




Perceptions of university students regarding engagement in synchronous discussions involving teamwork during the COVID-19 pandemic

Shih-Hsiung Liu ^{1*}

 0000-0002-8690-7919

¹ Center for Teacher Education, National Changhua University of Education, Changhua City, TAIWAN

* Corresponding author: shsiung@cc.ncue.edu.tw

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ABSTRACT

Teamwork is usually a component of the learning assessment framework of online courses, and the timely sharing of information and feedback through synchronous communication is beneficial for team-based assignments. However, during the COVID-19 pandemic, university students did not always actively engage in virtual teamwork in online environments because they were learning from home and were subject to the effect of disruptions at home. This study explored the perceptions of university students who engaged in synchronous discussions involving teamwork during the COVID-19 pandemic. Semi-structured individual interviews were conducted with 25 Taiwanese university students. Through qualitative methods that incorporated individual interviews and a content analysis, six content concepts were established. Afterward, relational content analysis was conducted. This study revealed that the students benefited from visible synchronous discussions in terms of inquiry dialogue, project creation, and learning satisfaction. Notably, the interviewees mostly did not switch on their webcams but recognized that webcam use can benefit discussions. The participants' decision to switch on/off their webcams was primarily influenced by their perception of the importance of a given project than by their privacy concerns. Moreover, when home-based learning was implemented during the COVID-19 pandemic, group leaders encountered an obstruction when they were guiding their group members to engage in teamwork involving physical tasks. Future studies should explore how members should be guided to engage in teamwork involving physical tasks during synchronous discussions.

Keywords: synchronous discussion, visible communication, COVID-19, online teamwork, webcam usage

INTRODUCTION

The outbreak of the COVID-19 pandemic resulted in unplanned changes to university teaching. Group discussions involving teamwork, a common teaching activity in university courses, have transformed into online discussions that exclusively involve synchronous and asynchronous learning activities. Murphy and Collins (1997) argued that synchronous discussion requires interactivity, spontaneity, and fast decision-making (creation of conclusions). Theoretically, synchronous interaction is a highly recommended method for achieving teamwork during a pandemic. Although studies have indicated that the aforementioned transformation is a necessary or permanent trend in response to the COVID-19 pandemic (Goh & Sandars, 2020; Sohrabi et al., 2020), not all university students have adapted to this sudden transformation of their learning pattern. For example, courses that have a major group project component instead of merely peer dialogue may be adversely affected by new challenges pertaining to online learning environments. Studies have reported that specific courses, such as project-based assignments (Awuor et al., 2022), were difficult to

implement in an online learning setting because students must understand a project thoroughly and identify effective methods for working with each other.

According to Young and Henquinet (2000), university instructors usually design group projects as an assignment in which requires two or more individuals to come together to achieve specific objectives. Another reason for using group projects is that additional information and multiple perspectives may lead to intellectual synergy and better understanding and retention of concepts. The discussion involving group projects is different from the regular discussion that does not involve teamwork. The former type of discussion forces team members to reconcile mutual thoughts for creating a group project, while the latter type mainly provides an environment that members could share their opinions and may further make individual arguments. Studies have employed scaffolding-based socially shared regulation of learning to foster cooperation in an online project-based course (Cortázar et al., 2022) and used a collaborative online system (e.g., Google Jamboard) to promote collaborative and interactive learning (Shamsuddin et al., 2022); however, the engagement of students in teamwork learning is still an issue of concern. Studies have examined the effects of synchronous methods on the performance of students in a university course during the COVID-19 pandemic (Demirtas & Turk, 2022; Vollmer & Drake, 2022). But few studies have explored the engagement of university students in discussing and completing their group projects through synchronous interactions during the COVID-19 pandemic. How the members of a group discuss their group project when they interact virtually but are physically separated is a topic that warrants further investigation.

Group projects are an essential component of learning assessments, and students must conduct synchronous discussions with their peers to complete group projects because of the difficulties of conducting in-person discussions. Before the COVID-19 pandemic, students perceived peer interactions to be unimportant (Kuo et al., 2014); however, during the COVID-19 pandemic, students had to focus more on their interactions with their peers to complete group projects. Students expect to conduct effective synchronous discussions with their teammates in an online context; they expect all team members to engage in these discussions through actions such as providing timely feedback, contributing to team preparations, collaborating on group projects, and writing reports. Studies have revealed that students perceive difficulties in obtaining efficient feedback from teammates during their group project preparations in an online education setting (Wut & Xu, 2021). Moreover, Salta et al. (2022) reported that students had a lower level of emotional engagement in an online setting relative to a traditional learning environment. They may experience disappointment because of the considerably limited and smaller-than-expected output of their peers. Specific problems have limited the effectiveness of synchronous interactions. When students failed to engage in peer discussions with their teammates or conduct efficient discussions, the shift from a traditional learning environment to a distance-learning environment during the COVID-19 pandemic resulted in poor learning quality (Salta et al., 2022; Wut & Xu, 2021).

Additionally, a new problem has emerged, namely that university students do not always actively participate in virtual communities or engage in collaborative teamwork in online environments. This is because they learn exclusively through home-based learning and may be affected by disruptions at home. During the COVID-19 pandemic, students had to engage in online discussions instead of real-world classroom discussions for group projects.

Because fully online courses usually involve teamwork as a component of learning assessment and the timely sharing of information and feedback through synchronous communication is beneficial for completing team-based assignments, university instructors must understand the perceptions of university students regarding synchronous discussions involving teamwork. Moreover, perception is a set of senses involving the ability to perceive changes in body positions and movements. University students may perceive different experiences due to changes in learning situations. Accordingly, this study explored the perceptions of university students regarding their engagement in synchronous discussions involving teamwork during the COVID-19 pandemic.

LITERATURE REVIEW

Synchronous discussions are beneficial for students engaged in teamwork because they facilitate the sharing of learning information and provision of related responses (Fidas et al., 2005; McBain et al., 2016) and

further enhance the learning satisfaction associated with virtual communication when students collaborate successfully to complete their learning tasks (Bravo et al., 2006). Synchronous discussions can increase the engagement of students in teamwork, but it is a challenge for instructors (Anas et al., 2022).

Synchronous Discussion in Home-Based Setting

When almost all learning behaviors occur remotely in a home-based setting during the pandemic, students may develop the misconception that they can simultaneously perform housework and participate in learning activities. Rodrigues et al. (2022) highlighted the aforementioned viewpoints and demonstrated the difficulty of separating learning from home-based activities because students are physically separated from their schools and classmates. Henrie et al. (2015) defined learning engagement as participation, commitment, investment, or effortful involvement in learning activities. Although exclusively home-based online learning can reduce the time spent traveling to school to attend courses, fully investing one's time in a specific model and spending extended periods of time in the same place is a difficult task. Students can simultaneously perform daily household activities while they are sharing their viewpoints or even while they are listening to online classmates during learning activities.

Additionally, if a student exhibits the aforementioned behaviors, they may switch off their webcams during videoconferencing activities. Castell and Sarvary (2021) indicated that students usually refrained from switching on their webcams during synchronous learning activities that were conducted during the COVID-19 pandemic. Bedenlier et al. (2021) discovered that the webcam usage behavior of students was related to personal thoughts and feelings (e.g., privacy and cognitive perception) and course characteristics (e.g., group cohesion). Lapitan Jr. et al. (2021) also highlighted that instructors should request their students to turn on their webcams during synchronous sessions to encourage visible synchronous communication. However, in another study, several students turned on their webcams more often than other students because doing so increased the interactivity of classes and created a more class-like atmosphere. Webcam use also enabled them to receive nonverbal communication cues that improved their interactive understanding (Kalman et al., 2020). Students who switched on their webcams for communication have been verified to be more engaged in synchronous discussions than students who do not switch on their webcams. If students do not wish to disclose their physical location, blurring the webcam background is a feasible method. Because the nonverbal cues involved in webcam use have been verified as a method for promoting the effectiveness of online communication, students switch on or switch off their webcams for various purposes in addition to personal privacy.

Factors Related to Engagement in Synchronous Discussions

Hu (2022) indicated that the Taiwanese university students were not used to interacting with online classmates when enrolling in an online course during pandemic. Other studies also found that students were unprepared for the transition resulting in negative responses about synchronous discussion (Rahiem, 2020; Schultz & DeMers, 2020). Several factors influence student engagement in synchronous discussions during the COVID-19 pandemic.

The collaborative component may positively influence the engagement of students in teamwork with their peers, especially when they feel psychologically safe and supported during dialogues (Nerantzi, 2020). Awuor et al. (2022) determined that group collective efficacy moderated the relationship between teamwork competency and satisfaction. Penrod et al. (2022) demonstrated that student engagement is dependent on clear and purposeful communication. Purposeful questions and inquiry dialogue strengthen synchronous discussion.

Additionally, Aguilera-Hermida (2020) indicated that students and professors must increase their knowledge of technological tools to conduct remote teaching and learning, guide positive learning experiences, and increase the acceptance of synchronous learning. Shamir-Inbal and Blau (2021) recognized that leaders in virtual teams play a vital role because they need to reconcile different opinions from participants and facilitate the coordination between the members in the teamwork. University students' engagements in synchronous discussion involving teamwork may not be as high as in regular online discussions because of an increase of teamwork components. The perceptions of university students'

engagements in synchronous discussion involving teamwork during the COVID-19 pandemic should be investigated.

Perceptions Regarding Engagement in Synchronous Discussions Involving Teamwork

Considering group project components, this study used the perspective of the community of inquiry framework (Garrison et al., 2001) to explain the perceptions of university students' engagement in synchronous discussions involving teamwork.

Garrison et al. (2001) investigated and reported that participant perceptions regarding engagement in synchronous discussions involving teamwork are inseparable from the community of inquiry. Garrison et al. asserted that relative to a traditional classroom, deep and meaningful learning experiences occur in an online community through the development of three interdependent elements, namely,

- (1) social presence,
- (2) cognitive presence, and
- (3) teaching presence.

Social presence facilitates information exchange and is related to learning satisfaction in a computer-mediated conferencing environment (Gunawardena & Zittle, 1997; Wise et al., 2004). Cognitive presence helps participants to explore available information, solve their problems, and identify answers on the basis of student-to-instructor and student-to-student interactions (Shen & Khalifa, 2008). Teaching presence ensures that online students stay motivated and actively engaged in their online learning throughout the learning process (Anderson et al., 2001).

Studies have demonstrated that effective online communication requires the interdependency of three types of presence (teaching, social, and cognitive presence; Garrison et al., 2010; Nagel & Kotze, 2010; Shea & Bidjerano, 2009; Turk et al., 2022). Shea and Bidjerano (2009) demonstrated the direct influence of teaching presence on cognitive presence; they also revealed that teaching presence is necessary for stimulating cognitive presence among students during online learning. Other studies have also reported that teaching presence plays a key role in establishing both social and cognitive presence (Joo et al., 2011; Ke, 2010).

Additionally, Joo et al. (2011) reported that for university courses, teaching presence positively influences perceived usefulness and ease of use of online learning and enhances learner satisfaction, whereas social presence does not exhibit these effects. However, Mitchell et al. (2021) determined that an increase in social presence enhances the motivation, engagement, and perceived learning of students in a pandemic-constrained environment. The aforementioned findings regarding the various types of presence reveal their main function in virtual engagement. When the complexity of teamwork increases and students must work in a pandemic-constrained environment, the interdependency of three types of presence can explain the perceptions of students' engagements in synchronous discussion involving teamwork.

Conceptual Framework

Because of substantial changes to learning patterns during the COVID-19 pandemic, most university students only learn and interact with their instructors and classmates remotely in a home-based setting. University students have recognized that synchronous discussion is beneficial for group project discussions. The literature regarding online learning during the COVID-19 pandemic (Bedenlier et al., 2021; Castell & Sarvary, 2021; Nerantzi, 2020; Penrod et al., 2022; Wut & Xu, 2021) has indicated that various factors can affect the effectiveness of synchronous discussions, including being psychologically safe, receiving efficient feedback from teammates, the absence of expressions, and the engagement of students in sharing behaviors (e.g., webcam use). However, in contrast to an online synchronous dialogue on specific issues, the new requirement during the COVID-19 pandemic is that university students must finish a group project solely through online synchronous discussions. University students may become aware of new concepts and their connections. Moreover, in a team project, team members must engage in both collective and individual thinking. Team members may differ in terms of their individual perceptions regarding how their group project is completed. That is, when students are required to engage in online synchronous interactions to complete a group project for a necessary assessment during the COVID-19 pandemic, their perceptions regarding

engagement in synchronous discussions for teamwork in a home-based learning setting are unclear and warrant further examination.

METHODOLOGY

The present study explored the engagement of university students in synchronous discussions involving teamwork during the COVID-19 pandemic. A key challenge of teamwork is that every group member must contribute to and collaborate on the subtasks that a team is required to complete (Anas et al., 2022). The perceptions of university students who engage in synchronous discussions involving teamwork can serve as evidence of substantial developments in learning patterns. Therefore, individual semi-structured interviews were conducted to collect the experiences and perceptions of university students who engage in synchronous discussions involving teamwork during the COVID-19 pandemic.

Participants

This study was conducted in Taiwan. Discussion activities are frequently used in university classrooms. A common discussion type is to prompt students' reflection by asking a practical question and sharing with each other. Ministry of Education, Taiwan promoted the project of group cooperative learning in 2012 (Chang, 2013). The majority of Taiwanese teachers are aware of the teaching activities of cooperative learning. Universities also encourage their instructors to design teamwork activities regarding problem-based learning or project-based learning, specifically in vocational training courses. Moreover, due to a well-structured technological architecture in Taiwanese universities, the majority has created digital learning platforms with the functions of whole-class discussion, small-group discussion, and group project-based discussion for instructors and students.

Taiwan has 126 universities (45 public and 81 private institutions). On the basis of Gay's (1992) sampling recommendations, 20% of these 126 universities (i.e., 25 universities) were randomly sampled for the present study. The researcher emailed the university administrative departments responsible for online teaching and requested these departments to inquire whether their students would be willing to share their experiences pertaining to online teamwork. Thereafter, the researcher of the present study invited 25 volunteers who engaged in online teamwork during the pandemic (i.e., one volunteer from each of the 25 sampled universities). The academic backgrounds of the 25 participants included K-12 education, language arts, mathematics, law, performance art, business management, and medicine education.

Local governments in Taiwan declared the implementation of online teaching for all schools in May 2021. Online teaching lasted until October 2021 at which point students could return to school provided that the appropriate measures were in place (e.g., wearing of masks), that is, the online teaching period was implemented for approximately half a year. The study interview was conducted in January and February 2022. All volunteer participants were sophomore students or more senior students; therefore, they could compare the teamwork-related discussion activities that were conducted online and synchronously with those that were conducted in person.

With respect to the frequency of synchronous discussions involving teamwork that were conducted during the home-based learning period, the participants indicated that they conducted synchronous discussions one to three times a week during the pandemic, with each discussion lasting approximately 1 h (excluding activities that involved the teaching of course content by online instructors).

Interviews

Semi-structured individual interviews were conducted to collect data regarding the participants' perceptions of their engagement in synchronous discussions involving teamwork. Each participant was interviewed remotely by using visible synchronous communication tools. All interviews were recorded, and each interview lasted for at least 50 min.

A semi-structured interview is a qualitative research method that combines a series of predetermined, but open-ended questions with the opportunity for the interviewer to further explore particular themes or responses (Neuman, 2004). The interview questions of the present study were designed in accordance with the framework proposed by Patton (2015), who indicated that experience- and behavior-related questions

should focus on what an individual has done and what they think about their experiences. Patton also recommended that researchers refrain from asking “why” questions because they can lead to irrelevant speculations. Accordingly, to collect data pertaining to engagement in synchronous discussions involving teamwork, the interview questions of the present study focused on the experiences and perceptions of participants with respect to the synchronous discussions that they had conducted.

To protect against researcher bias in the interview, this study developed the interview questions by referring to relevant literature, consulting colleagues, and considering the relationships between the interviewees’ experiences and perceptions.

The interview questions comprised six items that were designed on the basis of the literature findings. The first question, referring to Castell and Sarvary (2021) and Bedenlier et al. (2021) is an inductive question that aims to clarify a participant’s experiences regarding synchronous discussions involving teamwork. The second question, referring to Murphy and Collins (1997), pertains to the implementation of synchronous discussions involving teamwork. The third and the fourth questions, referring to Fidas et al. (2005) and Bravo et al. (2006), relate to a participant’s perceptions of learning effectiveness and learning satisfaction, respectively. The final question, referring to Kalman et al. (2020), concerns a participant’s viewpoints regarding synchronous discussions and prompts them to compare these discussions with their experiences with learning in person. Briefly, the first interview question required the interviewees to recall the experiences of synchronously discussing group projects. The follow-up questions were designed to help interviewees express their perceptions and opinions by the aforementioned experiences.

Three days prior to their scheduled interviews, the interviewees received a list of the interview questions for their interviews, which is, as follows:

1. For several months during the COVID-19 pandemic, all students were required to stay at home and learn remotely. University students often discussed group projects through virtual communication. Please describe the most representative experiences related to synchronous discussions involving teamwork during the COVID-19 pandemic, including those involving synchronous video-based/audio-only synchronous communication.
2. For the aforementioned experiences, how did you share your individual opinions, respond the opinions of others, and work on projects (decision-making) to complete team-based assignments?
3. For the aforementioned experiences, did synchronous interactions facilitate inquiry dialogue and lead to favorable learning outcomes? Do you think synchronous interactions are effective for learning?
4. Were you satisfied with the synchronous discussions that you conducted? What factors could have affected the participation processes and individual engagement?
5. Synchronous visible interactions allow for participants to see facial expressions and gestures. What are your thoughts about visible interactions?

Three colleagues with sufficient experience in online teaching were invited to review the interview questions through a synchronous videoconferencing meeting. In addition to recommendations pertaining to text revisions, the researcher was advised to ask more questions about relevant experiences to help participants to form viewpoints on engagement in synchronous discussions.

Moreover, during the interviewing processes, when the interviewees expressed a specific opinion, the researcher asked further questions to understand the connections between the opinion and experiences in order to prevent the researcher’s bias from becoming involved in the interviewees’ perceptions.

Data Analysis

The digital recordings of all interview data of participants were transcribed. Through content analysis, interviewing data were quantified and subjected to conceptual and relational analyses.

The procedures for conceptual analysis were designed on the basis of the content analysis methods proposed by Krippendorff (2018); they included reading all interview data, developing conceptual codes based on predefined concepts discussed in other studies, making decisions on whether to code for the existence or frequency of a concept, classifying concepts, developing rules for coding, and coding the text. The aforementioned predefined concepts included visibility/non-visibility (Bedenlier et al., 2021; Castell & Sarvary,

Table 1. Six concepts established through conceptual analysis of synchronous discussion

Content concept	Code (number of interviewees)	Example
Use of video-based/audio-only synchronous communication	1: Video-based (8) 0: Audio-only (17)	I do not want to spend time dressing up, & I would also like to lie down because I spend a long time sitting in front of my screen ... I would turn off my webcam to avoiding revealing my state (coded as 0, interviewee 14, 1110120).
Appointment of a discussion leader prior to a discussion	1: Yes (16) 0: No (9)	Nobody took lead at start of a discussion. Discussions proceeded on basis of what we wanted to talk about. Subsequently, our dialogue ceased for some time. I hated to wait for follow-up messages; thus, I took initiative to lead discussions (coded as 0, interviewee 10, 1110124).
Perceptions of inquiry dialogue	1: Yes (16) 0: No (9)	Each member shared their personal thoughts & posted on "Jamboard." We viewed each other's points & further reflected on our own thoughts. A member may also ask questions ... Through this form of inquiry dialogue, we usually identified problems related to teamwork (coded as 1, interviewee 12, 1110126).
Creation of projects	1: Yes (17) 0: No (8)	We would immediately write down identified content related to teamwork during a discussion. Subsequently, we reviewed our previously created content & discussed our follow-up. After conducting several discussions, we completed our projects (coded as 1, interviewee 20, 1110123).
Learning satisfaction	1: Yes (12) 0: No (13)	I was satisfied with synchronous discussions. We first assigned work to each member, discussed contributions of each member, & finally completed our draft. Everyone is self-disciplined in completing their work (coded as 1, interviewee 21, 1110117).
Recognition of video-based/audio-only synchronous communication	1: Video-based (23) 0: Audio-only (2)	I felt that members should turn on their webcams for effective communication. When webcams were switched off, everyone became less certain about whether their individual viewpoints were understood. When webcams were used, discussions became more similar to in-person discussions. Our teammates became engaged in a discussion when they could see each other (coded as 1, interviewee 22, 1110121).

2021), interactive process (Murphy & Collins, 1997), effectiveness of sharing of learning information (Fidas et al., 2005), and learning satisfaction associated with virtual communication (Bravo et al., 2006). The three colleagues and the author of this study analyzed the collected data based on the predefined concepts, respectively. Afterwards, we constantly discussed the contents that were categorized differently until the analytical results showed consistency among the analysts.

For relational analysis procedures, proximity analysis techniques were adopted; they included exploring the internal relationship between concepts (positive or negative associations with each other), exploring the external relationships of concepts (e.g., a concept might imply the relevance of another concept), and stating the relationships between concepts.

RESULTS

Conceptual and relational analyses were conducted to understand the perceptions of university students regarding their engagement in synchronous discussions involving teamwork during the COVID-19 pandemic.

Conceptual Analysis

The present study predefined four content concepts (visibility/non-visibility, interactive process, learning effectiveness, and satisfaction) to prepare for conceptual analysis, and it subsequently established six concepts during the final phases on the basis of data-driven definitions (Table 1).

The first concept is the "use of video-based/audio-only synchronous communication" during discussions. The participating students typically used Google Meet with their webcams switched on. The second concept is the "appointment of a discussion leader prior to a discussion," that is, whether a discussion leader was appointed prior to a synchronous discussion. The third concept is "perceptions of inquiry dialogue," that is, whether the participants engaged in mutual understanding to complete group projects through synchronous

Table 2. Association between two row variables & three column variables

	Perceptions of inquiry dialogue	Creation of projects	Learning satisfaction
Use of video-based/audio-only synchronous communication	.514 (.010 [*])	.471 (.019 [*])	.542 (.007 [*])
Appointment of a discussion leader prior to a discussion	.826 (.000 [*])	.379 (.058)	.721 (.000 [*])

Note. *p<.05

Table 3. Correlation between “use of video-based/audio-only synchronous communication” & “recognition of video-based/audio-only synchronous communication”

		Recognition of video-based/audio-only synchronous communication		Sum
		Video-based	Audio-only	
Behavior of video-based/audio-only synchronous communication	Video-based	8	0	8
	Audio-only	15	2	17
Sum		23	2	25

discussions. The fourth concept is “creation of projects,” that is, whether teamwork was achieved through synchronous discussions, which is similar to learning effectiveness. The fifth concept is “learning satisfaction,” that is, the satisfactory perceptions of synchronous discussions involving teamwork, including the processes and outcomes of project discussions. Final concept is the “recognition of video-based/audio-only synchronous communication.” When the participants were asked about the effective interactions that occurred during synchronous discussions involving teamwork, several participants indicated that video-based synchronous communication was more effective than audio-only synchronous communication for enhancing learning.

Relational Analysis

The present study further conducted a relational analysis by applying a cross-tabulation technique and using Cramer’s V-square value. The row variables were “use of video-based/audio-only synchronous communication” and “appointment of a discussion leader prior to a discussion”; and the column variables were “perceptions of inquiry dialogue,” “creation of projects,” and “learning satisfaction.” This study cross-tabulated the frequencies of the three column variables on the basis of the two row variables. Additionally, it analyzed the correlation between “use of video-based/audio-only synchronous communication” and “recognition of video-based/audio-only synchronous communication” by performing a cross-tabulation with McNemar’s test because these two variables were paired proportionally.

During the analysis, three significant Cramer’s V-square values ($p < .05$) were obtained for the variable “use of video-based/audio-only synchronous communication,” revealing that visible synchronous discussions were associated with perceptions of inquiry dialogue, completion of projects, and learning satisfaction (**Table 2**). That is, video-based synchronous communication was more effective than audio-only synchronous communication in promoting inquiry dialogue, completion of team tasks, and satisfaction with discussion processes and outcomes among participants. Furthermore, two significant Cramer’s V-square values ($p < .05$) were obtained for the variable “appointment of a discussion leader prior to a discussion,” indicating that the appointment of a discussion leader prior to a discussion was associated with perceptions of inquiry dialogue and learning satisfaction.

Discrepancy of video-based/audio-only synchronous communication between behaviors and recognition

Notably, approximately two-thirds of the participants were unwilling to switch on their webcams when they were engaged in synchronous communication; they did so even though they were mostly aware that switching on their webcams could enhance group interactions (**Table 1**). In the present study, a McNemar’s test was performed to determine if differences exist between two related groups (i.e., behavior and recognition) with respect to dichotomous variables.

The results presented in **Table 3** reveal a nonsignificant Cramer’s V-square value of .202 ($p > .05$). A reasonable explanation for this result is that the eight participants who adopted video-based synchronous communication exhibited behaviors that were consistent with their recognition of such communication,

whereas the other 15 participants who switched off their webcams (i.e., adopted audio-only synchronous communication) exhibited behaviors that were highly inconsistent with their recognition of synchronous communication. Their opinions are, as follows.

The analysis of qualitative data revealed that 17 interviewees adopted audio-only synchronous communication. Eight of them explained that they adopted audio-only synchronous communication because they wanted to feel comfortable (e.g., lying on a sofa) and be able to simultaneously perform other tasks during their learning process. Five of them explained that they were unfamiliar with their group members. Two of them self-reported low confidence levels. The remaining two participants explained that webcam use was not required by their instructors or group leaders. However, the 15 interviewees (out of 17 interviewees) who did not use their webcams recognized that video-based synchronous communication contributed to synchronous learning; they also indicated that they were willing to switch on their webcams if they perceived a project to be more important than other projects or if their leaders or peers required webcam use. They were willing to switch on their webcams for reasons including determining whether one's viewpoints were clearly conveyed by observing the facial expressions and gestures of listeners, avoiding distractions by focusing on one's screen, and enhancing the willingness of team members to engage in inquiry dialogue because of the high similarity of visible communication-based discussions with in-person discussions. Notably, aforementioned reasons were related to academic performance. An interviewee said the following:

I must admit that it depends on what course and how important this discussion or project is to me. If a discussion was really crucial for my academic grades or future work, I would engage in the discussion with my webcam switched on (interviewee 9, 20220117).

By contrast, the eight interviewees who adopted video-based communication during synchronous discussion indicated that visible interaction facilitated the engagement of participants in discussions for various reasons, including a strong awareness of whether messages were clearly delivered and a high motivation for discussions. Notably, three of them indicated that their teamwork involved collaborations for developing visible products (e.g., table games, drama performance, and the display of product design) and that visible presence was required for them to contribute to their teams.

Appointment of a discussion leader prior to a discussion did not facilitate creation of projects

The appointment of a discussion leader prior to a discussion was associated with perceptions of inquiry dialogue and learning satisfaction but with the creation of projects (Cramer's V-value=.379, $p>.05$). The levels of participation and enthusiasm in synchronous discussions were cited as possible reasons by two interviewees (interviewees 1 and 24). Six participants indicated that specific tasks influenced the creation of projects (interviewees 1, 8, 19, 22, 23, and 25). One interviewee said the following:

Some people just kept silent. I encouraged them to say something about their viewpoints, but they only gave curt responses, such as "I agree." If a person attended an online meeting but did not exhibit a high degree of engagement, the cooperative project could not be completed (interviewee 24, 20220219).

Another interviewee indicated that his project involved playing a board game, which was difficult to play through an online discussion format. Interviewee 8 stated that his projects involved physical rehearsals for a drama, which was almost impossible to simulate through synchronous discussions; he said the following:

The professor required us to discuss a script about how to welcome hotel guests. Afterward, we simulated various roles and made a film. It was difficult for us to act together ... I asked my family members to help, but it didn't work out well (interviewee 8, 20220118).

In addition to the levels of participation and enthusiasm in synchronous discussions, the attribute of teamwork projects is a main reason for the decision to not complete group projects during the home-based studying that was implemented during the pandemic.

DISCUSSION

As the aforementioned in literature review, university students may become aware of new concepts and their connections when engaging in synchronous discussion involving teamwork during pandemic. According to the results of the relational analysis, two study findings were worthy of discussion.

Unwillingness to Switch on Webcams Despite Recognition of Webcam's Benefits for Discussions

The findings indicate that video-based synchronous communication is more effective than audio-only synchronous communication in enhancing virtual communication for group projects. The interviewees of the present study reported that video-based synchronous communication allowed them to verify whether their individual messages were clearly delivered. This finding is consistent with that of Mitchell et al. (2021) and Wise et al. (2004), who revealed that social presence can enhance information exchange and perceived learning during online interactions. In theory, the ease of use of learning technology enables students to easily conduct visible synchronous discussions. However, approximately two-thirds of the interviewees of the present study switched off their webcams even though they recognized the benefits of conducting a visible meeting to discuss team-based tasks.

Studies have indicated that privacy concerns and comfortable perception were the main reasons why some participants switched off their webcams (Bedenlier et al., 2021; Castell & Sarvary, 2021). In the present study, the interviewees indicated that they did not want to spend time dressing up in a home-based learning environment and prioritized comfort during learning. However, most of the interviewees were willing to switch on their webcams if they perceived that a discussed project was sufficiently crucial or if they were required to do so by their leaders or peers. Therefore, the participants' decisions to switch off their webcams were influenced more by their feelings and mental reactions than by their privacy concerns. That is, university students are attracted to the concept of a comfortable home-based life even though they should be engaged in discussions involving teamwork. This explanation corresponds to the findings of Rodrigues et al. (2022), who indicated that fully home-based learning increased the difficulty of separating one's learning activities from one's home-based life. Accordingly, except for urgent personal matters that may disrupt home-based learning, two positions are held with respect to the ability of students to focus on their learning activities and refrain from becoming excessively comfortable with their home-based learning environment. When students could not distinguish their learning from their home-based life, they were inclined to switch off their webcams and implement audio-only synchronous communication. However, when these students perceived that a discussed project was sufficiently crucial, they were willing to switch on their webcams and actively engage in visible interactions. Therefore, university instructors should remind students of the importance of engaging in teamwork for academic learning and demonstrating the effectiveness of inquiry dialogue with visible synchronous communication.

A Group Leader Played a Key Role in Project Discussion Rather Than Project Creation Because of Specific Tasks Involving Physical Performance

The results presented in **Table 2** reveal that the appointment of a discussion leader prior to a discussion plays a key role in synchronous discussions. During a synchronous meeting, the discussion leader hosted discussion activities and handled various matters including subjects, procedures, dialogue summaries, and even the participation of silent members. These activities directed the flow of discussion and enhanced inquiry dialogue and learning satisfaction. Conversely, if a synchronous discussion was not managed by a leader, the dialogue of the discussion became casual and irrelevant, resulting in poor-quality online discussions.

Studies have revealed that teaching presence helps to ensure that online students stay engaged in their online learning throughout the entire learning process (Anderson et al., 2001; Shea & Bidjerano, 2009). The present study discovered that a leader's role is similar to that of an instructor who maintained the processes of synchronous discussion. When they were under a leader's guidance, the participating students perceived that they benefited from engaging in synchronous discussions involving teamwork. This finding is consistent with that of Joo et al. (2011), who reported that only social presence does not contribute to learning effectiveness.

This study identified the perspectives of Shamir-Inbal and Blau (2021), indicating the importance of leader's guidance. Nevertheless, some participants did not perceive their teamwork to be successful because of specific tasks (e.g., playing roles in a drama together). Perceived effectiveness of synchronous discussion does not indicate the successful creation of group projects. Except for the spurring of negative mindsets, a group leader must become more capable of leading members in collaborative teamwork (particularly teamwork involving physical performance) in a home-based learning setting during the COVID-19 pandemic.

Shea and Bidjerano (2009) argued that teaching presence is necessary for stimulating cognitive presence among students during online learning. Nevertheless, teaching presence with the function of valuing the ideas and feedback of teammates and feedback does not sufficiently explain the aforementioned finding of the present study regarding the creation of group projects. In addition to the levels of participation and enthusiasm in synchronous discussions, the attributes of group projects should be considered. University instructors could design digital presentations instead of physical presentations for group projects.

CONCLUSIONS

This study explored the perceptions of Taiwanese university students regarding their engagement in synchronous discussions involving teamwork during the pandemic and identified six concepts, namely the use of video-based/audio-only synchronous communication, appointment of a discussion leader prior to a discussion, perceptions of inquiry dialogue, creation of projects, learning satisfaction, and recognition of video-based/audio-only synchronous communication. The findings reveal that video-based synchronous communication is beneficial for inquiry dialogue, the creation of projects, and learning satisfaction. Notably, two-thirds of the participants did not switch on their webcams for synchronous discussions, and the majority of them recognized that visible communication with webcams switched on can enhance the effectiveness of discussions. Furthermore, the present study demonstrated that the appointment of a discussion leader prior to a discussion plays a key role in inquiry dialogue and learning satisfaction during synchronous discussions; however, the successful creation of projects is dependent on the attributes of team projects.

During the COVID-19 pandemic, most people were required to stay at home. University instructors employed various learning systems and communication tools to continue teaching their courses. When group projects are an essential component of learning assignments in fully online courses, students should consider visible synchronous communication that more closely resembles in-person interactions and prepare themselves for visible synchronous discussions involving teamwork. Notably, the successful creation of projects is dependent on the attributes of team projects during the home-based studying. Future studies should explore how members can be led to engage in teamwork involving physical performance.

Limitations

The present study has a key limitation. University student use various technical equipment with varying network capacity to engage in visible synchronous learning. Although online teaching was implemented for all courses during the COVID-19 pandemic, the results of the present study may exhibit bias because of the differences among the students enrolled in online courses.

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REFERENCES

- Aguilera-Hermida, P. A. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, 1, 100011. <https://doi.org/10.1016/j.ijedro.2020.100011>

- Anas, S., Kyrrou, I., Rand-Weaver, M., & Karteris, E. (2022). The effect of online and in-person team-based learning (TBL) on undergraduate endocrinology teaching during COVID-19 pandemic. *BMC Medical Education*, 22(1), 1-9. <https://doi.org/10.1186/s12909-022-03173-5>
- Anderson, T., Rourke, L., Garrison, R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks*, 5(2), 1-17. <https://doi.org/10.24059/olj.v5i2.1875>
- Awuor, N. O., Weng, C., Piedad, E. J., & Militar, R. (2022). Teamwork competency and satisfaction in online group project-based engineering course: The cross-level moderating effect of collective efficacy and flipped instruction. *Computers and Education*, 176, 1-12. <https://doi.org/10.1016/j.compedu.2021.104357>
- Bedenlier, S., Wunder, I., Gläser-Zikuda, M., Kammerl, R., Kopp, B., Ziegler, A., & Händel, M. (2021). Generation invisible? Higher education students' (non)use of webcams in synchronous online learning. *International Journal of Educational Research Open*, 2, 100068. <https://doi.org/10.1016/j.ijedro.2021.100068>
- Bravo, C., Redondo, M. A., Ortega, M., & Verdejo, M. F. (2006). Collaborative environments for the learning of design: A model and a case study in Domotics. *Computers & Education*, 46(2), 152-173. <https://doi.org/10.1016/j.compedu.2004.07.009>
- Castelli, F. R., & Sarvary, M. A. (2021). Why students do not turn on their video cameras during online classes and an equitable and inclusive plan to encourage them to do so. *Ecology & Evolution*, 11(8), 3565-3576. <https://doi.org/10.1002/ece3.7123>
- Chang, S. J. (2013). *The spring of classroom teaching-Group cooperative learning teaching manual*. Ministry of Education of Taiwan.
- Cortázar, C., Nussbaum, M., Alario-Hoyos, C., Goñi, J., & Alvares, D. (2022). The impacts of scaffolding socially shared regulation on teamwork in an online project-based course. *The Internet and Higher Education*, 55, 100877. <https://doi.org/10.1016/j.iheduc.2022.100877>
- Demirtas, B. K., & Turk, U. (2022). Student performance under asynchronous and synchronous methods in distance education: A quasi-field experiment. *International Review of Economics Education*, 41, 100244. <https://doi.org/10.1016/j.iree.2022.100244>
- Fidas, C., Komis, V., Tzanavaris, S., & Avouris, N. (2005). Heterogeneity of learning material in synchronous computer-supported collaborative modelling. *Computers & Education*, 44(2), 135-154. <https://doi.org/10.1016/j.compedu.2004.02.001>
- Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education*, 15(1), 7-23. <https://doi.org/10.1080/08923640109527071>
- Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the community of inquiry framework: A retrospective. *The Internet and Higher Education*, 13(1-2), 5-9. <https://doi.org/10.1016/j.iheduc.2009.10.003>
- Gay, L. R. (1992). *Educational research competencies for analysis and application*. Macmillan.
- Goh, P. S., & Sandars, J. (2020). A vision of the use of technology in medical education after the COVID-19 pandemic. *MedEdPublish*, 26. <https://doi.org/10.15694/mep.2020.000049.1>
- Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *American Journal of Distance Education*, 11(3), 8-26. <https://doi.org/10.1080/08923649709526970>
- Henrie, C. R., Halverson, L. R., & Graham, C. R. (2015). Measuring student engagement in technology-mediated learning: A review. *Computers & Education*, 90, 36-53. <https://doi.org/10.1016/j.compedu.2015.09.005>
- Hu, Y. H. (2022). Effects of the COVID-19 pandemic on the online learning behaviors of university students in Taiwan. *Education and Information Technologies*, 27, 469-491. <https://doi.org/10.1007/s10639-021-10677-y>
- Joo, Y. J., Lim, K. Y., & Kim, E. K. (2011). Online university students' satisfaction and persistence: Examining perceived level of presence, usefulness and ease of use as predictors in a structural model. *Computers & Education*, 57(2), 1654-1664. <https://doi.org/10.1016/j.compedu.2011.02.008>
- Kalman, R., Esparaza, M. M., & Weston, C. (2020). Student views of the online learning process during the COVID-19 pandemic: A comparison of upper-level and entry-level undergraduate perspectives. *Journal of Chemical Education*, 97, 3353-3357. <https://doi.org/10.1021/acs.jchemed.0c00712>

- Ke, F. (2010). Examining online teaching, cognitive, and social presence for adult students. *Computers & Education*, 55, 808-820. <https://doi.org/10.1016/j.compedu.2010.03.013>
- Krippendorff, K. (2018). *Content analysis: An introduction to its methodology*. SAGE. <https://doi.org/10.4135/9781071878781>
- Kuo, Y. C., Walker, A. E., Schroder, K. E. E., & Belland, B. R. (2014). Interaction, internet self-efficacy, and self-regulated learning as predictors of student satisfaction in online education courses. *Internet and Higher Education*, 20, 35-50. <https://doi.org/10.1016/j.iheduc.2013.10.001>
- Lapitan Jr, L. D., Tiangco, C. E., Sumalinog, D. A. G., Sabarillo, N. S., & Diaz, J. M. (2021). An effective blended online teaching and learning strategy during the COVID-19 pandemic. *Education for Chemical Engineers*, 35, 116-131. <https://doi.org/10.1016/j.ece.2021.01.012>
- McBain, B., Drew, A., James, C., Phelan, L., Harris, K. M., & Archer, J. (2016). Student experience of oral communication assessment tasks online from a multidisciplinary trial. *Education & Training*, 58(2), 134-149. <https://doi.org/10.1108/ET-10-2014-0124>
- Mitchell, C., Anderson, K. C., Laverie, D., & Hass, A. (2021). Distance be damned: The importance of social presence in a pandemic constrained environment. *Marketing Education Review*, 31(4), 294-310. <https://doi.org/10.1080/10528008.2021.1936561>
- Murphy, K. L., & Collins, M. P. (1997). *Communication conventions in instructional electronic chats* [Paper presentation]. The Annual Convention of the American Educational Research Association. <https://doi.org/10.5210/fm.v2i11.558>
- Nagel, L., & Kotze, T. G. (2010). Supersizing e-learning: What a Col survey reveals about teaching presence in a large online class. *The Internet and Higher Education*, 13(1-2), 45-51. <https://doi.org/10.1016/j.iheduc.2009.12.001>
- Nerantzi, C. (2020). The use of peer instruction and flipped learning to support flexible blended learning during and after the COVID-19 Pandemic. *International Journal of Management and Applied Research*, 7(2), 184-195. <https://doi.org/10.18646/2056.72.20-013>
- Neuman, L. W. (2004). *Social research methods: Qualitative and quantitative approaches*. Pearson.
- Patton, M. Q. (2015). *Qualitative research and evaluation methods*. SAGE.
- Penrod, D., Shaw, T., Nash, J., Dierkes, M., & Collins, S. (2022). Community college students' perspectives on online learning during COVID-19 and factors related to success. *Teaching and Learning in Nursing*, 17(3), 267-273. <https://doi.org/10.1016/j.teln.2022.01.012>
- Rahiem, M. (2020). The emergency remote learning experience of university students in Indonesia amidst the COVID-19 crisis. *International Journal of Learning, Teaching and Educational Research*, 19, 1-26. <https://doi.org/10.26803/ijlter.19.6.1>
- Rodrigues, M. A. M., Zornoff, D., & Kobayasi, R. (2022). Remote Pathology teaching under the COVID-19 pandemic: Medical students' perceptions. *Annals of Diagnostic Pathology*, 56, 151875. <https://doi.org/10.1016/j.anndiagpath.2021.151875>
- Salta, K., Paschalidou, K., Tsetseri, M., & Koulougliotis, D. (2022). Shift from a traditional to a distance learning environment during the COVID-19 pandemic: University students' engagement and interactions. *Science & Education*, 31(1), 93-122. <https://doi.org/10.1007/s11191-021-00234-x>
- Schultz, R. B., & DeMers, M. N. (2020). Transitioning from emergency remote learning to deep online learning experiences in geography education. *Journal of Geography*, 119(5), 142-146. <https://doi.org/10.1080/00221341.2020.1813791>
- Shamir-Inbal, T., & Blau, I. (2021). Characteristics of pedagogical change in integrating digital collaborative learning and their sustainability in a school culture: e-CSAMR framework. *Journal of Computer Assisted Learning*, 37(3), 825-838. <https://doi.org/10.1111/jcal.12526>
- Shamsuddin, A. A., Woon, C. K., & Hadie, S. N. H. (2022). Feedback from medical student on an interactive online anatomy practical using the Google Jamboard platform. *Journal of Taibah University Medical Sciences*, 18(2), 234-243. <https://doi.org/10.1016/j.jtumed.2022.08.007>
- Shea, P., & Bidjerano, T. (2009). Community of inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education. *Computers & Education*, 52, 543-553. <https://doi.org/10.1016/j.compedu.2008.10.007>

- Shen, K. N., Yu, A. Y., & Khalifa, K. (2010). Knowledge contribution in virtual communities: Accounting for multiple dimensions of social presence through social identity. *Behavior & Information Technology*, 29(4), 337-348. <https://doi.org/10.1080/01449290903156622>
- Sohrabi, C., Alsaf, Z., O'Neill, N., Khan, M., Kerwan, A., Al-Jabir, A., Iosifidis, C., & Agha, R. (2020). World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *International Journal of Surgery*, 76, 71-77. <https://doi.org/10.1016/j.ijso.2020.02.034>
- Turk, M., Heddy, B. C., & Danielson, R. W. (2022). Teaching and social presences supporting basic needs satisfaction in online learning environments: How can presences and basic needs happily meet online? *Computers & Education*, 180, 104432. <https://doi.org/10.1016/j.compedu.2022.104432>
- Vollmer, R. L., & Drake, T. (2022). A qualitative investigation of undergraduate students' experience in a flipped, remote course during the COVID-19 pandemic. *Journal of Nutrition Education and Behavior*, 54(7), 27-28. <https://doi.org/10.1016/j.jneb.2022.04.061>
- Wise, A., Chang, J., Duffy, T., & Del Valle, R. (2004). The effects of teacher social presence on student satisfaction, engagement, and learning. *Journal of Educational Computing Research*, 31(3), 247-271. <https://doi.org/10.2190/VOLB-1M37-RNR8-Y2U1>
- Wut, T. M., & Xu, J. (2021). Person-to-person interactions in online classroom settings under the impact of COVID-19: A social presence theory perspective. *Asia Pacific Education Review*, 22, 371-383. <https://doi.org/10.1007/s12564-021-09673-1>
- Young, C. B., & Henquinet, J. A. (2000). A conceptual framework for designing group projects. *Journal of Education for Business*, 76(1), 56-60. <https://doi.org/10.1080/08832320009599051>

