BRIDGING THE STUDENTS' AND INSTRUCTOR'S EXPERIENCES: EXPLORING INSTRUCTIONAL POTENTIAL OF VIDEOCONFERENCE IN MULTI-CAMPUS UNIVERSITIES

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ABSTRACT
Videoconferencing was often used to distribute live or pre-recorded lectures to students at remote sites. This paper reports a recent study of videoconferencing as a form of technology-enabled learning and teaching in higher education. Videoconferencing was integrated in a blended synchronous approach to teaching remote and face-to-face students in a multi-campus Chinese university. The study focused on first-year engineering students' learning and instructor's teaching experiences, reflecting the instructional potential of videoconferencing. A qualitative approach to examining these experiences was adopted. The findings inform: (1) the instructional potential of videoconference on transforming instructional performance in a blended synchronous virtual environment; and (2) the learning experiences were characterized in a synchronous perceptual differences between the face-to-face and online modalities. The implications of the findings to utlilise the videoconferencing potential in the context of multi-campus university learning and teaching are also discussed.

INTRODUCTION

Videoconference is often used as a tool for multi-campus teaching. The primary objective has been to diminish remote students' isolation and remove geographical distance with greater attention to tool utilisation and economies of scale than to pedagogical development for enrichment of the educational experience (Andrews and Klease 1998; Freeman 1998; Jacobs and Rodgers 1997; Pearson and Jesshope 1998). However, this application was primarily to distribute live or pre-recorded lectures to students at remote sites rather than enrichment of the educational experience.

With the advance of information and communication technology (ICT), blended synchronous learning and teaching (Hastie, Hung, Chen & Kinshuk, 2010) visually and verbally mediated by videoconferencing, is widely promoted in changing higher education landscape. This blended approach was to connect students at multi learning sites different from those blending the technology for subject learning in classroom (e.g., Kirkgöz, 2011). How to connect enrolled students at different remote sites with those in university main campuses for enhancement of educational experiences seems no longer a challenge. It is highly possible to enhance instruction, student communication and learning (Szeto, 2011; Woo, et al., 2008) in multi-campus universities. Various blended synchronous videoconferencing approaches to connecting remote groups of students with those in main campus emerge, forming larger communities of inquiry. In this respect, videoconferencing seems to be used for enriching university learning and teaching (Szeto, in press, 2014; Ebden 2010; Hammond 2009). In fact, its instructional potential in practice is yet to be fully explored (Lawson, Comber, Cage and Cullum-Hanshaw, 2010).

This paper aims to report a study exploring a videoconferencing approach to multi-campus teaching and learning that differs from the previous studies mentioned. Instead of transmitting traditional live or pre-recorded lectures, the study focuses on exploring instructional potential of videoconferencing in a blended synchronous teaching approach to learning engineering drawing for the students located at different sites. There were two research questions to be addressed:

(1) What is the instructional potential of videoconferencing in the blended synchronous learning in a multi-campus Chinese university context?
(2) How can the potential characterize the online/face-to-face students' learning and instructors' teaching in the blended synchronous virtual environment?

TEACHING REMOTE AND FACE-TO-FACE STUDENTS IN HIGHER EDUCATION

Remote and face-to-face students are taught separately and are selfdom engaged in learning synchronously in universities. After reviewing the literature on using videoconferencing in schools, Lawson et al. (2010, p.307) concluded that:

> The utilization of videoconferencing by schools is at a very early stage and yet, the recognition of its potential for educational interaction between remote participants in well established. With the advance of videoconferencing technology, new modes of learning and teaching are developed not only to bridge the two for learning but also build larger learning communities.

According to the review, videoconferencing has been implemented slightly better in universities than in schools. In Whipp and Lorentz's (2009) study, they reported that videoconference was used as a communication tool for exploration of help giving in online teaching and learning. Although Li, Moorman and Dyjur (2010) integrated videoconference in their e-mentoring system to support inquiry-based learning, they seemed to focus on limited features of videoconference as a tool. However, Knipe and Lee's (2002) findings indicated that learning via videoconferencing is not the same as in traditional classrooms due to inappropriate instructional planning. However, different university teachers accounted for various teaching and learning effects.

In contrast, Stephenson, Brown, and Griffin (2008) concluded that although a preference for classroom teaching was evidenced, the participants in their study appreciated the electronic delivery of lecturing via different conferencing devices. Smyth (2005) conceptualised videoconference in instructional planning. She proposed a framework for pedagogic decision making for the integration of videoconferencing media in the curriculum for constructivist-oriented teaching. She further suggested a rubric of engaging students in various types of interaction with sound instructional decisions utilises the full advantages of videoconferencing. Thus, videoconference can be utilised as a tool and also an instructional element to enable instructional planning.

The above review has revealed that instructional potential of videoconferencing is yet to be finalized. The recent development of ICT evidences that videoconference can offer new affordances for learning and teaching on the Internet. Its capability can enhance a sense of simultaneity for remote learners as if learning were taking place in a 'close to face-to-face' virtual environment (Smyth, 2011). By comparing four types of synchronous computer-mediated communication in language teaching, videoconferencing could create 'a sense of natural communication' in collaboratively negotiating meanings in language learning for individual students or remote learning groups (Yamada, 2009). However, its sense of simultaneity for the learners as if learning were taking place in a 'close to face-to-face' virtual environment (Smyth 2011) was pending further exploration. The primary concerns are the instructional potential of videoconferencing and the educational experience derived from the instructional use of videoconferencing.

In summary, instructional potential of videoconferencing needs further exploration in learning and teaching practices. This paper set out to address the two research questions: What potential emerged in the blended synchronous learning and how the potential was characterized in the virtual environment? Thus, a study was initiated to explore the potential of videoconferencing in the blended synchronous approach to teaching two groups of remote and face-to-face engineering students in a multi-campus Chinese university. To explore the potential, this study adopted Garrison, Anderson and Archer's (2000) Community of Inquiry (CoI) as a theoretical lens through which the students as well as of an instructor's experiences were examined.

THE COI FRAMEWORK

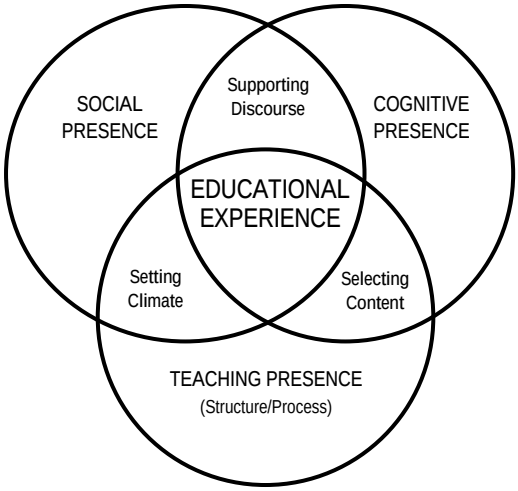

Figure 1: The Community of Inquiry framework.
Source: Garrison *et al.*, (2000) Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2*(2-3)*, p.87-105.

The CoI framework was conceptualized in a range of studies from asynchronous text-based computer-mediated communication (CMC) to synchronous computer conferencing (Rourke, Anderson & Garrison, 1999). The centre of the framework, lying at the intersection of the teaching, social and cognitive presences, is a quality educational experience. This is seeking attainment of educational experiences via deeper levels of meaningful learning in relation to constructivist-oriented instruction (Akyol, Arbaugh, Cleveland-Innes, Garrison, Ice & Richardson, 2009; Akyol & Garrison, 2011). It is posited that teaching, social and cognitive presences are the three important conceptual elements in a community of inquiry, representing three dimensions of characterizing the educational experience. Focusing on the experiences in a community of inquiry, the framework has been widely adopted in various studies of online learning. Figure 1 shows the CoI framework and its three presences. Figure 1 shows the CoI framework.

Teaching presence is interpreted as the instructional design that facilitates education experiences in relation to the other two presences - social presence, that is "the ability of participants in a community of inquiry to project themselves socially and emotionally, as 'real' people through the medium of communication being used" (Garrison et al., 2000, p. 94); and cognitive presence, that is 'participants in any particular configuration of a community of inquiry [being] able to construct meaning through sustained communication' (Garrison et al., 2000, p. 89). Thus, an appropriate blend of teaching, social and cognitive presences in online teaching and learning plays a key role in articulating meaningful educational experience that can contribute to deeper levels of learning (Ke, 2010). Thus, the CoI framework is timely as the theoretical lens adopted in this study.

Indeed, the three presences characterised the blended synchronous learning and teaching experiences. To explore the experiences, the CoI coding template (Garrison, et al., 2000) of the three presences was used as a coding structure for data collection and analysis (See Table 1).

RESEARCH DESIGN

This paper draws from a larger study aiming to investigate synchronous online teaching and learning involving 150 undergraduate students over a 2-year period (Szeto, 2013). This paper reports the first phase of the cross-institutional project in which 28 students participated. A grounded theory approach (Strass & Corbin, 1990) was adopted to explore instructional potential of videoconferencing as the educational experience reflected. By implementing the approach, an instructor synchronously taught a group of face-to-face students on a university campus and a group of online students located at a remote learning site. Due to limited resources, only one remote learning group was set up instead of multiple groups.

A project team was formed with two faculty members from an engineering department (the department) of the multi-campus university and the author from another educational institution in Hong Kong. This team was an interdisciplinary cooperation (Karal, 2010) for the advancement of ICT integration in multi-campus teaching and learning. As a pedagogic synergy in higher education, the team members started the study with a computer-aided engineering drawing course. One of the two faculty members (the instructor) was responsible for the synchronous teaching. To obtain informant consensus, the project team explained to the students the aims, research design and processes of the study. All students (N = 28) accepted to participate in the study. Half of the students were randomly assigned to the online group and the other half were in the face-to-face group.

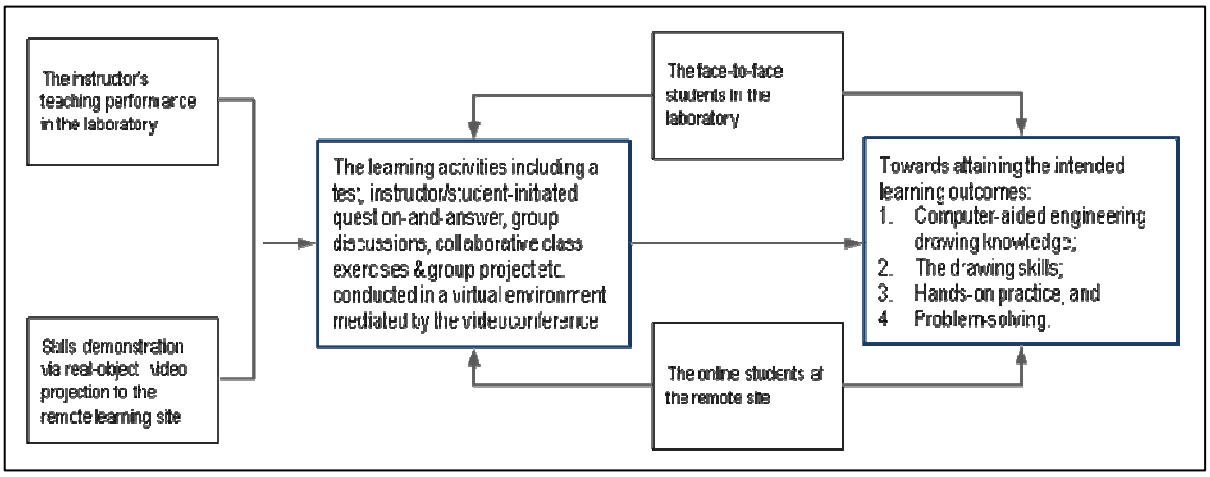

Figure 2: The blended synchronous learning and teaching process.

Twenty-eight first-year engineering students participated in the first phase of a five-phase study. They were divided into two groups, each comprising 14 students. GP1 (n = 14) was taught face-to-face in an engineering laboratory while GP2 (n = 14) synchronously attended the same sessions mediated by the devices at a remote site (a different campus site of the university). The students were required to attend 6 hours per day for 9 days/sessions with a total of 54 hours in an intensive summer engineering drawing course. They also submitted 7 engineering drawings and 1 group project and took a quiz in the fifth session for formative assessment.

Internet-based, multi-point videoconferencing, real-object projection and real-time communication synchronously accessible to the GP2 students were integrated in the campus networked learning environment. Figure 2 shows the blended synchronous instruction mediated by videoconference.

The instructor synchronously taught the two groups and facilitated the blended learning activities in the Internet-based videoconference learning environment where the two groups of students could see and talk to each other as if in a virtual "face-to-face" environment.

DATA COLLECTION AND ANALYSIS

This study collected and analysed data in the notions of grounded theory (Strass & Corbin, 1990). By implementing this approach, the aim was "to gain deeper understandings of the lived experience of learners [and instructors]" (Bianco & Carr-Chellman, 2007, p.303). It was appropriate to capture the data as it emerged during the blended synchronous learning. Data were collected over the entire course including class observation, video recording, teaching reflection, semi-structured interviews and an end-of-course group sharing.

The blended synchronous processes were captured on video tapes in a 4-in-1 recording format, while two researchers observed the sessions, one in the laboratory and one at the remote site, respectively (Szeto, 2013). Figure 3 shows a snapshot of the adapted blended synchronous learning and teaching:

Figure 3: A snapshot of the blended synchronous learning and teaching.

Two to three students were randomly invited from the two groups for a semi-structured interview about their experiences immediately after each session. The instructor also wrote reflective journals on his teaching. At the end of the last session, 5 online and 4 face-to-face students and the instructor accepted the invitation to take part in a focus group sharing of their experiences. The interviews and sharing were recorded in a digital audio device for verbatim transcription.

To conform with Strauss and Corbin's (1990) notions of grounded theory, a coding template was recommended. This study adapted the CoI coding template (Garrison, et al., 2000) as a preconceived coding structure for data analysis. All coded data were compared for emergent meanings of the students and instructor's experiences. This analysis was completed with the use of a computer-aided qualitative data analysis software package, NVivo. Table 1 shows the coding structure with sample quotes.

Table 1: The coding structure with sample quotes in a hierarchy.

Codes	Categories	Sample quotes
Teaching presence	■ Instructional management ■ Building understanding ■ Direct instruction	I found the demonstration was enjoyable (The instructor). I explained the topic exceptionally clearly to the students (GP1).
Social presence	■ Emotional expression ■ Open communication ■ Group cohesion	The instructor spent longer facilitating us in the question and answer session than the other group (GP2). The students required additional stimulation of group communication (The instructor).
Cognitive presence	■ Triggering events ■ Exploration ■ Integration ■ Resolution	We experienced short transactional interactions with GP1 for the in-class activities (GP2).

Adapted from Garrison *et al.*, (2000) Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2*(2-3)*, p.87-105.

Then, the reliability of the analysis was enhanced through a cross-checking, comparing and auditing process by another qualitative researcher in the study. This cross-checking process established the internal validity of the data analysis (Bush, 2002).

FINDINGS

The findings of qualitative data analysis revealed the videoconferencing potential through the GP1 and GP2 students' learning and the instructor's teaching experiences. Tables 2 to 4 compare the students and instructor's experiences by the individual CoI presence attributes.

Table 2 shows a quick comparison of the experiences by the teaching presences with the bold text as key themes emerged in the data.

Table 2: Comparison of the student and instructor's experiences in the teaching presence

GP1's learning experience	GP2's learning experience	The instructor's teaching experience
- The presentation was very **detailed** and at a **steady pace**. - Deliberately **slowed down** teaching pace. - This was **extraordinary** compared with what they had experienced in normal class teaching. - The topic was **exceptionally clear.** - **Overdone repetition** might make the teaching a bit unnatural.	- A **positive perception** of the blended synchronous teaching. - Teaching was very **comprehensive**. - Demonstration was **really good** because the **skill processes** were **enlarged** on a big screen. - Deliberately-repeated steps for skills demonstration **enhanced clarity.** - The synchronous teaching approach seemed **better than face-to-face.**	- **Different attention** was paid to the GP2 students - GP1 seemed to be a **'control group'** in an experiment. - **Encouraged** questions and **detected** the **students' understandings** of the content. - GP2 could fully grasp the content while GP1 did **not** feel **bored**. - Teaching **pace** was adjusted for **clarity**. - **Repetition** was more important to GP2. - Experienced the **pedagogical difference and challenges.** - Teaching was **enjoyable** in this mode.

GP1: The face-to-face group; GP2: The online group

The table reflected the instructor's teaching performance in this study. His strategy was in a mix of teacher-facilitated individual learning in the beginning that was gradually transformed into collaborative constructive learning at the end. With the lecturing, demonstration and group activity methods, clarity of conveying the content to the students in terms of "detailed", "steady/slow teaching pace" and "extraordinary" was enhanced. Although the different amount of attention given to GP1 and GP2 was noticeable, the two groups of students complimented the teaching as being 'comprehensive'. The instructor synchronously experienced both pedagogic challenges and enjoyment in the process. Table 3 shows the comparison in the social presence

attributes.

Table 3: Comparison of the student and instructor's experiences in the social presence

GP1's learning experience	GP2's learning experience	The instructor's teaching experience
- The instructor spent **longer** facilitating GP2 in the Q & A sessions. - Seemed to be **neglected** by the instructor. - **Interested** in **meeting** other students located at the remote site - Interaction with GP2 **was difficult** because the students were not **physically present**. - **Screen projection** of GP2 students enhanced a sense of **connected learning communities** at large. - Audio transmission was rough and unstable.	- Received too much attention as if they were under **the spotlight**. - **Multi-screen projections** of the instructor's teaching and Gp1 students created **a "real" sense** of attending **'face-to-face'** teaching. - Experienced **short transactional interactions** with GP1 for cross-group activities. - **Cooperative tasks** with GP1 were **indirect** in the environment. - Transmission was occasionally interrupted and the system was restarted.	- Ensured that his '**teaching performance**' were as **real** as possible on the screen. - Pushed **so hard** to facilitate **inter-group communication** - Adjusted his **language use**. - Facial expressions and other **social cues** were used **directly** and **explicitly**. - Used **hand gestures** for the GP2 students to facilitate their responses.

GP1 = The face-to-face group; GP2 = The online group

The comparison shows that the instructor's teaching performance via videoconferencing characterised social presence as 'real' and 'face-to-face' with direct and explicit language used in the facilitation of inter-group activities. Hand gestures and social cues also enhanced student communication. Although GP1 found it interesting to virtually meet the GP2 students, they felt neglected because the instructor spent too long with GP2 in some question-and-answer sessions. On the contrary, the GP2 students felt that they were placed under a spotlight in the social presence. The two groups of students appreciated the multi-screen projection of the instructor and themselves that enhanced a 'real' sense of 'face-to-face' communication. Paradoxically, they realised that interacting with the other students was indirect and found it difficult to do cooperative tasks in the virtual environment although it seemed 'real'. GP1 also agreed with GP2 that a sense of being connected with other learning communities synchronously enriched their experience during the face-to-face learning. It is likely that the participants performing as 'real' as possible in the environment can enhance social presence. Table 4 shows the comparison in the cognitive presence attributes.

Table 4: Comparison of the student and instructor's experiences in the cognitive presence

GP1's learning experience	GP2's learning experience	The instructor's teaching experience
- Engineering **knowledge** and computer-aided drawing **skills** were **gained** in these activities. - The technology should be **reliable** and there should be **zero** technical **problems to achieve the** expected learning **outcomes**. - **Responses** to the instructor's or GP2 students' **questions** could encourage **knowledge sharing.**	- **Satisfactory learning** together with GP1 in **groups** was facilitated in a **virtual 'face-to-face' learning environment**. - Engineering **knowledge** and drawing **skills** were familiarized more **quickly.** - Assignments could be completed more **easily**. - Lacked **live practice** of the knowledge learned **together** with the instructor.	- The students were **spontaneous** when engaging in **group learning activities**. - They might be **disengaged** sometimes. - The assignment and quiz results did **not** show **remarkable difference** between the GP2 and GP1 students. - Additional **stimulation** of **group communicative interactions** was required.

GP1 = The face-to-face group; GP2 = The online group

The comparison shows that the GP1 and GP2 students could gain the engineering knowledge and skills quickly and achieve similar results for the group assignments. GP1 agreed that discussing with the instructor and the GP2 students could encourage knowledge sharing, provided that there were no technical problems. The instructor observed that the two groups of students spontaneously participated in group learning activities although some seemed to be disengaged. Additional efforts, however, were required to foster group communicative interactions in the instructional process.

DISCUSSION

In the context of multi-campus universities, transmission of traditional or pre-recorded lectures in synchronous/asynchronous modes (Andrews and Klease 1998; Freeman 1998; Woo et al. 2008) has been taken for granted as the main videoconferencing feature. However, the findings reported in this paper have evidenced the instructional potential of videoconferencing which is different from direct transmission of recorded lectures. Synchronously connecting face-to-face on-campus students with remote students in different campuses enriches the overall learning experience. Learning seems to be much richer than in either face-to-face teaching or the online learning mode (see Tables 2 to 4), when educational experience is the centre of the instructional process (see Figures 1). The implication is that synchronously and visually/verbally connecting students located at different campuses can possibly build a scalable and flexible virtual 'face-to-face' learning community of inquiry mediated by videoconference. The instructional potential of videoconference is reflected in the learning and teaching experiences captured in the blended synchronous virtual community of inquiry.

TRANSFORMATION OF TEACHING PERFORMANCE IN THE BLENDED SYNCHRONOUS LEARNING

The instructor's teaching performance has reinforced teaching presence in the blended synchronous instructional process. He reflected a fruitful synchronous teaching journey because his pedagogy was transformed. 'I taught in a traditional face-to-face classroom before. It was about passing information to the students with different teaching aids. Now, the teaching format has changed, and so has my strategy' (extract from the instructor's reflection). This transformation possibly occurred in the shift from teacher-centred to student-centred teaching through sound instructional planning (e.g. Smyth 2005). By synchronously blending face-to-face and remote scenarios, the instructor was situated in a better position instead of a challenging situation to transform towards sensible performance in the CoI framework. In fact, multiple roles of teaching, facilitating, moderating and supporting in between face-to-face and visually/verbally connected virtual situations mediated by videoconferencing are required.

BLENDED SYNCHRONOUS EXPERIENCES IN THE PERCEPTUAL DIFFERENCE BETWEEN FACE-TO-FACE AND ONLINE SITUATIONS

Due to the synchronous approach, online learning tasks such as discussions and collaborative projects between the face-to-face and remote students occurred in a visually/verbally connected virtual learning community, while face-to-face communication could synchronously take place within each group at different campuses. Consequently, the students were unintentionally situated in a synchronous dual communicative situation (i.e. communication synchronously takes place in face-to-face & online situations) and their performance in the tasks was possibly differently affected. The two groups of students rated their experience below the mid-point of the Likert scale. In contrast, Li, Moorman and Dyjur (2010) concluded that their e-mentoring model via videoconference could engage students in guided inquiry with carful system design.

The scholars' studies were different from the students and instructor of this study who were engaged in the synchronous communicative situation. The learning experiences were diverse. One student commented that 'We were not used to discussing with others through a screen and a microphone with a voice level louder than normal talking' (group sharing extract/GP2/S3). They experienced a sense of indirectness in working on the tasks in the situations. In fact, the cross-group interactions between GP1 and GP2 for cooperative activities were transactional and short. The students could not get away from a perceptual preference for a face-to-face situation although they had already adapted to the virtual learning in the engineering drawing course.

IMPLICATIONS OF BLENDED SYNCHRONOUS VIDEOCONFERENCE-BASED LEARNING FOR MULTI-CAMPUS UNIVERSITIES

The interdisciplinary cooperation between the engineering and education experts (e.g., Karal, 2010) has created a solid pedagogic synergy for the advancement of using videoconferencing for blended synchronous learning on the Internet. The videoconferencing potential was exploited in the study. As Smyth (2005) suggested, videoconference is important to instructors because it could be an instructional planning tool. By examining the students' learning and instructor's teaching experience, videoconference is an instructional tool for both students and instructors by enhancing the teaching, social and cognitive presences. The learning and teaching experiences of this study characterise the instructional potential of videoconference multi-campus universities can take into consideration in developing new instructional approaches:

(1) Instructors need time for adaptation to the instructional transformation;
(2) The synchronous perceptual difference between online and face-to-face situations may hinder students' participation in the virtual environment;
(3) The synchronous difference may affect students' cross-group communication;

(4) Training requires for both students and instructors; and
(5) Connection of online/face-to-face students and instructor in a blended synchronous community of inquiry is feasible, if universities provide extra support in terms of the three CoI presences.

CONCLUSIONS

This paper is valuable in that it explores the instructional potential of videoconference through the students' learning and instructor's teaching experiences in blended synchronous learning. It is admitted that the technical barriers, pedagogical constraints and ICT competencies at the time the previous studies were conducted were much different from what is now available.

One GP1 student highlighted that 'This [teaching] is extraordinary [compared with] what we have experienced in normal classroom teaching' while the GP2 students complimented the teaching with the comment that 'This blended synchronous videoconferencing approach to learning and teaching seemed better than the face-to-face teaching in the classroom'. These compliments are different from the finding of Knipe and Lee's (2002) study that the local students obtained more review, information and explanation from the lectures and skill practices than the external students.

The instructional potential of videoconferencing has evidenced in enriched and extended learning and teaching experiences, whereby not only face-to-face and online students but also the instructor are transformed. This paper only reflects the findings of the potential derived from the study in a multi-campus Chinese university. There is no intention to generalize the results due to institutional differences in learning and teaching.

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