AJET | ASCILITE

Examining the utility and usability of mobile instant messaging in a graduate-level course: A usefulness theoretical perspective

Ying Tang and Khe Foon Hew
The University of Hong Kong, Hong Kong

This study examined the usefulness of a mobile instant messaging (MIM) tool to support teaching and learning. Taking a usefulness theoretical perspective, we examined in detail the utility and usability of using WeChat in a postgraduate-level course. Multiple types of data were collected and analysed, including MIM interaction records, questionnaire surveys and semi-structured interviews. The results show that, overall, MIM can be utilised in a variety of ways to support teaching and learning. These include promoting transmissive, demonstrative, dialogic, journaling, helpline and notebook activities. We also found MIM to be particularly suitable for promoting affective social presence (expression of emotions, self-disclosure) and cohesive social presence (phatics, vocative). Four specific technological attributes of MIM that facilitated information sharing among students were reported. Implications for practice and research, including challenges and possible solutions, are proposed, followed by a discussion of the study's limitations and suggestions for future research.

Introduction

Mobile instant messaging (MIM), developed in tandem with the growing ubiquity of the Internet and smartphones, has become a cornerstone of daily communication. Duggan (2013) reported that sending and receiving messages constituted 81% of all activities mobile phones could be used for. Among smartphone owners aged 18 to 29, 49% use messaging apps (Duggan, 2015). A 2017 survey found that WhatsApp and WeChat, two of the most popular MIM applications globally, had more than 1.5 billion and 980 million active users, respectively (Statista, 2018).

Popular MIM applications such as WhatsApp and WeChat are compatible with major smartphone operating systems, such as iOS, Android and Windows. There are also desktop versions of these applications enabling users to access messaging from computers. MIM is typically free and includes several easy-to-use features, such as mobile accessibility, multiple modality (e.g., text, emoticons, pictures), group formation and communication, conversational interactions, sharing capabilities and high levels of privacy and personalisation (Rambe & Bere, 2013). Garcia and Jacobs (1999) defined MIM communication as quasi-synchronous, as users can be instantly engaged in the information exchange or respond to an inquiry with a time lag when not immediately available. This quasi-synchronicity is realised through the push notification, a notification window that pops up on the smartphone screen when a new message arrives and then remains visible until the message is read, replied to or deleted. This function empowers users, first, with the capability to stay connected all the time, and second, with the flexibility to manage their communication either synchronously or asynchronously.

Intrigued by the unprecedented level of MIM communication and spurred by the increasing affordability and capabilities of mobile devices, researchers and practitioners are now delving into its educational and pedagogical potential. Empirical studies have shown that MIM facilitates flexible out-of-class interactions (Hazaea & Alzubi, 2016), student reflection on learning (Alsaleem, 2013), peer discussion and collaboration (Barhoumi, 2015). However, relative to other social technologies, MIM is still the least explored communication mode in education research (Rambe & Bere, 2013).

Given this gap in the literature, the present study aimed to investigate MIM's usefulness as an educational tool and how its addition in and out of the classroom impacts students' behaviours and perceptions. Guided by the usefulness theory perspective by Kirschner, Strijbos, Kreijns, and Beers (2004), the central research question is: what is the usefulness of employing MIM in educational activities? Specifically, we examined

the usability and utility of the educational use of MIM, which were operationalised with the following sub-questions respectively:

(1) What is the usability of using MIM in educational activities?
    (a) What are the educational affordances of using MIM in educational activities?
    (b) What are the social affordances of using MIM in educational activities?
(2) What is the utility of using MIM in educational activities?
    (a) What are the technological affordances of using MIM in educational activities?

Literature review

Using MIM for education: previous research

Researchers have been exploring the educational use of MIM in various education contexts. Butgereit (2007) studied high school students using Mxit, a proprietary MIM software developed in South Africa, in an after-school tutor program. Mxit helped students get help with their mathematics homework from volunteer tutors and was found to be beneficial as an addition to in-school instructions. Andujar (2016) examined the writing development of Spanish learners of English as a Second Language by using WhatsApp in a quasi-experimental study. Each student in the treatment group formulated a question each day on any topic they liked; each student had to provide at least one answer per question. Students in the control group received no such intervention. Results suggested a positive significant effect in favour of MIM use in enhancing students' grammatical, lexical and mechanical accuracy. Ng, Luk, and Lam (2016) reported an accounting class in Hong Kong where the lecturer posted several content-related topics for students to discuss on WeChat after class. A sample topic was: "We have learnt the topic of 'Depreciation'. Among the 3 methods of calculation please explain how a company choose a suitable method." (p. 21) Students posted their opinions in the WeChat group, followed by comments from the lecturer. Farmer, Liu, and Dotson (2016) described using WhatsApp to discuss sexual and reproductive health issues facilitated by trained health program leaders. Students in Kenya shared personal insights about the topics and provided feedback to each other on ways to promote sexual health for university students (Farmer et al., 2016). Elsewhere, Wang, Fang, Han, and Chen (2016) examined students' teaching, cognitive and social presence in a WeChat-supported Chinese language learning class.

In a recent study, Gasaymeh (2017) investigated 152 first-year university students about their perceptions of introducing WhatsApp into the formal learning context. Students welcomed the practice and perceived the educational integration of WhatsApp to be easy, fun and useful (Gasaymeh, 2017). Almekhalafy and Alzubi (2016) used WhatsApp to help students learn English and found students welcomed this addition with the reduced anxiety and increased confidence to communicate in the foreign language. Previous studies also investigated teachers' perceptions of MIM as an avenue for professional development. For example, Carpenter and Green (2017) surveyed 240 educators about using Voxer for professional development communication and resource sharing. The results indicated 96% of the participants appreciated the expanded professional networks, and 86% rated the Voxer-facilitated content as high quality (Carpenter & Green, 2017). However, some studies identified several negative student perceptions of using MIM for education. Kim, Lee, and Kim (2014), for example, reported students feeling unhappy about having to search for resources on cell phones or type a lengthy opinion due to the small keyboard and screen size. Some students also thought that using MIM was time-consuming (Hazaea & Alzubi, 2016), while others disliked getting class-related messages outside school hours because this interfered with their private lives (So, 2016).

Previous findings have undoubtedly given us insights about the practices and perceptions of MIM use in education. However, a substantial body of research has tended to examine only one or two aspects of MIM use such as student or teacher attitude towards MIM or how MIM was used to support learning. Very few studies have provided a theoretical perspective to analyse the findings. The present study aims to redress these limitations and offer a fresh contribution by taking a usefulness theoretical perspective to examine in detail the utility and usability of MIM for teaching and learning purposes.

Usefulness theoretical perspective

To explain the usefulness theoretical perspective, we start by providing the definitions and relationship of the three key terms related to this theory: usefulness, utility and usability. Kirschner et al. (2004) suggested evaluating the usefulness of an educational system according to two criteria: utility and usability. Specifically, an educational system is considered useful if it provides users with the functionalities needed to perform a learning task (utility) and enables users to understand and operate the tool easily (usability).

The concepts of utility and usability are based the notion of "affordance" drawn from ecological psychology, which suggests that the key to evaluating a learning environment is understanding what activities can be enabled, as "specific types of learning need to be afforded in different ways" (Kirschner et al., 2004, p. 49). For instance, teachers choose a specific tool with the belief that it is likely to afford certain types of learning; in turn, understanding affordances can help teachers to make more informed decisions when designing instructional activities. Kirschner et al. (2004) argued that "education is always a unique combination of technological, social, and educational contexts and affordance" (p. 50).

The term *affordance* was first proposed by Gibson (1979) to indicate the functional properties of an object, and then defined by Norman (1988) as the "perceived and actual fundamental properties of a thing, primarily those fundamental properties that determine just how the thing could possibly be used" (p. 9). For example, the shape of some door handles leads users to believe that they should be pulled instead of pushed (Kirschner et al., 2004). Affordance theory has been influential in many fields, such as industrial design, human-computer interaction, and educational practices. Conole and Dyke (2004) provided a taxonomy for understanding the affordances of information and communication technologies, including accessibility, speed of change, diversity, communication, collaboration and reflection, to name a few. In another example, Bower (2008) offered a list of affordances and suggested a match between the learning task requirement and the learning tool affordances. Bower (2008) then proposed a design methodology of five stages: (1) identifying educational goals, (2) postulating suitable tasks, (3) determining the affordance requirements of the task, (4) determining the affordances available and (5) designing the e-learning task, which serves as a guideline of how technology adoption can best meet the requirements of learning tasks.

In the framework proposed by Kirschner (2002), the notion of utility was associated with educational affordances and social affordances and usability was measured by technological affordances. On the operational level, we examined these three affordances (educational, social and technological) with different constructs based on related literature, as shown in Figure 1.
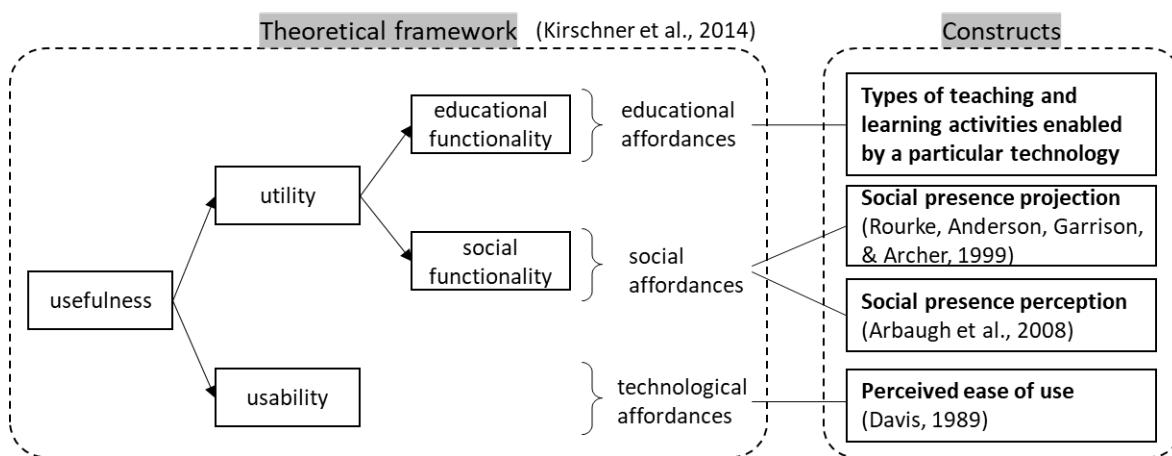

Figure 1. Usefulness theoretical perspective and constructs adopted in this study

Educational affordances describe how instrumental a technology is in deciding whether and how learning might take place (Kirschner, 2002). For example, smartphones with cameras could be used to gather authentic learning materials by capturing real-life artefacts and blogs, with their high level of individuality, openness and connectivity, may be used to facilitate idea sharing. For instructors, it is important to understand the educational affordances of the technology before they can effectively incorporate it into pedagogical practices (Churchill & Churchill, 2008). Following Kirschner et al. (2004), we refer to educational affordances in this study specifically as the teaching and learning activities that MIM enables a user to perform either inside or outside the classroom.

Social affordances refer to a tool's characteristics that enable social interactions among participants, with the goal of improving group cohesion and members' sense of belonging (Kirschner et al., 2004). In this study, we characterise social affordances primarily in terms of their potential to promote social presence (Kreijns & Kirschner, 2001), in both aspects of social presence projection and social presence perception. Social presence is an important mediating variable in promoting student interactions and critical discourse (Garrison, 2011) in virtual environments, where few visual cues are available. Garrison (2011) defined social presence as "the ability of participants to identify with the group or course of study, communicate purposefully in a trusting environment, and develop personal and affective relationships progressively by way of projecting their individual personalities" (p. 23). A recent meta-analysis (Richardson, Maeda, Lv, & Caskurlu, 2017) concluded that social presence can influence student learning in terms of participation and motivation, satisfaction with the course and instructor, course design, intention and retention in online learning, learning outcomes and critical thinking and higher-level learning.

Technological affordances denote a tool's design features that enable users to accomplish certain tasks with ease that satisfies the user (Kirschner et al., 2004). In other words, an educational artefact assumes a role that helps students accomplish what they expect to achieve without technical difficulties. This definition corresponds with Davis's (1989) idea about the ease of use of a system or technology, defined as "the degree to which a person believes that using a particular system would be free of effort" (p. 320). Therefore, we interpret technological affordances of MIM primarily in terms of its ease of use perceived by students in learning activities.

Methodology

To gain an in-depth understanding of MIM's pedagogical potentials, we adopted a mixed-method case study design (Yin, 2008), prioritising qualitative methods because of the exploratory nature of the research questions. The qualitative data included semi-structured interviews and students' online interaction records (the specific content of postings); quantitative data sources included post-class surveys and online interaction records (the frequency or quantity of postings). Data triangulation contributed to a more complete view by seeking convergence and corroboration across the different methods (Yin, 2008). This study has been approved by the university research ethics committee.

Contexts

The case was chosen purposively, as the instructor used a popular MIM tool, WeChat, to support course activities. The course was a disciplinary master's-level course about educational technology, offered in the fall 2017 semester at a large Asian university. Students met three hours per week, for eight sessions in total. The course was conducted in a blended format, wherein students participated in both online discussions and face-to-face class interactions.

WeChat is one of the most popular MIM applications in Asian countries with more than 980 million active users (Statista, 2018). It is a free all-in-one communication application with the following commonly used functions (Tencent, 2018). Figure 2 displays these main functions annotated in the user interface:

(1) Multimedia messages: to send text, image, voice and video messages
(2) Group chat and calls: to send group chats with up to 500 people and video calls up to 9 people
(3) Free voice and video calls
(4) Emojis and stickers: to conveniently express feelings and create one's own sticker sets
(5) Moments: a personal photo stream to share daily updates
(6) Real-time location: to share real-time location on a built-in map

(7) WeChat for Web: to use the application via a Web browser
(8) WeChat for Desktop: to use the application via desktop computer software.

Figure 2. WeChat main functions (adapted from AttractChina, 2014)

Participants

Twenty-five students were enrolled in the class: 23 females and 2 males. Twenty-four students had WeChat already installed and were using it on a daily basis for social interactions. Twenty students were from mainland China, 4 were from Hong Kong, and 1 was from the Philippines who had been working in a local university for more than 3 years. No one encountered difficulties in joining the group or using WeChat. All students agreed to participate in the study.

Procedure

In the first five sessions, the instructor delivered the course content in a flipped format. Before each class, students watched a lecture video and participated in focused discussions; during the class, the instructor facilitated group activities related to key topics; after the class, students were assigned individual reflective tasks to promote further understanding. A sample discussion prompt was, "Name one thing that you feel most connected to in the last class." The pre- and post-class discussions were voluntary and did not count towards final grades. The last three sessions were scheduled for students' group presentations. Students divided themselves into six groups, and each group was to conduct one mini-lesson on a specific teaching strategy, such as self-directed learning and experiential learning. Each presentation lasted for 1 hour, and students had full control over the design and management of the activity.

The instructor established a class WeChat group and posted a QR code on the course page prior to the first session. Scanning the QR code would enrol students in the class WeChat group. The in-class meetings were administered with a hybrid format. At the beginning of each face-to-face session, the instructor would log in to his WeChat account with the WeChat for Web service, which enabled him to display the class WeChat group interface on the projected class screen. The instructor would use the class WeChat group as a platform for focused discussions on specific course topics in the classroom. For example, the instructor posed the question "Who exactly is an adult learner? Does age, education level matter?". Students posted their opinions and responded to their peers on WeChat. The discussions that occurred in the class WeChat group would then be visible to all students as a backchannel, facilitating the comment and feedback during lectures and presentations.

Students were also asked to participate in the pre- and post-class discussions out of classroom in the class WeChat group. No other regulations were prescribed. Students had full control over deciding when and how they would utilise the class WeChat group to assist teaching and learning in this class. For example, students could use it for in-class backchannel discussions when needed, or out-of-class help seeking and information sharing.

Data collection

Data was collected from three major sources: the interaction records in the class WeChat group, an end-of-course survey and student interviews. Figure 3 aligns the theoretical framework, constructs and data sources.
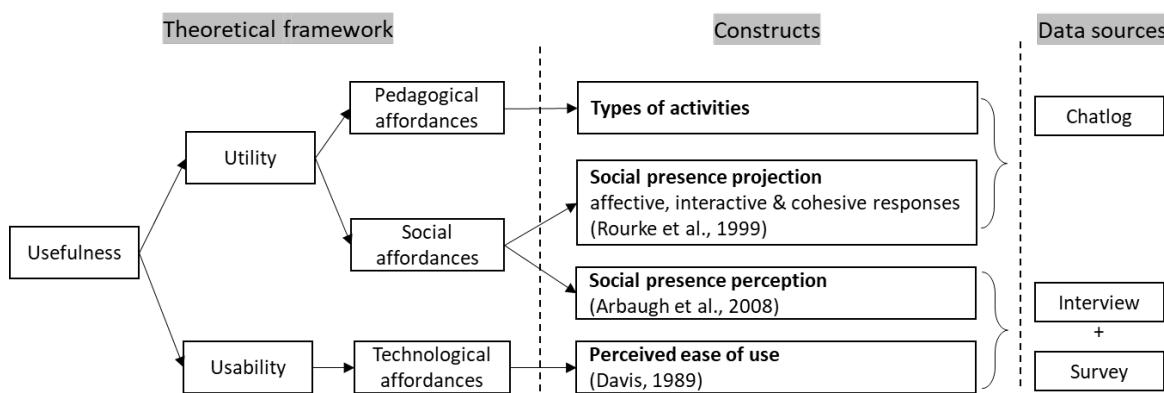

Figure 3. Alignment of theoretical framework, constructs and data sources

Posts to the WeChat group were collected with the consent of all participants. An online survey containing 15 five-point Likert scale questions was sent out to students by the end of the semester. The response rate was 84%. The first nine questions were adapted from a section of the Community of Inquiry questionnaire on social presence (Arbaugh et al., 2008) to understand students' perception of peer interactions in the virtual environment. The other six questions were adapted from Davis' (1989) Perceived Ease of Use scale to examine the perceived difficulty of understanding and operating WeChat.

Semi-structured interviews were conducted with five students who were recruited using a convenience sampling method. The interviews were designed to validate the results of the quantitative survey and to solicit a deeper understanding of students' feelings and ideas. Each interview lasted between 30 minutes and 1 hour. The main foci of the interview questions included students' familiarity or ease with using WeChat, their attitudes towards/evaluation of using WeChat, how they perceived others (instructor and peers) when using WeChat and possible challenges when using WeChat for classroom purposes.

Data analysis

Quantitative data (chat logs and surveys) were analysed with descriptive statistics. Qualitative data (chat logs and interviews) were transcribed verbatim and analysed with content analysis method (Holsti, 1969). Two independent coders analysed the data. The initial agreement of inter-rater reliability reached 90%, and all disagreements were resolved through discussion.

Utility: educational affordances
We refer to educational affordances in this study as the teaching and learning activities that MIM enables a user (e.g., a student or an instructor) to perform inside or out of classroom settings. To find out what educational activities were afforded by WeChat, we first differentiated between academic and non-academic activities. We adopted the inductive content analysis method (Holsti, 1969) to identify and categorise the types of educationally related activities that were demonstrated in the class WeChat group messages. No preconceived categories were employed. Rather, we allowed the types of activities to emerge from the data and successively refined the operationalisation of the categories with iterative coding.

Utility: social affordances

We examined how students projected themselves and how they perceived others in the online environment. Perceptions of social presence were analysed based on the first nine survey items and student interviews. Projections were coded with a validated instrument comprising three dimensions: affective, interactive and cohesive responses (Rourke et al., 1999). The original framework was developed in the context of asynchronous text-based conferencing, so we made the following modifications to suit the MIM environment. Table 1 shows the modified codebook.

- Affective: expression of emotions. Emoji and stickers were added to the definition, as these are frequently used to express emotions (Wang et al., 2016).
- Interactive: quoting from others' messages. A quoting software feature allows users to quote others entire message or cutting and pasting selections of others' messages. It was not applicable to MIM, and therefore removed in this study.
- Interactive: continuing an idea. This indicator was adapted from the original *continue a thread* and redefined as using the @ feature to indicate continuing someone's idea. The original indicator was dependent on the reply feature, which was not applicable in the MIM environment.

Table 1

Social presence categories and indicators (adapted from Rourke et al., 1999, p. 59)

Category	Indicators	Definition	Example
Affective	Expression of emotions	Conventional expressions of emotion, or unconventional expressions of emotion, includes repetitious punctuation, conspicuous capitalisation, emoticons, emoji and stickers.	Really happy to have you this semester.
	Use of humour	Teaching, cajoling, irony, understatements, sarcasm.	Maybe he just needs a female teacher rather than a man.
	Self-disclosure	Presents details of life outside of class, or expresses vulnerability	I did my undergraduate in the US.
Interactive	Continuing an idea	Using the @ feature to indicate continuing someone's idea.	@Emily not for the speaker to wake the guy up?
	Referring explicitly to others' messages	Direct references to contents of others' posts.	I like your interaction part in the course.
	Asking questions	Students ask questions of other students or the moderator.	@Emily not for the speaker to wake the guy up?
	Complimenting, expressing appreciation	Complimenting others or contents of others' messages.	I like your interaction part in the course.
	Expressing agreement	Expressing agreement with others or content of others' messages.	I agree. Coffee helps.
Cohesive	Vocatives	Addressing or referring to participants by name.	Thanks Kayla!
	Addresses or refers to the group using inclusive pronouns	Addresses the group as *we, us, our, group.*	I'll miss you ALL so much!
	Phatics, salutations	Communication that serves a purely social function, greetings, closures.	Happy New Year!

Usability: technological affordances
Technological affordances referred to students' perceived ease of using WeChat. Descriptive statistical analysis was performed using the last six survey items, triangulated by the inductive content analysis with the interview data.

Results

The course ran from 4 September 2017 to 16 November 2017, yet the interaction in the WeChat group extended through to 22 February 2018, for a total of more than 6 months. Overall, 444 messages were collected, among which 275 were identified as academically related, such as focused content discussions, material sharing and course announcement; the remaining 169 messages served social functions, including holiday salutations or non-academic information sharing.

Utility

Educational affordances: types of activities
Twenty-two activities were identified in the communication records. Eleven activities were during class, and the remaining were out of class. Fifteen activities were assigned by the instructor, and the other seven were initiated by the students. Altogether, we identified six activity types: journaling, dialogue, transmission, helpline, demonstration and notebook. The most frequent activities were transmission ($n =$ 7), demonstration ($n = 6$) and dialogue ($n = 5$).

Four activities were conducted with the general message delivery function: journaling, dialogue, transmission and helpline. The demonstration activity was supported by WeChat for Web, with which students displayed the interactions on the projected screen. All demonstrative activities were performed in class. To perform the notebook activity, users pressed one message, chose "combine and forward" and then selected up to 100 messages to be forwarded. The chosen messages were then organised into a file and sent as a single message. Table 2 presents a summary of activities, features, frequencies and examples.

Table 2
Types of activities, definitions, frequencies and examples

Type	Feature	Freq.	Examples
Transmission	Information delivery	7	(Instructor message) "The slides are available now."
Demonstration	Exhibition of students' group work	6	(Session 6, student presentation) Each group was asked to design a trademark, take a picture and send to the WeChat group, which was displayed via WeChat for Web on the class screen.
Dialogue	Focused discussions on specific topics	5	(Session 1, in-class activity) Who are adult learners?
Journaling	Learner self-reflection	1	(Session 2, post-class activity) Talk about ONE thing from last class that you feel most connected to.
Helpline	Request for assistance	1	(Student message) "Ms Lee, could you upload the slides?"
Notebook	A repertoire of relevant content	1	(Session 2, in-class activity) Students' responses were selected, combined and forwarded, and the instructor commented on the pre-class discussion.

Social affordances: social presence projection
We analysed 383 posts after removing the instructor's messages. The results showed that students were able to project social presence in the WeChat group. The most frequent indicator was "affective – emotional expression" ($n = 184$), meaning that MIM was particularly helpful in enabling affective interactions.
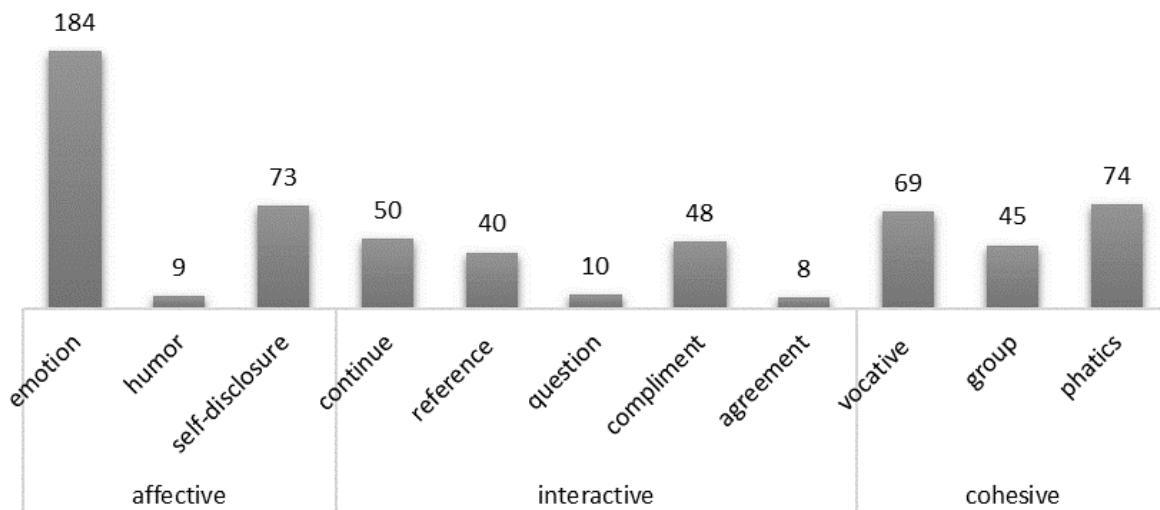
Figure 4. Social presence indicators and frequencies

The interviews explained how students felt about projecting presence in the MIM environment. Overall, students felt more spontaneous and informal in expressing feelings and ideas compared to online forums, which was considered less mobile-friendly and more work related. One student noted, "WeChat is less intimidating, and I won't be that nervous". In addition, WeChat helped students strategically manipulate the impressions that they would like to leave with others. Students mentioned several features as helpful in projecting themselves positively.

- Semi-synchronicity granted students extra time to phrase responses and consider the possible effect:

  I will pay special attention to the wording. I try not to be the first person to answer the questions. I will refer to what others have said and build upon that, trying to make my answers look more insightful and thoughtful. If somebody posts something that blows my mind, I will pay special attention to him, then he will be my top choice of group member next time.

- Emojis and stickers conveyed feelings and made conversations livelier and friendlier:

  I am a big fan of using emoji and stickers … Sometimes it's weird to describe your feelings in a long and serious sentence, and it's just hard to describe feelings with words. When I was working as a client manager, my supervisor would ask us to use more stickers and less words, because text was dry, and it would not make you approachable. To me, a person would be more kind and easy-going if he knows how to use stickers.

- The WeChat Moments allowed users to curate their personal timeline by posting status updates, much in the same way one might with Facebook personal pages. Users could selectively post pictures, text, videos or Web links and choose who could see the posts or tag specific audiences:

  WeChat Moments is like your online CV. Everybody carefully selects and only showcases good things. If I add somebody as a new friend on WeChat, I will check her moments first. This allows me to have a first impression and better understanding of her, so if we meet in real-life, I will have more topics to make conversations.

Social affordances: social presence perception
The questionnaire results (see Table 3) indicated that 81% students considered WeChat an excellent medium for social interaction. They felt comfortable conversing through WeChat (86%) and participating in discussions (91%). There was an established sense of collaboration (76%), and students felt their ideas were acknowledged (71%). Some students did not feel comfortable expressing disagreement in the group, as shown in question 5.

Table 3
Perceived social affordances

Perceived social presence (Arbaugh et al., 2008, p. 135)	SA[a]	A	N	D	SD
1. Getting to know other classmates gave me a sense of belonging in the course.	38.1	52.4	4.8	4.8	0
2. I was able to form distinct impressions of some classmates on WeChat.	14.3	57.1	19	9.5	0
3. WeChat is an excellent medium for social interaction.	61.9	19	14.3	4.8	0
4. I felt comfortable conversing through WeChat.	52.4	33.3	9.5	4.8	0
5. I felt comfortable participating in WeChat discussions.	52.4	38.1	9.5	0	0
6. I felt comfortable interacting with other classmates in WeChat discussions.	47.6	33.3	19	0	0
7. I felt comfortable disagreeing with other classmates while still maintaining a sense of trust in WeChat discussions.	19	33.3	33.3	14.3	0
8. I felt that my point of view was acknowledged by other classmates in WeChat discussions.	23.8	47.6	23.8	4.8	0
9. WeChat discussions help me to develop a sense of collaboration.	19	57.1	19	4.8	0

[a] SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree

Analysis of the interview data helped reveal how students perceived others in the MIM environment and how and why WeChat affected their perceptions. First, all interviewees expressed that the WeChat group enabled them to better acknowledge their classmates' presence. Students would have an impression about their classmates, based on user online behaviours. The following excerpt serves as an example:

> I noticed one classmate had a very cute profile picture, and then began paying attention to her utterances in the group. I don't know her very well in real life, but I can tell she is very lively and quick-witted, from her profile picture, the way she expresses and her participatory rate and speed.

Some students regarded WeChat interactions as a useful icebreaker, helping them to form off-line friendships. Online interactions provided topics for further face-to-face discussion. One student reported:

> If I see somebody post something interesting in the group, I will add them as my WeChat contacts and have some private interactions first. Then I can approach them in person next time and pick up what we have discussed in WeChat naturally. It won't be that awkward.

The WeChat group gave students a better sense of their peers in class, enabling them to get to know each other better. A student commented:

> It definitely gives me a sense of community. In other classes without WeChat groups, I barely know anything about my classmates. I only know four to five people as my group members. I went to the classes, sat together with them and only interacted with them. No other classes will have holiday salutations, but we say "Happy New Year" in this class WeChat group.

The WeChat group also provided opportunity to sustain participants' relationships. As discussed above, interactions on the class group chat lasted for three more months after the course ended. As one student expressed:

> This group exist after the classes end. We can still have conversations. I've seen WeChat helps my mom get in contact with her old middle school classmates, which is very touching to me. This feeling of connection may not be that intense because we are still on campus.

Usability

Table 4 shows students' perceptions of WeChat's ease of use. According to the survey, more than 95% respondents agreed that WeChat was easy to learn, easy to use and flexible to interact with, while 81% found WeChat easy enough to control that it helped them accomplish what they wanted to.

Table 4
Perceived ease of use

Perceived ease of use (Davis, 1989, p. 340)	SAª	A	N	D	SD
1. Learning to operate WeChat was easy for me.	76.2	19	4.8	0	0
2. I found it easy to get WeChat to do what I want it to do.	57.1	23.8	14.3	4.8	0
3. My interaction with WeChat was clear and understandable.	42.9	33.3	19	4.8	0
4. I found WeChat to be flexible to interact with.	52.4	42.9	4.8	0	0
5. It was easy for me to become skilful at using WeChat.	66.7	19	14.3	0	0
6. I found WeChat easy to use.	81	9.5	9.5	0	0

ª SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree

According to the interview data, WeChat was convenient and flexible. One student commented, "We won't use it every day if it is hard to use. Even if you are not familiar with a new function, it will only take one or two minutes to figure it out". Students also talked about five outstanding technological features that assisted their interactions and learning experience:

(1) Location-free group discussion. Students can be exposed to a variety of ideas, with text or audio/video conferencing in the group. They do not need to go to school and meet physically.
(2) Presence awareness. Students expect to get instant feedback, and generally WeChat feedback is more immediate than other communicative channels. When a new WeChat message arrives, the push notification will alert the user and acts as a signal of starting conversation. It provides users with a continuous awareness of others' availability, which can encourage peer-to-peer communication.
(3) Non-verbal cues support. WeChat offers built-in sticker sets and allows users to design and use their own stickers. Students thought that using stickers can "make conversations more casual and stress-free", helping to "shorten the psychological distance"' among participants.
(4) File sharing. It was easy to send files to contacts using WeChat for Web and WeChat for Desktop. Students thought it was more convenient than e-mail sharing.
(5) Social networking. Students liked the integration of social networking. WeChat Moments enable them to know more about their classmates outside of school.

Discussion

Social interaction

The results are consistent with previous research in confirming MIM's usefulness in facilitating social presence, especially affective expressions (Park & Sundar, 2015). Wang et al. (2016) reported that the two most frequently used features for expressing affect in MIM were emoticons (72%) and photos (21%), with the most frequently used emoticons being smiling faces and thumbs-up. Social presence is positively related to student participation, motivation, satisfaction and learning outcomes (Richardson et al., 2017). Therefore, instructors of online learning or blended learning could consider incorporating MIM to foster a sense of community in the class and assist the development of students' interpersonal relationship.

In addition to supporting the findings in literature, we found two features that were unique to MIM like WeChat in promoting social presence. First, the most frequently used non-verbal cues in this study were stickers rather than emoticons or emojis. Emoticons are a group of keyboard characters, such as :-) to represent facial expressions, while emojis are small images (e.g., 😍) to express the users' emotions; stickers, by contrast, are customised pictures exclusive to particular mobile applications. With WeChat, users can design and use their own stickers, thus adding elements of individuality and fun to the conversation. In the interviews, students expressed that they enjoyed using stickers to foster a sense of closeness. They also viewed people who use stickers to be more easy-going and amicable. The availability of stickers might be a unique advantage of MIM in social interactions.

Another unique feature of WeChat is the integration of messaging and social networking functions. Users were able to present themselves to others selectively, by customising their profile pictures and curating personal pages (Moments) with textual comments, pictures and videos. Students appreciated the

opportunities to perceive their classmates outside of the classroom for non-academic purposes. The Moments status updates served as conversational topics that helped users to form, manage and maintain positive interpersonal relationships. This reflects the early insights of Walther (1996), suggesting that computer-mediated communication can exceed face-to-face interaction as hyper-personal, enabling people to strategically present themselves to others. Perceived satisfaction and intimacy in the virtual environment might thus be felt more acutely than in face-to-face interactions.

Pedagogical incorporation

This study offers evidence that MIM can serve pedagogical purposes, especially in transmissive and dialogical activities. Two new activities emerged: the demonstration and notebook activities.

The demonstration activity integrated smartphone cameras, the WeChat group and the classroom projector. The instructor or anyone from the group launched his/her WeChat for Web on the class projector. The interactions were then displayed to all. This activity was actively adopted by students when showcasing their group work to the class. They could take a picture of their work and send it to the group, which would then instantaneously be shown on the screen. This is an effective mechanism to facilitate in-class idea sharing and exchanging. Students commented:

> Traditionally, each group will have to go to the front and transcribe the discussion results onto the board for display. But now we can just take a picture, and everybody can see it immediately. It is much more efficient and convenient.

In the notebook activity, students were able to select multiple messages and combine and forward them in a unified file to others. This may provide a solution to a common criticism of using MIM for educational discussions, namely, disorganisation and information overload (Tang & Hew, 2017). Because MIM messages are chronologically displayed rather than organised in threads, discussions can sometimes be not thematically focused and therefore challenging to follow. The notebook activity can be strategically implemented to facilitate out-of-class discussion. Instructors may assign students as discussion facilitators, responsible for selecting and collecting relevant posts. Peers serving as facilitators may then create a casual atmosphere and allow students to take greater responsibility and ownership in the discussion (Hew & Cheung, 2012).

Tensions of using MIM

Technologically speaking, MIM is very easy to use with multiple features. However, there are also some challenges to using MIM for educational purposes. The affordances and challenges are interdependent tensions that educators need to navigate and manage (Pimmer & Rambe, in press) before the tool can be successfully incorporated in the classroom.

The most frequently mentioned tension in students' interviews was about "staying notified and being immediate". That is, while some students valued the increased interactivity supported by message notifications, others found that it created pressure to reply immediately as an obligation. One student noted, "Even if I am in the middle of something, I just can't help but react to the notification. I know clearly that I am being distracted, but it has become a habit". Another student said, "I can choose to reply later, but the other person may not be available then. The problem cannot be solved immediately". Users can strategically mute the notifications such that they would not be constantly interrupted, but students voiced that they were afraid of sacrificing peer relationships if they missed a notification. Tu, McIsaac, Sujo-Montes, and Armfield (2014) suggested setting up a timeline to allow postponed responses, such as "24 hours during weekdays and 1-2 days for the weekend" (p. 93).

The other tension is between sharing and competition. Group discussion creates opportunities for peer sharing, but it may also lead to pressure in the form of peer comparisons. For an in-class formative assessment requiring immediate feedback, students sometimes felt anxious that they could not be as quick as their classmates to produce quality answers. For example, one student expressed, "When I see my classmates coming up with great answers and being much faster, I feel myself not that smart". To alleviate this tension, we suggest instructors advise students to build on their peers' comments (e.g., provide new

information based on personal examples, experiences, or relevant sources from the literature), instead of trying to generate completely novel ideas all the time.

Conclusion and future directions

This study comprehensively examined the usefulness of MIM in the graduate-level educational context from the lens of utility and usability. Multiple data sources, including interaction records, survey questionnaires and interviews, were triangulated to support the constructs of educational, social and technological affordances. Overall, MIM was mostly used in transmissive, demonstrative and dialogic activities. As a social tool incorporating convenient emoji and sticker use, presence-awareness and social networking function, MIM helped students express themselves, perceive others in class as a learning community and form, manage and maintain interpersonal relationships. There were also tensions to be managed, particularly about immediacy and peer pressure. Table 5 summarises the results with the evidence.

Table 5
Summary of results

Dimension	Constructs	Results
Utility	Educational affordances	Six activities were afforded including: journaling, dialogue, transmission, helpline, demonstration and notebook. The top three were transmission ($n = 7$), demonstration ($n = 6$) and dialogue ($n = 5$).
	Social affordances	WeChat helped students express themselves, especially affect, and strategically manipulate their online projection, with the help of the semi-synchronicity, emoji and sticker availability and social networking function. WeChat also allowed students to perceive others with a sense of the class and helped them form, manage and sustain relationships.
Usability	Technological affordances	More than 80% of students agreed WeChat was easy to use and interact with. Students positively evaluated five technological features: location-free group interaction, presence awareness, support of emoji and stickers, file-sharing feature and social networking function.
Tension	Immediacy	The notification imposed pressure on students to reply immediately. Solution: set up a timeline to allow postponed responses.
	Peer pressure	Students worried that they couldn't generate quality answers as quickly as others. Solution: encourage students to think about answers before posting.

Owing to the nature of a case study, the generalisability of the results is limited. The current study examined the use of MIM in one master-level class from the multifaceted lens of the usefulness theoretical perspective. Future studies should be conducted involving other student groups (e.g., undergraduates, high school students) to determine whether the findings apply or to establish other new findings if applicable. Second, future studies could examine the extent to which MIM can facilitate social presence compared to other technologies such as an online forum. Understanding which tool can better promote social presence will be useful to an instructor of online or blended learning classes in building social connections among the students. Third, researchers have reported that in the asynchronous environment, online discussion strategies, such as pre-structured threads, debate or role-play, would influence students' levels of cognitive thinking (Darabi, Arrastia, Nelson, Cornille, & Liang, 2011). It would be interesting to see if the same can be said about the MIM-facilitated quasi-synchronous environment. In this study, the main discussion strategy employed may be best described as an open-ended reflection with a probing question. Future research could be conducted to examine the use of MIM to support online debate or role play and investigate how MIM-supported pedagogical activities may affect students' levels of critical thinking compared to other technologies.

References

Almekhlafy, A., & Alzubi, A. A. F. (2016). Mobile-mediated communication a tool for language exposure in EFL informal learning settings. *Arab World English Journal, 7*(1), 388–407. Retrieved from https://awej.org/images/AllIssues/Volume7/Volume7Number1March/23.pdf

Alsaleem, B. I. A. (2013). The effect of "WhatsApp" electronic dialogue journaling on improving writing vocabulary word choice and voice of EFL undergraduate Saudi students. *Arab World English Journal, 4*(3), 213–225. Retrieved from https://awej.org/images/AllIssues/Volume4/Volume4Number3Sept2013/18.pdf

Andujar, A. (2016). Benefits of mobile instant messaging to develop ESL writing. *System, 62*, 63–76. https://doi.org/10.1016/j.system.2016.07.004

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*(3-4), 133–136. https://doi.org/10.1016/j.iheduc.2008.06.003

AttractChina. (2014). *Understanding social media in China*. Retrieved from http://www.attractchina.com/understanding-social-media-china/

Barhoumi, C. (2015). The effectiveness of WhatsApp mobile learning activities guided by activity theory on students' knowledge management. *Contemporary Educational Technology, 6*(3), 221–238. Retrieved from http://www.cedtech.net/articles/63/634.pdf

Bower, M. (2008). Affordance analysis–matching learning tasks with learning technologies. *Educational Media International, 45*(1), 3–15. https://doi.org/10.1080/09523980701847115

Butgereit, L. (2007). *Math on MXit: Using MXit as a medium for mathematics education.* Paper presented at Meraka INNOVATE Conference for Educators, CSIR, Pretoria. Retrieved from https://researchspace.csir.co.za/dspace/handle/10204/1614

Carpenter, J. P., & Green, T. D. (2017). Mobile instant messaging for professional learning: Educators' perspectives on and uses of Voxer. *Teaching and Teacher Education, 68*, 53–67. https://doi.org/10.1016/j.tate.2017.08.008

Churchill, D., & Churchill, N. (2008). Educational affordances of PDAs: A study of a teacher's exploration of this technology. *Computers & Education, 50*(4), 1439–1450. https://doi.org/10.1016/j.compedu.2007.01.002

Conole, G. & Dyke, M. (2004). What are the affordances of information and communication technologies? *ALT-J, 12*(2), 113–124. https://doi.org/10.3402/rlt.v12i2.11246

Darabi, A., Arrastia, M. C., Nelson, D. W., Cornille, T., & Liang, X. (2011). Cognitive presence in asynchronous online learning: A comparison of four discussion strategies. *Journal of Computer Assisted Learning, 27*(3), 216–227. https://doi.org/10.1111/j.1365-2729.2010.00392.x

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org/10.2307/249008

Duggan. M. (2013, September 13). *Cell phone activities 2013*. Retrieved from https://pewrsr.ch/2GRmc9P

Duggan. M. (2015, August 19). *Mobile messaging and social media 2015*. Retrieved from http://www.pewinternet.org/2015/08/19/mobile-messaging-and-social-media-2015/

Farmer, M. Y., Liu, A., & Dotson, M. (2016). Mobile phone applications (WhatsApp) facilitate communication among student health volunteers in Kenya. *Journal of Adolescent Health, 58*(2), 54–55. https://doi.org/10.1016/j.jadohealth.2015.10.121

Garcia, A. C., & Jacobs, J. B. (1999). The eyes of the beholder: Understanding the turn-taking system in quasi-synchronous computer-mediated communication. *Research on Language and Social Interaction, 32*(4), 337–367. https://doi.org/10.1207/s15327973rls3204_2

Garrison, D. R. (2011). *E-learning in the 21st century: Framework for research and practice* (2nd ed.). New York, NY: Routledge. https://doi.org/10.4324/9780203838761

Gasaymeh. A. M. (2017). University Students Use of WhatsApp and their Perceptions Regarding its Possible Integration into their Education. *Global Journal of Computer Science and Technology, 17*(1). Retrieved from https://computerresearch.org/index.php/computer/article/view/1641

Gibson, J. (1979). *The ecological approach to visual perception.* Boston, MA: Houghton Mifflin. https://doi.org/10.4324/9780203767764

Hazaea, A. N., & Alzubi, A. A. (2016). The effectiveness of using mobile on EFL learners' reading practices in Najran University. *English Language Teaching, 9*(5), 8–21. https://doi.org/10.5539/elt.v9n5p8

Hew, K. F., & Cheung, W. S. (2012). *Student participation in online discussions: Challenges, solutions, and future research*. New York, NY: Springer Science & Business Media. https://doi.org/10.1007/978-1-4614-2370-6

Holsti, R. (1969). *Content analysis for the social sciences and humanities.* Reading, MA: Addison-Wesley.

Kim, H., Lee, M., & Kim, M. (2014). Effects of mobile instant messaging on collaborative learning processes and outcomes: The case of South Korea. *Journal of Educational Technology & Society, 17*(2), 31–42. Retrieved from http://www.jstor.org/stable/jeductechsoci.17.2.31

Kirschner, P. A. (2002). Can we support CSCL? Educational, social and technological affordances for learning. In P. Kirschner (Ed.), *Three worlds of CSCL: Can we support CSCL* (pp. 7–34). Heerlen: Open Universiteit Nederland.

Kirschner, P., Strijbos, J. W., Kreijns, K., & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational Technology Research and Development, 52*(3), 47–66. https://doi.org/10.1007/BF02504675

Kreijns, K., & Kirschner, P. A. (2001). The social affordances of computer-supported collaborative learning environments. In *Proceedings of the Frontiers in Education Conference, 2001* (Vol. 1, pp. T1F–12). IEEE. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber¼963856

Ng, K. K., Luk, C. H., & Lam,W. M. (2016). The impact of social mobile application on students' learning interest and academic performance in Hong Kong's sub-degree education. In F. J. García-Peñalvo & A. J. Mendes (Eds.), *Proceedings of the 2016 international symposium on educational technology* (pp. 18–22). Beijing: IEEE Press. https://doi.org/10.1109/iset.2016.10

Norman, D. (1988). *The psychology of everyday things*. New York, NY: Basic Books.

Park, E. K., & Sundar, S. S. (2015). Can synchronicity and visual modality enhance social presence in mobile messaging? *Computers in Human Behavior, 45,* 121–128. https://doi.org/10.1016/j.chb.2014.12.001

Pimmer, C., & Rambe, P. (in press). The inherent tensions of 'instant education'. A critical review of mobile instant messaging. *The International Review of Research in Open and Distributed Learning*.

Rambe, P., & Bere, A. (2013). Using mobile instant messaging to leverage learner participation and transform pedagogy at a South African University of Technology. *British Journal of Educational Technology, 44*(4), 544–561. https://doi.org/10.1111/bjet.12057

Richardson, J. C., Maeda, Y., Lv, J., & Caskurlu, S. (2017). Social presence in relation to students' satisfaction and learning in the online environment: A meta-analysis. *Computers in Human Behavior, 71,* 402–417. https://doi.org/10.1016/j.chb.2017.02.001

Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (1999). Assessing social presence in asynchronous text-based computer conferencing. *Journal of Distance Education, 14*(2). Retrieved from https://www.learntechlib.org/p/92000/.

So, S. (2016). Mobile instant messaging support for teaching and learning in higher education. *The Internet and Higher Education, 31*, 32–42. https://doi.org/10.1016/j.iheduc.2016.06.001

Statista. (2018). Number of monthly active WeChat users from 2nd quarter 2010 to 2nd quarter 2017. Retrieved from https://www.statista.com/statistics/255778/number-of-active-wechat-messenger-accounts/

Tang, Y., & Hew, K. F. (2017). Is mobile instant messaging (MIM) useful in education? Examining its technological, pedagogical, and social affordances. *Educational Research Review, 21*, 85–104. https://doi.org/10.1016/j.edurev.2017.05.001

Tencent. (2018). *WeChat app store preview*. Retrieved from https://itunes.apple.com/us/app/wechat/id414478124?mt=8

Tu, C., McIsaac, M. S., Sujo-Montes, L. E., & Armfield, S. (2014). Building Mobile Social Presence for U-Learning. In F. Neto (Ed.), *Technology Platform Innovations and Forthcoming Trends in Ubiquitous Learning* (pp. 77-93). Hershey, PA: IGI Global. https://doi.org/10.4018/978-1-4666-4542-4.ch005

Walther, J. B. (1996). Computer-mediated communication. *Communication Research, 23*(1), 3–43. https://doi.org/10.1177/009365096023001001

Wang, Y., Fang, W. C., Han, J., & Chen, N. S. (2016). Exploring the affordances of WeChat for facilitating teaching, social and cognitive presence in semi-synchronous language exchange. *Australasian Journal of Educational Technology, 32*(4), 18–37. https://doi.org/10.14742/ajet.2640

Yin, R. K. (2008). *Case study research: Design and methods.* Thousand Oaks, CA: Sage.

Corresponding author: Ying Tang, yingtang@connect.hku.hk