous years in which students followed face-to-face education. With this data, the current study contributes to previous research on students' social presence during collaborative assignments. This is crucial because online education will become even more important in the future. Therefore, this study is a building block for future research on variables influencing online collaborative learning, to tackle the decrease in social presence.

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## Appendices

### Appendix A

### **Student Questionnaire.**

The following items, adapted from (Kreijns et al., 2003; Weidlich et al., 2018) and translated to Dutch from the questionnaire were answered by the Pabo students on a five-point Likert scale, ranging from strongly disagree to strongly agree.

1. Het was eenvoudig om projectgenoten te benaderen.
2. Er was ruimte voor spontane informele gesprekken.
3. Ik maakte deel uit van een goed lopende projectgroep.
4. Ik had een goede werkrelatie met mijn projectgroep.
5. Ik voelde mij comfortabel tijdens de groepmeetings.
6. Ik kon mij identificeren met mijn projectgenoten.
7. Er was sprake van veel off-topic conversaties.
8. Ik was tevreden met het geleverde eindproduct.
9. Ik was gemotiveerd gedurende het groepsproject.
10. De taken waren eerlijk verdeeld in de projectgroep.
11. Ik was in staat om duidelijke indrukken van mijn projectgenoten te vormen.
12. Ik voelde mij op mijn gemak om deel te nemen aan groepsdiscussies.
13. Ik voelde mij op mijn gemak tijdens de interactie met mijn projectgenoten.
14. Ik voelde mij op mijn gemak wanneer ik het niet eens was met een van mijn projectgenoten.
15. Ik heb het gevoel dat mijn standpunten werden erkend door mijn projectgenoten.
16. Online educatie is een excellent medium voor sociale interactie.
17. Tijdens de onlinesamenwerkingsbijeenkomsten had ik het gevoel dat ik en de andere projectgenoten dicht bij elkaar stonden.
18. In onlineonderwijs ervaar ik de aanwezigheid van andere studenten.