



Person-to-person interactions in hybrid teaching and learning

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ABSTRACT

This paper aims to investigate person-to-person interactions in a hybrid classroom setting from a Community of Inquiry perspective. A typology of person-to-person interaction in hybrid learning environment is proposed. Hybrid mode seems to be the most convenient setting in terms of flexibility. In the hybrid classroom setting, teachers multi-task to take care of both onsite and online students at the same time. Students need to simultaneously communicate with the teacher in the lecture theatre and with their peers both in the classroom and online. In-depth interviews with university students and teachers were conducted in Hong Kong to investigate the challenges and the coping strategies of student-to-teacher interaction and student-to-student interaction in hybrid mode. Three distinct themes are generated: proximity; location and flexibility. The themes proximity and location contribute to the challenges. In short, challenges to student-to-teacher interactions include (1) the difficulty in accommodating the needs of online and in-class students at the same time, and (2) some online students are being ignored by the teachers. Challenges to student-to-student interactions include communication among online and onsite students; the Social Presence is found to be affected negatively by the hybrid approach. To alleviate such situations, solutions to challenges in student-to-student interactions are (1) more teamwork among students from online and in-class; and (2) encouraging learning from peers. We contribute to the literature on how to conduct hybrid teaching with greater efficiency by a new perspective to improve person-to-person interaction. The success factors of the hybrid mode are well-planned lessons, established familiarity, knowledge check, and adequate teaching equipment available.

Introduction

After the pandemic period, many educational institutions shifted back to the traditional face-to-face mode. Like some professional courses from medical schools and nursing programs, students are required to return to the classroom to attend practical sessions. On the other hand, some universities have adopted the hybrid mode of teaching after the pandemic. That means they allow students to choose whether to attend the class in a face-to-face format or an online format. This teaching mode is currently in use by 21 % of colleges (LiveWebinar, 2025). Among 50 UK universities, the number of hybrid courses grew from 4.1 % in 2018/19 to 28 % in 2022/23 (Standley, 2023). Most educators (60.4 %) are now using hybrid mode in teaching, and nearly 60 % of education experts believe hybrid classes will overtake traditional classroom formats (Edwards, 2025). It is anticipated that the hybrid learning mode will dominate education that most educational institutions will provide hybrid learning by 2025, with many students enrolling in at least some online courses (LiveWebinar, 2025; Staff, 2022). This learning

environment mostly welcomed by part-time students because it allows the greatest flexibility for the students (Wut et al., 2022).

Hybrid meetings are also common in commercial settings as they offer flexibility to the people who need to join the event. It has a good cost-effective reason. Nowadays, teachers and students in higher education are well-equipped with online technology. Also, teachers are used to playing around with online tools, and students are also familiar with the tools (Raes et al., 2020). Hybrid mode is also widely used in some of the teacher's meetings and conferences. Thus, it is a good time to examine the effectiveness of a hybrid classroom.

This paper aims to investigate person-to-person interactions in a hybrid classroom setting from a Community of Inquiry perspective. This perspective provides a valuable structure for identifying and analyzing the interplay in hybrid classrooms. In the hybrid classroom setting, teachers must multi-task to take care of the onsite and online students. Online students need to communicate with the teacher and other classmates in the classroom and to connect with other online classmates. Vice-versa, in-class students have to deal with the teachers and peers

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face-to-face and communicate with other online classmates.

The term 'hybrid' means some of the students are in the classroom, and some other students are in virtual mode (Young, 2002; Wut et al., 2022). People use 'hybrid' in mixed manners. Hybrid teaching and learning have another meaning for two teaching modes: face-to-face and online, run in a synchronous or parallel manner. Whereas for blended teaching and learning, face-to-face and online learning run in an asynchronous manner. These definitions were used in the study. Teachers in hybrid teaching, unlike in the blended approach, need to operate in two entirely different learning environments while students can enjoy more flexibility and options. Such a teaching mode has become possible since COVID-19 because teachers and students in higher education are equipped with suitable equipment, tools, and skills for hybrid teaching and learning. It is foreseeable that more classes are going to be introduced and implemented using a hybrid approach (Staff, 2022). There has been a discussion on online learning environments (Wut & Xu, 2021) as well as blended learning environments (Wut et al., 2024). However, there is a lack of literature devoted to hybrid learning in the post-pandemic era, although it is more technically challenged (Raes et al., 2020). This study aims to identify the new challenges to student-to-teacher and student-to-student interactions in hybrid mode during the post-pandemic period and to propose possible measures to make it more effective. The results will contribute to the theoretical framework and applications of the community of inquiry frameworks, enhance the understanding and operations of hybrid teaching, and offer insights into the pedagogy direction and approaches.

Literature review

Hybrid education and challenges

Hybrid learning is not a new thing. Sometimes, scholars refer to a hybrid learning environment as the same as a blended learning environment (Merisi et al., 2022). The hybrid learning environment was examined in a manner like online learning (Gamage et al., 2022). It would overlook the complexity of the setting. Hybrid learning was called blended synchronous learning in the past. The intention of using blended synchronous learning is to enlarge the student population. Remote students can more or less engage similarly to face-to-face classroom students who make use of video conferencing technology (Bower et al., 2015). There are some advantages to the institutions. More students could be recruited without physical boundaries (Abdelmalak & Parra, 2016). Student attendance is no longer an issue because an online option is available. On the other hand, students can use their time flexibly and save travel time. Furthermore, students from different places around the world can connect and exchange ideas with each other (Lakhal et al., 2017).

However, there are challenges to adopting hybrid teaching. Teachers are busy dealing with technical issues and tend to revert to using slide presentations, which slows down the pace of teaching (Bower et al., 2015; Stewart et al., 2011). Pedagogical challenges like a heavy mental load on teachers' multi-tasking also have negative effects on the implementation of hybrid teaching. Technological issues with video and audio equipment and tools used during the class are also reported (Raes et al., 2020). There are other practical issues, such as teachers being tempted to focus more on in-class students due to their physical presence and allowing direct interactions and also because not all online students turn on their cameras due to concerns about privacy over their physical surroundings. Besides, teachers need to make sure they pay equal attention to students attending online and in-person classes. Regarding hybrid learning, more effort is required for student engagement in online mode. Teachers need to design class activities to encourage online students to participate to a similar extent as face-to-face students (Olt, 2018).

Community of inquiry framework

Community of Inquiry Framework (Garrison et al., 2010; Garrison & Vaughan, 2008) was used in this study. It is composed of three parts: Teaching Presence, Social Presence, and Cognitive Presence, which is also moderated by Technology (Hwang, 2018). In teaching presence, teacher-to-student interaction was mentioned. Student-to-student interaction was regarded as Social Presence. Last but not least, student-content interaction is within the scope of Cognitive Presence. Social Presence was discussed separately in an online context and a non-online context. It is associated with student engagement and, finally, their learning outcomes, including student satisfaction and academic performance (Wut et al., 2023). Teaching Presence poses a great challenge to teachers since they need to work concurrently with two groups of students: face-to-face and online students. Providing the same set of class activities related to Cognitive Presence to both groups of students might, to some certain extent, compromise part of the students' needs. The community of inquiry framework was based on experience in higher education. The three types of interaction meet in the middle and form the overall educational experience for teachers and students (Garrison et al., 2010).

The model was developed around the turn of the last century. The Internet became popular not long before that time. The model provides a solid framework to discuss the foundation of face-to-face and online teaching. The framework has been used in the blended learning approach of the higher education context (Wut et al., 2024). It was observed that more and more educational institutions are using a comparatively flexible approach to teaching, that is to say, a hybrid approach. As such, the framework probably works in a hybrid approach. There are some interaction scenarios that are unique in the hybrid approach, unlike the face-to-face approach or online approach.

Person-to-Person interaction

In the post-pandemic period, although teachers and students are already familiar with using technologies in hybrid learning (Wut et al., 2022), teachers might focus more on going through the teaching materials through the computers when delivering the lectures and interacting with the students who are physically attending the class; and pay relatively less attention to the online students who might feel being neglected (Huang et al., 2017). That is to say, online students are negatively affected and receive only little teacher-to-student interaction. In fact, not only are online students influenced, but teachers are sometimes bothered by technical issues involved in class adopting hybrid setting and thus teacher-to-in class student interaction might also be affected.

There might be some problems in student-to-student interaction as well, especially between remote students and in-class students (Zydney et al., 2019). Students usually interact with teachers in hybrid teaching through various online/offline tools. Onsite students should communicate more with each other to create a positive learning environment. Similarly, online students should connect and communicate with each other using different software like Zoom, Microsoft Teams, and so on. Then, how about the communication between online and in-class students? Though encouraged, not all of the in-class students have computers with them, which makes it difficult to connect and communicate in class. There are a lot of complications in a hybrid learning environment. There was a technical setup discussion to enhance the interactions among teachers and students. Recommendations have been provided to the teachers in hybrid teaching (Detyna et al., 2023). However, a detailed pedagogical strategy has yet to be discussed.

Previously, scholars examined the issue in an overarching manner without looking at the hybrid learning environment in detail (Merisi et al., 2022). Interaction among students (using face-to-face mode) and students (using online mode) is neglected in the literature. As a whole, this study addresses the literature gap by proposing research questions

using a systematic approach (Table 1):

- (i) What are the challenges of (face-to-face and online) student-to-teacher interaction in hybrid mode?
- (ii) What are the challenges of (face-to-face and online) student-to-(face-to-face and online) student interaction in the same mode?
- (iii) What are the challenges of face-to-face student-to-online student interaction in a hybrid learning environment?
- (iv) What are the coping strategies of (face-to-face and online) student-to-teacher interaction in hybrid mode and student-to-student interaction in a hybrid learning environment?"

Methodology

The research selected four teachers and eleven students using purposive sampling. Selecting respondents who are experienced, willing to participate, and express their opinions (Palinkas et al., 2015). The interview questions were designed according to the research questions. It was piloted using one male and one female students in October 2022. Some wordings in the interview questions were corrected to improve the meaning (Wut & Chou, 2009).

In-depth interviews with university learners (11 students) and four teachers were conducted in Hong Kong in 2023. All of them come from a university. There are two male and two female teachers. All of them are experienced teachers. The inclusion criteria for the teachers are that at least half of the teaching classes use a hybrid approach and they have over ten years of teaching experience. This is to make sure that they could share their best practice in hybrid teaching in the interview. They did not receive any proper training on conducting hybrid teaching, but they had experience in doing online learning during the pandemic. There are five male and six female students studying in the Business, Social Science, and Science disciplines. They are full-time university students aged between 19 and 22. Students were recruited with a quota in terms of gender and major so that balanced representation could be obtained (Tables 2 and 3). Students need to fulfill the inclusion criteria: (1) their attendance rate is at least 70 %, and (2) they mainly use only one attendance mode in the class. Students cannot be our respondents if they cannot fulfill either one of the above conditions. The class size is around sixty and more students were on remote basis than in the classroom (2:1 ratio).

The authors started the research process in September 2022. After obtaining ethical approval from the research committee, the authors sent invitations to the respondents in November 2022. The interviews were held generally for around one hour, with some warm-up questions to make sure the respondents fulfilled the inclusion criteria and let them know the purpose of the study. The in-depth interviews were conducted on a one-to-one basis. The open-question technique was used for the core questions so that respondents could freely express their opinions. All participants provided us with written consent, and they were told that they could quit at any time. The anonymity of the respondents is protected as all the data are presented in an anonymous way, and no personal characteristic is mentioned. The interview process started in January 2023 and ended in March 2023. The interview was conducted in Chinese. The script was translated into English by a native English speaker. Both students and teachers were asked about the interaction

Table 1

Topology of person-to-person interaction in hybrid learning environment (adapted from Detyna et al. (2023)).

Interaction	Teacher (face-to-face)	Student (face-to-face)	Student (online)
Student (online)	Research question (i)	Research question (iii)	Research question (ii)
Student (face-to-face)	Research question (i)	Research question (ii)	Research question (iii)

Table 2

Demographic information of teacher respondents.

Teacher	Gender	Marital Status	Age	Disciplines	Teaching Experience
Teacher H	Female	Single	44	Language	10 years
Teacher B	Male	Married	40	Tourism	15 years
Teacher L	Female	Married	48	Business/Marketing	10 years
Teacher C	Male	Married	60	Tourism	20 years

Table 3

Demographic information of student respondents.

Student	Gender	Mode of attendance	Major	Year
Student1	Female	Full-time	Business/Marketing	4
Student2	Female	Full-time	Business/Marketing	4
Student3	Male	Full-time	Social Science	4
Student4	Male	Full-time	Social Science	4
Student5	Female	Full-time	Social Science	4
Student6	Female	Full-time	Business/Marketing	4
Student7	Male	Full-time	Science	4
Student8	Male	Full-time	Science	3
Student9	Female	Full-time	Business/Marketing	4
Student10	Male	Full-time	Social Science	4
Student11	Female	Full-time	Business/Marketing	4

among teachers and students, among students in remote or in-class settings, teaching efficiency, the future of hybrid learning, and teaching tools. When the point of saturation was reached, the interview process would be stopped.

Data analysis

The analysis of this study started with gathering data, breaking down the data, reconstructing the findings, interpreting them, and coming to a conclusion (Yin, 2014). Labels were assigned to the transcripts. Codes were identified with content analysis using the software NVivo, version 12, by two independent researchers. There were some variations in coding between coders, and meetings were conducted to discuss the variation and ensure the validity and reliability of the coding process (Hood, 2007). A third coder was invited if the meeting could not reach a decision (Bryant & Charmaz, 2010). Themes were then arranged and categorized based on significance and accuracy (Lee et al., 2024).

Findings/Results

Teacher-to-student interactions

Interaction between teacher and face-to-face students

Since the teacher can see face-to-face students from time to time during the class, the teacher might put more focus on face-to-face students:

"I (teacher) will spend more time with face-to-face students. "The face-to-face students ask the question immediately. I interact more with the face-to-face students before the lesson and during the break time. I think it is not easy for the teacher to take care of the face-to-face students and online students simultaneously." (Teacher H)

"I will take more care of the face-to-face students. Because I can see the reaction from the face-to-face students. For instance, if the students don't get the point or feel confused, they may have some micro-expression. In this case, I may take more care of them. For online students, I can't see their micro-expression." (Teacher B)

"The face-to-face students can ask the question immediately because they know more about the class situation. For example, not many students are onsite. Thus, it would not be too disruptive for face-to-face students to ask teacher questions more frequently." (Online student 1)

Students who study face-to-face would have an easier to approaching the lecturer from the beginning and end of the lecture. It is because some lecturers would communicate with us initiatively during the break and we can ask questions about tutorial exercises immediately. (Face-to-face student 6)

"The teachers take more care of the face-to-face students. Because most teachers will use a break time to talk with students face-to-face and maybe share what happened recently." (Online students 9 & 11).

Face-to-face Students would feel that they are closer to the teacher compare to online students. Thus, they are willing to contact teacher in various way.

Interaction between teacher and online students

Some online students, for various reasons, do not open their cameras. It might be due to their home environment. The home environment might be too small in Hong Kong, and there might be some noise from other members of the family.

"Sometimes I might neglect online students as they do not open the camera. For the online students, I will ask whether they hear my voice or any questions at the beginning. There is not too much interaction between online students and me. Most of online students adopt typing when asking questions. I will not notice these questions (from online students) immediately. Because I may keep teaching and overlook the updates from the chatbox. Therefore, there is not much interaction between me and online students." (Teacher H)

"Most of the online students adopt typing when asking questions. It may be because online students are afraid that their voices will be recorded in the class video. I didn't do the roll call to encourage online participation. There were some time constraints in the class." (Teacher B)

"Based on the lack of interaction, online students feel that the teachers are ignoring them. The advantage of face-to-face is that you can see their facial expressions. For example, you can see if they don't understand, you can explain again. Online mode is very difficult to observe the changes in their facial expressions, so it was very difficult to make changes. In the online mode, students would answer questions, so it was necessary to prepare more PowerPoint slides than face-to-face learning." (Teacher C)

"I don't think lecturers take more care of online students. It is because the lectures can see the reaction of the face-to-face students. But the lectures can't see the reaction of the online students." (face-to-face student 3)

"I fear missing out because the live students can ask tutor easily and get a response." (Online students 1 & 4)

From the above extracts, online students were sometimes ignored by teachers, and their interactions were impaired.

Student-to-student interaction

Previous literature focuses on student-to-teacher interaction and neglects student-to-student interaction (Wut & Xu, 2021). However, student-to-student interaction is important because they can observe and learn from each other. Student-to-student interaction was reported to be impaired in fully online learning (Wut & Xu, 2021).

Interaction among face-to-face students

Interaction among face-to-face students in the classroom is well documented (Wut & Xu, 2021). The number of students in the classroom is small since some of the students are online. It is not difficult for face-to-face students in the whole class to get acquainted.

"Class size (f2f) is smaller because some of the students go online. Students are easy to communicate. They know each other quickly. Face-to-face students prefer face-to-face groupmates" (Teacher B)

"Some classes must go face-to-face, so they will discuss group projects together after class." (Teacher D)

"Onsite students prefer to find onsite students doing group discussions. It is because we can see each other and communication speed is fast. For example, it is easier for me to ask for grouping when my classmates surround me." (Face-to-face Student 3)

I need to discuss group projects with my groupmates, so face-to-face discussion is better than online. Moreover, I can easily share my opinion in real-time." (Face-to-face student 10). "Most face-to-face students find group mates in live." (Online student 1)

Face-to-face students form the group discussion easily compare to online students.

Interaction among online students

Interaction among online students has been addressed recently due to the COVID-19 situation (Wut et al., 2023). Online student engagement is motivated by social content, online communication, and interactivity from the perspective of social presence theory. Social content refers to cognitive Social Presence and is a kind of personal communication. Online communication refers to affective Social Presence, and students are allowed to express their ideas anytime. Interactivity is more or less an awareness of the online learning environment (Wut et al., 2023).

"Online students prefer to discuss with online classmates because they are in the same space" (Teacher B). Some students come back to school for online learning but do not enter the classroom. After finishing the online class, they will discuss a group project with their groupmates face-to-face." (Teacher D)

"Finding groupmates for online classes was difficult since I do not know them personally. I do not know their capabilities and academic prospect. I prefer someone as smart as I am and would not back off during tough times." (Online student 9)

"I think online group discussion is enough. We can share ideas in Microsoft Teams. However, it is a little embarrassing to discuss it in person, like with strangers." (Online student 11)

Online students form group discussions with each other rather than in-class students due to the fact that not all in-class students have computers.

Interaction among online and f2f students

Interaction among online and face-to-face students was not explored well in the literature. It is the most challenging scenario in hybrid learning (Wut et al., 2022).

"It is difficult for online students to hear what face-to-face students are saying. Part of the face-to-face students mixed with online students while doing the group projects. So the result is not effective when face-to-face classmates are combined with online students." (Teacher H)

"I seldom communicate with my online classmate." (Face to face student 3)

"We have less chance to communicate with the students studying in online mode as we would not have any interaction since we would do

the tasks by the group face to face and online separately. I wouldn't know more about online students since the school adopted a 100 % online mode. It is because Online students would have less communication on the online platform since they will not communicate much with their classmates even face-to-face." (Face-to-face student 6)

"There is less interaction between face-to-face and online learning students. It is because I never saw them in person. So, how can I communicate with them? I need to listen to classmates' voices and see their faces. Then, I can know whether they are good or bad personalities and they can be my friends or not." (Face-to-face student 10)

From the above extract, the whole class was divided into two big groups: in-class students and online students.

Reasons students choosing online or face-to-face mode

Students have various reasons for attending the class online, either face-to-face or mixed. It depends on their own will.

"It depends on different classes. For instance, more face-to-face students in classes A and more online students in classes B. It seems online students are a bit more." (Teacher H)

"I think more than half of the students who adopt face-to-face. It may be related to the class time and students' timetable. They may have class before my class. Thus, they may think it is convenient to take my class." (Teacher B)

"I will choose the face-to-face mode for sure. It is because if I have questions, I can ask the tutor immediately. If typing questions in the chat room, it seems less effective." (Face-to-face student 3).

"Since my friends are learning face to face and I think learning in this mode is good, I always choose to learn in this mode. I may use my phone to distract from my study when I am learning at home. Learning face to face can reduce the opportunity that I would distract at school." (Face-to-face student 6)

"Yes, I think the hybrid approach should keep on. The students can choose which one is more suitable for them. For instance, some shy students may prefer online learning." (Online student 1). "The reason I chose the online mode was fewer students attend face-to-face. Thus, I decided to participate online. Another reason was that I could concentrate more than face-to-face, where I would talk with my classmates." (Online student 8)

"There is less interaction between face-to-face and online learning students. It is because I never saw them in person. So, how can I communicate with them? I need to listen to classmates' voices and see their faces. Then, I can know whether they are good or bad personalities and they can be my friends or not." (Face-to-face student 10)

Hybrid mode offers flexibility to the students. Some Chinese students are too shy to ask teachers in face-to-face classes. Those students would prefer to use online mode and ask teachers in the chat room.

Effectiveness of hybrid learning

The effectiveness of hybrid teaching and learning needs to be investigated at least from two perspectives: pragmatic and interactive perspective. Hybrid teaching and learning offer great flexibility for students. It saves students' transportation time from their homes to the university. It was welcomed by students because sometimes they might have only one class on the day. On the other hand, teacher-to-student interaction and student-to-student interaction might be impaired by the findings of the previous sections.

"We cannot cater to both face-to-face and online students at the same time. For example, we cannot move around a lot. However, some of the face-to-face students mixed in with online students while doing the group projects. So the result is not effective when face-to-face classmates are combined with online students." (Teacher H)

"I think the learning outcomes of the hybrid teaching mode are worse. Because there are some restrictions. For instance, it is difficult to know the student's progress." (Teacher B)

"I cannot concentrate because there was a lot of distraction at my home. I cannot participate the lesson in online mode. This is why I come to the class." (F2f student 3)

"I cannot know more about other students. Online students usually do not open the camera. I cannot see face-to-face students as well because the camera is pointing to the teacher side." (Online student 1)

"I think online learning is suitable for me, but I will have less time to communicate. For instance, there are no opportunities to communicate with other peer groups." (Face-to-face student 3).

"I think the hybrid approach should keep on. We can have more options. But I also think it is not easy for teachers to take care of the hybrid modes." (Online student 2).

"Yes, we have higher efficiency because I often work my part-time job when online class is going on." (Online student 11)

Hybrid learning offers flexibility to the students and restricts intensive student-to-student interactions.

In summary, three distinct themes were generated: proximity, location, and flexibility. Regarding proximity, there is much closer between teachers and face-to-face students than between teachers and online students. Location is another theme generated. Face-to-face students tend to interact with each other; this is a similar case for online students. Last but not least, flexibility was the last theme identified. The last theme, 'flexibility,' explains the high effectiveness of hybrid teaching and learning.

Discussion

Teacher-to-student interactions

Fairness issues have been raised by both face-to-face students and online students. Teachers were usually aware of the need to be fair to all students. Although teachers and students were familiar with connection technology in the post-pandemic period, teachers are busy handling some technical issues, such as connection problems, as mentioned in this study and concur with previous literature (Raes et al., 2020). It is easy for teachers to pay more attention to face-to-face students compared to online students (Detyna et al., 2023). Also, it is too easy for onsite students to ask the teacher on all occasions and get immediate feedback, whereas online students' questions need to be taken in the chatroom at a later stage. It is due to the location advantage. Both face-to-face and online students may feel distracted or disengaged when teachers divide their attention between groups (Dixon & Syred, 2022). Fig. 1 below shows the challenges hindering student-to-teacher interactions in hybrid classrooms (Fig. 1). This could affect students' engagement and their learning outcomes, including satisfaction and academic performance.

Student-to-student interaction

It was reported that interaction among onsite students is good since they see each other. By the same token, interaction among online students is satisfactory because they are on the same platform. Students can easily form two groups: one is online, and the other is face-to-face. Students are familiar with each other within their own group but not

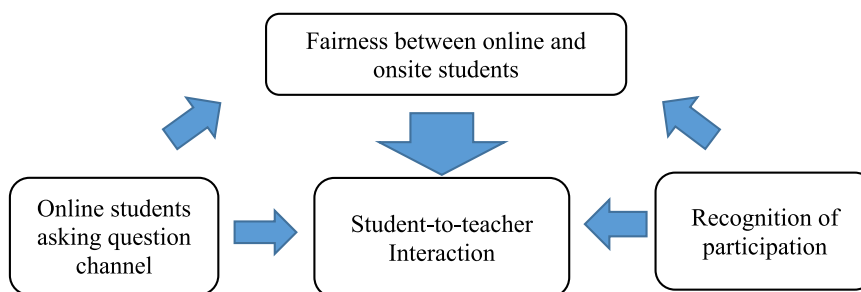


Fig. 1. Challenges hindering student-to-teacher interactions in hybrid classrooms.

across the group. This confirms the findings of previous literature (Stewart et al., 2011). Not all classrooms have another spare microphone or even a ceiling microphone for student use; sometimes, onsite students' questions cannot be listened to clearly by online students. As a result, online students would probably feel they are a bit isolated and lose motivation to learn in the later part of the course. Fig. 2 below shows challenges hindering student-to-student interaction in hybrid classrooms (Fig. 2). This could affect students' engagement and satisfaction.

Reasons students choosing online or face-to-face mode

Students choose online because they are shy. It would be more comfortable to attend the class remotely. Second, students have their peers online as well. Third, they can have part-time jobs easily. Finally, students might live far away. It would be more time efficient if they only had a single one-hour class in the whole day.

Students chose face-to-face mode because their home environment might be too noisy for them to have an online class. Second, students can ask teachers questions easily. Third, they know more classmates in a face-to-face setting.

Effectiveness of hybrid learning

Undoubtedly, hybrid learning provides flexibility for students to attend classes anywhere in the world. Students might take internships in some other countries. Visiting teachers or guests can join the class easily and widen the horizons of students. Our results reinforce the previous findings (Raes et al., 2020; Detyna et al., 2023). However, there are some challenges to the effectiveness of this setting. Teachers would be very busy taking care of what happens in the chatroom and in the classroom. It would be good to have a teaching assistant to take care of the chatroom and sometimes even raise questions on behalf of online students.

Conclusion

Starting from the Social Presence and Teaching Presence of the

Community of Inquiry, a new typology of person-to-person interaction in a hybrid learning environment was then proposed. There are two types of teacher-student interactions: teacher-face-to-face students and teacher-online students. There are three types of student-student interactions: face-to-face student-face-to-face student, online student-online student, and face-to-face-online student. The source of challenges in the hybrid learning environment came from the two themes: proximity and location. It would be regarded as a location advantage of interaction.

We contribute to the literature on how to conduct hybrid teaching with great efficiency. Three distinct themes were generated: proximity, location, and flexibility. The themes of proximity and location contribute to the challenges. Challenges to student-to-teacher interactions include (1) a single teacher cannot easily accommodate students' needs in online and face-to-face modes at the same time; (2) recognition of all the students' participation is difficult. Challenges to student-to-student interactions include (1) difficulty communicating between online and onsite students, (2) some face-to-face students come to the class late, and online students are usually on time. The challenges identified are not limited to the Chinese context. The communication and collaboration challenges are indeed inherent to the hybrid teaching mode (Gudoniene et al., 2025).

Solutions to student-to-student interactions are (1) designated teamwork among face-to-face students and online students and (2) learning from peers. Firstly, online collaborative work platforms can be used to facilitate interactions and discussion among students while regular check-ins and monitoring are necessary. Examples such as Trello, Padlet, Google Docs, and Notion. These external platforms can solve the interaction challenges of primarily using chatrooms among online users. Both groups of students can freely discuss online and collaborate on a specific task being assigned. Secondly, the fishbowl discussion approach can be adapted to facilitate discussion between online and onsite students. When one group discusses a topic, the other group has to provide comments and suggestions and then switch roles. Peer feedback and reflection activities can also be added to enhance the interaction and discussion atmosphere in hybrid classrooms. Thirdly, students can be invited to be teaching assistants to facilitate class activities and discussion. This approach not only improves the teaching

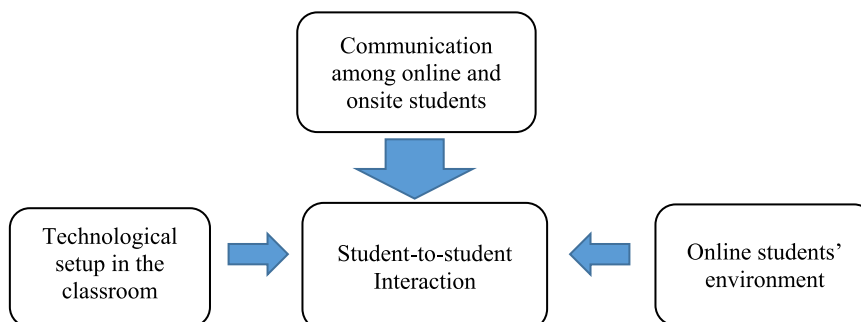


Fig. 2. Challenges hindering student-to-student Interactions in hybrid classrooms.

flow but also students' communication skills. Other than the above solutions at the operational level, institutions also take a critical role in facilitating hybrid teaching. Institutions should provide facilities and technologies to support the delivery of hybrid teaching. High-quality audio and visual technologies such as ceiling microphones, dual displays, and wide-angle and auto-tracking cameras can be installed in classrooms. Portable devices and tablets should also be provided to students and teachers to support their hybrid learning and teaching. WIFI networks should also be stable and accessible by all possible means. Moreover, collaborative software can be explored and subscribed to enhance student interaction. Besides the hardware and software infrastructure, institutions should provide technical assistance, teacher training, and student orientation and training regarding hybrid teaching and learning tools. Metaverse, virtual reality, and augmented reality can also be explored to create immersive learning experiences to engage both online and onsite students.

This study further explains the challenges and interactions in hybrid classrooms, addressing the inherent complexity of hybrid teaching. A new typology of interactions is introduced in hybrid teaching and learning, providing a structured framework to analyze interaction challenges. The results also provide insights into the pedagogy setting for facilitating interaction dynamics in class. Future research can explore the differences of these challenges in different contexts, such as regional, institutional, and disciplinary. More research can investigate the pedagogy policies, training frameworks, and class activities based on the interaction challenges in hybrid classrooms.

CRedit authorship contribution statement

Tai-ming Wut: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Helen Shun-mun Wong:** Resources. **Carmen Ka-man Sum:** Writing – review & editing.

Declaration of competing interest

The authors have no relevant financial or non-financial interest to disclose.

Declarations

Informed consent to participate in the study has been obtained from all the participants. All the participants and authors are consent for publication.

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