



Thematic Review

Is mobile instant messaging (MIM) useful in education? Examining its technological, pedagogical, and social affordances



Ying Tang*, Khe Foon Hew

Division of Information & Technology Studies, Faculty of Education, The University of Hong Kong, Hong Kong

ARTICLE INFO

Article history:

Received 6 February 2017

Received in revised form 10 May 2017

Accepted 10 May 2017

Available online 17 May 2017

Keywords:

Mobile instant message

Affordances

Teaching and learning

WhatsApp

WeChat

ABSTRACT

Although the use of mobile communication services, commonly known as *mobile instant messaging (MIM)* has gained considerable attention in recent years, we lack a comprehensive understanding of how it can be used for teaching and learning. This study is the first to systematically review the use of MIM in educational settings. Our search procedure yielded 39 empirical studies from six major educational databases. Using Kirschner et al.'s (2004) conceptual framework, we reviewed these 39 studies in terms of the possible technological, pedagogical, and social affordances of MIM. Overall, analysis of previous studies revealed six technological affordances of MIM. The four most frequently mentioned technological affordances were temporal, user-friendly, minimal cost, and multi-modality features. Our analysis also revealed six specific ways in which MIM was used in education: journaling, dialogic, transmissive, constructionist with peer feedback, helpline, and assessment. The effect of MIM on improving student cognitive outcomes can be summarized as cautiously optimistic when it was used to supplement course content in dialogic activities. MIM appears to make the development of social presence easier than other forms of computer-mediated communications (e.g., discussion forum). Challenges exist, namely device ownership, internet access, improper language use and interference with private lives. This study concludes by discussing several implications of the current research and suggestions for future studies.

© 2017 Elsevier Ltd. All rights reserved.

Contents

1. Introduction	86
1.1. What's new about MIM	86
1.2. Popular MIM apps	87
1.3. Rational for the current review	87
1.4. Research questions	88
1.5. Usefulness of MIM: a conceptual framework based on affordance perspective	88
2. Method	88
2.1. Literature search process	88
2.2. Data coding and analysis processes	89

* Corresponding author.

E-mail addresses: yingtang@connect.hku.hk (Y. Tang), kfhew@hku.hk (K.F. Hew).

3. Results	89
3.1. RQ1: in what contexts have MIM tools been used for educational purposes?	89
3.2. RQ2: what are the technological affordances, if any, of using MIM?	91
3.2.1. Minimal cost	92
3.2.2. User-friendly	92
3.2.3. Presence awareness	93
3.2.4. Multi-modality	93
3.2.5. Temporal	93
3.2.6. Compatibility	93
3.3. RQ3: what are the pedagogical affordances, if any, of using MIM in education?	93
3.3.1. Specific ways in which MIM was used in education	93
3.3.2. Effects of using MIM on cognitive outcomes	95
3.4. RQ4: what are the social affordances, if any, of using MIM?	98
3.5. RQ5: what are challenges, if any, of using MIM in education?	99
4. Discussion	100
4.1. Implications of the current study	100
4.2. Suggestions for future research	101
5. Conclusion	102
References	102

1. Introduction

Nearly 90% of adults aging between 18 and 29 in the U.S. are smartphone owners (Anderson, 2015). Along with the surge of device ownership is a growing obsession with smartphone applications (apps). Ninety percent of users' mobile time has been spent on using apps (Chaffey, 2016) that encompass all aspects of our lives, such as books, business, education, entertainment, and finance. Social networking, particularly mobile instant messaging (MIM), is probably the most popular category. Common features of MIM include the following: (1) it is accessible on mobile phones; (2) it transmits messages through the Internet, rather than through a telecommunication carrier; (3) it can send a message to a specific individual (private one-to-one communication), or to a group of individuals (one-to-many communication) (Church & de Oliveira, 2013; eMarketer, 2015); (4) it can read and reply an incoming message (Caro-Alvaro, Garcia-Cabot, Garcia-Lopez, de-Marcos, & Martinez-Herráiz, 2015); (5) it can add, delete or block a contact (Caro-Alvaro et al., 2015); and (6) it can save or delete chats (Caro-Alvaro et al., 2015). MIM is especially popular among young adults (18–29 years old) with half of smartphone owners using messaging apps (Anderson, 2015). MIM is expected to be used by 2.19 billion people by 2019 (eMarketer, 2015, Fig. 1).

1.1. What's new about MIM

Before the prevalence of MIM apps, short message service (SMS) and emails dominated our daily textual communication. However, MIM is picking up the momentum and has surpassed SMS to be the leading mobile communication service. SMS transmits messages through a telecommunication carrier which incurs a fee for the sender, while MIM transmits messages through the Internet (Leung, 2016). Bouhnik and Deshen (2014) concluded that compared with email

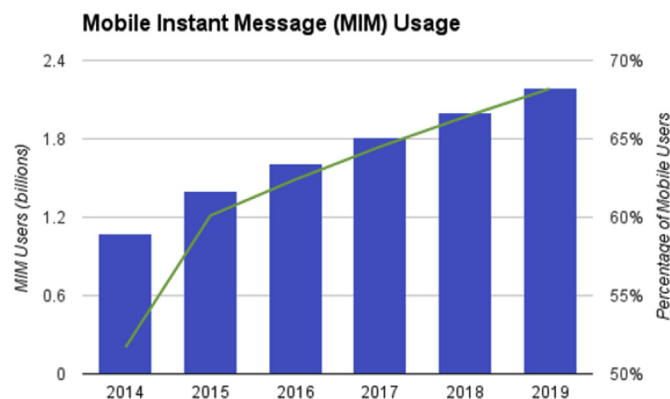


Fig. 1. MIM app users worldwide (Leung, 2016).

and SMS, it is easy to utilize WhatsApp to form a group, manage group members, maintain relatively high privacy level, and enable sharing and collaboration. Church and de Oliveira (2013) suggested the following advantages of MIM over SMS: (1) it is more economic and immediate; (2) it is more conversational and social in nature; (3) it is more conducive to constructing a sense of community; and (4) it leads to higher frequencies of chatting, planning/coordination and group communication. Rambe and Bere (2013a) compared the features of learning management system (LMS) and MIM, and applauded MIM in terms of its personalization, perceived non-intrusive nature, and mobile access to learning resources and instruction. LMS, on the other hand, is static with pre-packed content (Lee & McLoughlin, as cited in Rambe & Bere, 2013a). Drawing upon previous studies, we synthesized the results to exhibit the similarities and differences among different social networking tools (Table 1).

1.2. Popular MIM apps

In less than a decade, MIM has seen tremendous development. Two of the most popular MIM apps worldwide were WhatsApp and WeChat, based on the number of monthly active users as of April 2016 (Statista, 2017). Initiated in 2009, WhatsApp is now leading the worldwide market by owning more than 1 billion customers in over 180 countries (WhatsApp, 2016), while WeChat takes the majority of market share in Asian countries, especially in China, with more than 800 million active users (Tencent, 2016). Both applications provide users with simple, fun and accessible communication services. They are free to be downloaded across platforms, including Android, iPhone, Windows Phone as well as personal computers (Mac or Windows), that users can seamlessly synchronize chats onto the most convenient device. Besides, users can share a variety of media, such as text, emoticons, photos, videos, documents and location with an individual or a group. They can also use the built-in camera on their smartphones to capture real-time events and share immediately with others. Group chats are also made easy. WhatsApp allows 256 people to talk and share information at once, while WeChat allows up to 500 people to chat at the same time. In addition to the basic messaging functions, WeChat also supports other features, such as making payments, playing games, and reading news. It also allows individuals, enterprises and government agencies to use “official accounts” to build up better communication channels with readers. Readers can choose the official accounts of their interest, and receive information updates pushed from these accounts once they click the “follow” button. Educators can possibly take advantages of the following features including but not limited to: free charge, cross-platform accessibility, multi-modality and easy formation of group chats.

1.3. Rational for the current review

Among all social networking services, MIM is popularly chosen to be the primary means of communication method as young people move away from in-person interaction to multi-modal (e.g., text, pictures, video) communication on smartphones (Quan-Haase, 2008; Schwarz, 2011). Yet, despite the growing use of MIM, we lack a comprehensive understanding of how MIM applications are used for teaching and learning. In the past, several literature reviews have been written on the topic of mobile and ubiquitous learning (e.g. Cheung & Hew, 2009; Hwang & Tsai, 2011; Pimmer, Mateescu, & Gröbhiel, 2016; Wu et al., 2012). These reviews, however, dealt mainly on the utility of mobile devices (e.g., PDA, small portable DVD players, tablet PCs), or non-MIM applications (e.g., SMS, Twitter). Hitherto, no specific reviews of MIM applications have been found.

This review is significant in four ways. First, it is the first to analyze the use of MIM in educational settings with the main purpose of examining the possible technological, pedagogical, and social affordances associated with MIM. Second, this review helps educators better understand how MIM was actually being used in teaching and learning, and its benefits (if any). Third, this review enables educators to consider what other people have done with MIM and critically transfer the positive elements. Fourth, this review identifies several unanswered questions which can help researchers define future MIM research directions to explore.

Table 1

The comparison results among various social networking tools (y: yes/n: no) (Synthesized from Bouhnik & Deshen, 2014; Church & de Oliveira, 2013; Rambe & Bere, 2013a).

	MIM	LMS	SMS
Free cost on users	y	y	n
Easy mobile accessibility	y	n	y
Multiple modality	y	y	n
High personalization level	y	n	y
Easy group formation, management and communication	y	n	n
Easy conversational interaction	y	n	n
Easy content organization	n	y	n
Easy content sharing	y	y	n
High privacy level	y	y	y

1.4. Research questions

The overarching research question we aim to answer is: What is the usefulness of adopting MIM in education? Guided by this primary question, the following specific questions will be addressed:

- RQ1.** In what contexts have MIM tools been used for educational purposes?
- RQ2.** What are the technological affordances, if any, of using MIM in education?
- RQ3.** What are the pedagogical affordances, if any, of using MIM in education?
- RQ4.** What are the social affordances, if any, of using MIM in education?
- RQ5.** What are challenges, if any, of using MIM in education?

1.5. Usefulness of MIM: a conceptual framework based on affordance perspective

Kirschner, Strijbos, Kreijns, and Beers (2004) argued that a useful educational system or application has to fulfill two important components: utility and usability (Fig. 2). Utility represents the functionality that a system or application provides a user, while usability is associated with how well the user can use the functionality to accomplish a task (Nielsen, 1994). Both utility and usability play a pivotal role in determining how useful a system is, because “a system that is usable but does not have the functionalities the user needs, is worthless” (Kirschner et al., 2004, p. 52).

More specifically, the utility of an educational system or application is determined by its pedagogical and social affordances, while usability is determined by its technological affordances (Kirschner et al., 2004). Affordances were defined as the “perceived and actual fundamental properties of a thing, primarily those fundamental properties that determine just how the thing could possibly be used” (Norman, 1988, p. 9). Put another way, affordances refer to the possibilities and limitations for action that an object offers (Robey, Anderson, & Raymond, 2013). For example, the shape of some door handles lead us to believe that they should be pulled, instead of being pushed (Kirschner et al., 2004). A chair offers support for sitting; it “therefore affords sitting” (Norman, 1988, p. 9).

In this paper, we refer pedagogical affordances specifically to the teaching and learning activities (which may be individual- and/or group-based) that MIM enables a user to perform. These individual- and/or group-based activities focus on the cognitive outcomes (Kreijns & Kirschner, 2001). Examples of cognitive outcomes may include participants' learning performance (e.g., test scores), and the quality of problem solving (e.g., whether participants are able to post insightful interpretations on a topic based on relevant experience and literature or they merely repeat someone's ideas).

We characterize social affordance of MIM in this paper primarily in terms of its potential to promote social presence (after Kreijns & Kirschner, 2001). In this paper, we utilized Garrison, Anderson, and Archer's (1999) definition of social presence as the ability of students “to project themselves socially and emotionally as ‘real’ people” (p. 94). The notion of social presence has become a central concept in computer-mediated communication. It helps promote student satisfaction in computer-mediated communication (Gunawardena & Zittle, 1997), facilitate student online interaction (Tu, 2000), and build sense of community (Rovai, 2002). Social presence also supports student cognitive learning by making group interactions appealing and engaging (Tinto, 1987).

We interpret technological affordances of MIM primarily in terms of its potential to help users accomplish tasks with ease (Burden & Atkinson, 2008; Kirschner et al., 2004). Table 2 summarizes the definitions of technological affordance, social affordance, and pedagogical affordance, and some representative examples of how these are played out through MIM.

2. Method

2.1. Literature search process

We conducted a broad systematic search in six major databases containing publications on educational research: all EBSCOhost databases, the Web of Science, Scopus, PsycINFO, ERIC, and PubMed. A common search keyword “mobile instant

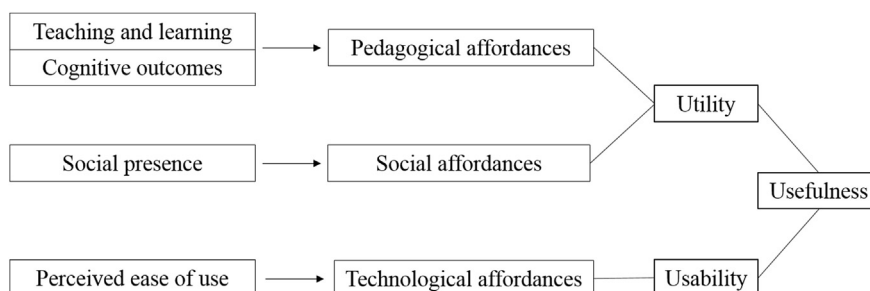


Fig. 2. Conceptual framework.

Table 2

Definition and examples of technological, pedagogical, and social affordances used in this paper.

Component	Definition	Examples
Technological affordance	The system or application allows users to perform tasks with ease.	MIM apps can alert students immediately to a message by their mobile phones, thus allowing the recipient to easily respond in one click.
Social affordance	The potential of MIM to promote online social presence.	Students can use MIM to express feelings, emotion, and mood.
Pedagogical affordance	The teaching and learning activities (which may be individual- and/or group-based) that MIM enables a user to perform. These activities focus on the cognitive outcomes.	Students can use MIM to ask peers or the teacher for help to clarify unclear course topics.

message OR WhatsApp OR WeChat OR Facebook Messenger OR QQ Mobile” was applied in all six databases for the preliminary round of searching effort. Considering that some studies may not use the exact term “mobile instant message” in their report, “WhatsApp OR WeChat OR Facebook Messenger OR QQ Mobile” was included in the search statement additionally as the most popular four MIM apps on market as of April 2016 (Statista, 2017), in order to improve the completeness of our search. No time frame was specified in the literature search.

As of December 31, 2016, 5639 potentially eligible studies were identified from the six databases. The articles were then examined by the first author to determine whether they were suitable to answer the research questions. The inclusion and exclusion criteria presented in Table 3 were adopted. We focused on peer-reviewed journal articles for high academic rigor (Korpershoek, Harms, de Boer, van Kuijk, & Doollaard, 2016). Due to the comparative nascence of MIM research in the literature, we also included conference proceedings in our search for papers because conference proceedings can provide useful information about works in progress which may not be published in a peer-reviewed journal. Our initial search generated 35 eligible articles after applying the inclusion criteria, and we identified 4 more articles in the snowball sampling afterwards. In total, 39 studies were regarded eligible for this review. Out of the 39 articles, 29 were selected from peer-reviewed journals, while 10 came from conference proceedings. Although all possible efforts have been made, we make no claim that our search is completely exhaustive. Fig. 3 shows the process of literature search and filtering.

2.2. Data coding and analysis processes

All articles were read carefully by the first author. To find answers to RQ1, the description of educational activity design in each article was read and summarized. We extracted and recorded the following information accordingly: the publication years, countries, subject areas, educational levels, MIM tools used and activity design. To answer RQ2, RQ3, RQ4 and RQ5, we paid particular attention to the findings, discussion and conclusion parts in the studies. Referring to the framework (see Fig. 2), we searched for themes related to technological affordance, social affordance, and pedagogical affordance, as well as the challenges of using MIM using the grounded approach (Glaser & Strauss, 1967). Ten studies (25%) were randomly chosen and read by the second author to confirm the reliability of coding process, which resulted in an agreement rate of 90%. Discrepancies were resolved by discussion between authors until consent was reached.

3. Results

3.1. RQ1: in what contexts have MIM tools been used for educational purposes?

Contextual information of all 39 articles reviewed was sorted out and displayed in Table 4.

Table 3

Inclusion and exclusion criteria.

Inclusion	Exclusion
a Research including empirical findings with actual data.	• Articles presenting personal opinions and theoretical argumentations.
b Research must be conducted with MIM apps, such as WhatsApp or WeChat.	• Studies dealing with other tools, such as traditional social networking sites (e.g., Facebook), blogs, Twitter, Wikipedia.
c Research must be conducted in educational settings for educational purposes, and clearly describing how instructors and students used MIM.	• Studies dealing with desktop instant messaging (IM) tools such as MSN, Yahoo Messenger, but not mobile instant messaging.
	• Articles dealing with cultural or political studies;
	• Articles involving students as participants but were not related to curriculum and instruction activities.
	• Articles that merely analysing content of messages but providing little or no information on educational activities. For example, articles that merely reported students in WhatsApp group pursued “all collaborative and cooperative learning activities” but failed to clearly explain the activities were excluded.
d Research must be written in the English language.	• All other languages.

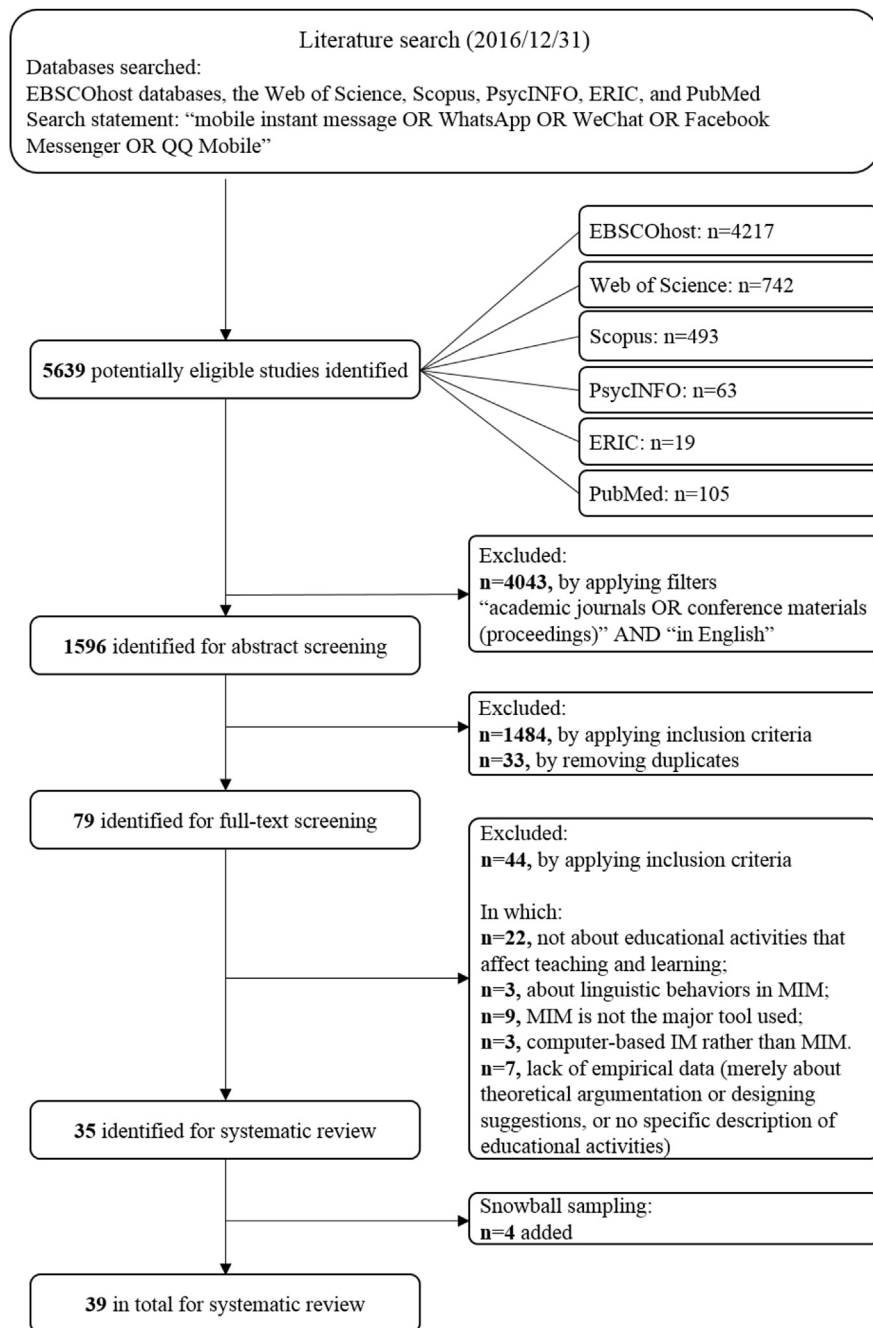


Fig. 3. The flowchart of literature search and filtering process.

We examined the geographic distribution of relevant studies (Fig. 4). The result concludes that 25 studies were conducted in Asia, nine in Africa, and four in Europe. One study (Wang, Fang, Han, & Chen, 2016) was conducted among students in both Australia and Taiwan, so it was considered as cross-continental.

Regarding academic disciplines, previous studies have covered a variety of subjects such as education, mathematics, and information systems. 17 studies (44%) were about language teaching and learning (Fig. 5). Teachers used MIM to help students learn foreign languages in all four skills: reading, writing, listening and speaking, encompassing various linguistic topics such as vocabulary, grammar and syntax. For example, students practiced writing by sending messages on a given topic to their classmates for comments and suggestions (Allagui, 2014), or were assessed in speaking proficiency by recording a two-

Table 4
Summary of 39 articles reviewed.

Nr General information						Research population	
First author and year	Country ^a	Edu. setting ^b	Subject ^c	Data source ^d	Research type ^e	Sample size	Duration
1 Allagui (2014)	OM	HE	EFL	AS, QS	D	50	1 semester
2 Almekhlafy and Alzubi (2016)	SA	HE	EFL	CA, QS, IN	D	40	1 semester
3 Alsaleem (2013)	SA	HE	EFL	AS	C	30	6 weeks
4 Andujar (2016)	ES	HE	ESL	AS, CA	C	80	6 months
5 Barhoumi (2015)	SA	HE	Research methods	AS, QS	C	68	1 year
6 Bouhnik and Deshen (2014)	IL	SE	n/a	IN	D	12 teachers and >400 students	n/a
7 Bozoglan and Gok (2016)	TR	HE	EFL	AS	C	58	4 months
8 Butgereit (2007)	ZA	SE	Math	IT	D	n/a	n/a
9 Chai and Fan (2016)	CN	HE	Interaction technology education	QS	C	117	5 weeks
10 Chen Hsieh, Huang, & Vivian Wu (2017)	TW	HE	EFL	AS, QS, IN	C	42	8 weeks
11 Dambal et al. (2015)	IN	HE	Medical ethics	AS, QS	D	20	Several days
12 Ding (2016)	CN	HE	EFL	QS, OB, AS, RF	D	342	8 weeks
13 Farmer et al. (2016)	KE	HE	Health	OB	D	n/a	6 months
14 Fattah (2015)	SA	HE	EFL	QS, AS	C	30	45 days
15 Han and Keskin, 2016	TR	HE	EFL	AS, IN	C	39	4 weeks
16 Hazaea and Alzubi (2016)	SA	HE	EFL	IN, CA	C	30	14 weeks
17 Khattoon et al. (2015)	GB	HE	Dentistry	IN	D	20 students and 6 teachers	n/a
18 Kim et al. (2014)	KR	HE	Educational technology	CA, QS, IN	C	48	1 week
19 Lai (2016)	HK	SE	ESL	AS	C	45	3 months
20 Liu and Shi (2016)	CN	HE	Computer education	QS, SNA, CA	C	78	16 weeks
21 Makoe (2010)	ZA	HE	Distance education	IT	D	23	4 months
22 Miller (2016)	HK	HE	ESL	IT	D	4	9 months
23 Mohammadi and Safdari (2015)	IR	Non-HE	EFL	AS	C	90 (13–16 yrs)	About 7 weeks
24 MI and Meerasa (2016)	IN	HE	Medical	QS, CA	D	106	46 days
25 Nassar (2016)	SA	HE	Information system	IN	D	100	10days
26 Ngaleka and Uys (2013)	ZA	HE	Information systems	CA	D	6	49 days
27 Ng at al., 2016	HK	HE	Accounting	AS, QS	C	64	3 months
28 Plana et al. (2013)	ES	HE	EFL	QS	D	95	12 weeks
29 Rambe and Bere (2013a)	ZA	HE	Information technology	RF, IN, QS	D	95	1 semester
30 Rambe and Bere (2013b)	ZA	HE	Information technology	CA	D	77	1 semester
31 Rambe and Chipunza (2013)	ZA	HE	Research methodology	CA	D	72	1 module
32 Robinson et al. (2015)	GB	HE	Radiography	CA	D	11	1 year
33 Shi and Luo (2016)	CN	HE	EFL	AS, QS	C	60	1 semester
34 Smit and Goede (2013)	ZA	HE	Information technology	QS, IT	D	65	3 weeks
35 So (2016)	HK	HE	Education	AS, QS	C	61	1 semester
36 Tarighat and Khodabakhsh (2016)	IR	Adult	EFL	IN	D	17	1 course
37 Wang et al. (2016)	AU & TW	HE	EFL & Chinese	IT, RF	D	30	1 semester
38 Willemse (2015)	ZA	HE	Health care education	RF	D	29	7 weeks
39 Zhang and Xue (2015)	CN	HE	Education	IN, OB	D	About 60 students, and 9 professors	2 years

Note. 'n/a' indicates information was not available in the cited studies.

^a Country codes according to ISO: Oman (OM), Saudi Arabia (SA), Spain (ES), Israel (IL), South Africa (ZA), China (CN), India (IN), Kenya (KE), Taiwan (TW), United Kingdom (GB), South Korea (KR), Hong Kong (HK), Iran (IR), Turkey (TR), Malaysia (MY).

^b Higher Education (HE), Secondary Education (SE).

^c Descriptive(D), Comparison-based (C) such as one-group pre-and-post-test design, quasi-experiment.

^d Assessment (AS), Questionnaire survey (QS), Interview (IN), Interaction Transcript (IT), Observation (OB), Social network analysis (SNA), Reflection (RF).

^e English as a Foreign Language (EFL), English as a Second Language (ESL).

minute speech and sharing the audio clip in a WhatsApp group consisting of the teacher and all other classmates (Tarighat & Khodabakhsh, 2016).

3.2. RQ2: what are the technological affordances, if any, of using MIM?

Table 5 lists the various technological affordances of MIM. Technological affordances refer to the characteristics of environmental conditions that make task completion effective and efficient (Kirschner et al., 2004). Content analysis of the previous studies revealed six different categories: temporal, user-friendly, minimal cost, multi-modality, presence awareness and compatibility. The four most frequently mentioned technological affordances were: temporal (n = total of 21 times mentioned), user-friendly (n = 12), minimal cost (n = 11), and multi-modality (n = 9) features. This suggests that temporal

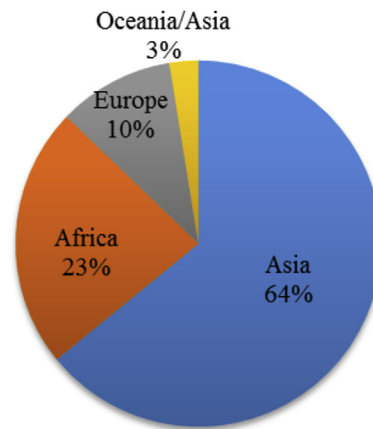


Fig. 4. Numbers of studies distributed based on geographic information.

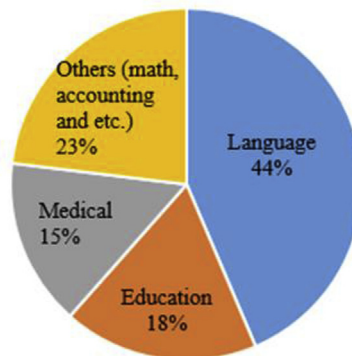


Fig. 5. Numbers of studies distributed based on subject information.

affordance, which refers to the ability of MIM to access, record, and send information conveniently via mobile phones anytime anywhere is perceived to be the most important technological affordance.

3.2.1. Minimal cost

MIM needs a mobile data plan, or the connection to a Wi-Fi network (Deloitte, 2014). Teachers and students who already own cellphone data plans will not need to pay extra money to use it (Butgereit, 2007). Compared to SMS, users could send messages on MIM apps without counting the number of words, or being deprived of multimedia content for free as long as there is free Wi-Fi network; while one SMS message could cost as much as one dollar in some parts of the world (Unuth, 2017). Almost all MIM apps also offer free voice calling over the Internet.

3.2.2. User-friendly

Using MIM apps is easy because it does not require users to have specific or advanced professional skills. WhatsApp, for instance, automatically scans through a user's address book and connects the user with other people who have WhatsApp installed on their mobile phones (Keyes, 2014). If learners perceive using a particular system will be free of effort and problem,

Table 5
Technological affordances of MIM.

Technological affordances of MIM	<i>f</i>	Sample research
Minimal cost	11	Butgereit (2007)
User-friendly	12	Allagui (2014)
Presence awareness	3	Barhoumi (2015)
Multi-modality	9	Robinson et al. (2015)
Temporal	21	Kim et al. (2014)
Compatibility	3	Zhang and Xue (2015)

they will be more inclined to accept and adopt it in practices (Davis, 1989). In particular, many digital natives born in the 1990s are already very familiar with the use of mobile Internet; hence they can get used to MIM very quickly (Chai & Fan, 2016).

3.2.3. Presence awareness

MIM is made specifically for mobile devices, not for computers, which means users can easily carry WhatsApp or WeChat in their pocket or bag (Unuth, 2017). When a new message arrives, MIM will automatically display a push notification on the smartphone screen to alert the user about the message arrival. This push notification feature helps create presence awareness that acts as a signal for one user to start conversing with another user, or with multiple users (Deloitte, 2014). The extremely popular MIM app (WhatsApp) offers an extra unique advantage – it allows a user to check if the other person has received and read the message which is not possible in emails (Khatoun, Hill, & Walmsley, 2015). This implies that the presence awareness afforded by WhatsApp can help enhance social interactions between the sender and the recipient (Buchenscheit et al., 2014). But would push notifications provide a distraction for the user whilst at work? Currently, we do not have a definite answer to this question because there is a lack of studies on this very issue. Although there is a scarcity of research into this issue in the context of MIM, the problem of distraction may not be a big concern because users can choose to control MIM notifications by allowing them to appear only during certain hours.

3.2.4. Multi-modality

Users can send multimodal messages using MIM, including emoticons, pictures, videos and files. Sending information with MIM apps is also faster than email (Isaac & de la Merced, 2015). By supporting multi-modal information transmission, students were able to demonstrate affective responses (Robinson et al., 2015), and easily send non-textual information such as geometric figures with photos taken with smartphones (Nassar, 2016).

3.2.5. Temporal

Temporal affordances refer to the ability to access material anytime anywhere, as well as to record and retrieve information (Bower, 2008). The portability of smart mobile devices (e.g., smartphones) and accessibility of MIM apps grant users the freedom to use the service anytime anywhere to chat with peers or the teacher (Kim, Lee, & Kim, 2014). It enables learners to enjoy just-in-time learning experience that they can expect to have learning support promptly and flexibly (Rambe & Bere, 2013a, 2013b; Rambe & Chipunza, 2013), with no time and space constraints. MIM also automatically saves communication records which enables users to search, retrieve and review particular posts easily and quickly (So, 2016). Such functionality may serve as an electronic notebook of content knowledge, as some students stated, “Extraction of ideas from an accessible information repository is more expedient for exam preparation than navigating primary texts.” (Rambe & Bere, 2013a, p. 553, p. 553).

3.2.6. Compatibility

Popular MIM apps, such as WhatsApp and WeChat, have been developed and published on various mobile platforms like iOS and Android. They can also be easily accessed on any desktop computers (e.g., on a Mac or PC). This may help learners keep a continuity of learning experience, and offer students more choices of platforms (mobile or desktop) to communicate (Zhang & Xue, 2015).

3.3. RQ3: what are the pedagogical affordances, if any, of using MIM in education?

This section is divided into two main sections: (1) the specific ways in which MIM was used in education; and (2) the effects of using MIM on student cognitive outcomes.

3.3.1. Specific ways in which MIM was used in education

Our analysis revealed six specific ways in which MIM was used in education: (1) journaling, (2) dialogic, (3) transmissive, (4) constructionist with peer feedback, (5) helpline, and (6) assessment, as shown in Table 6 with representative examples. The three most common ways are using MIM for dialogic, transmissive, and helpline purposes.

3.3.1.1. Journaling. This function refers to participants using MIM as a form of electronic journal to post self-reflection comments. Alsaleem (2013), for example, reported a one-group pre-post study in which 30 female students in a Saudi Arabian University journaled using WhatsApp to respond to a prompt each day over six weeks for a total of 30 entries. The WhatsApp entries were solely utilized as a form of self-reflection and self-expression. No feedback was provided by the teacher or peers. Analysis of pre-test and post-test data found that using WhatsApp as an electronic journaling tool significantly improved the participants' vocabulary and author's voice.

3.3.1.2. Dialogic. Dialogic function emphasizes the discourse between participants (Bower, Hedberg, & Kuswara, 2010). Three subcategories of dialogic-related learning activities were identified: (a) structured request/question-and-response; (b) free-flow conversation practice; and (c) focused discussion on specific class topics. In the structured request/question-and-response learning activity, students were assigned a particular role or sequence to perform. An example in which MIM was used to

Table 6

Ways in which MIM was used.

Affordance	Learning activities	Example	f*	Sample studies
Journaling Dialogic	Learner self-reflection	Using MIM to post self-reflection comments on particular topics	1	Alsalem (2014)
	Structured peer request/question-and-response for targeted language practice	Using MIM to write a request or question in English to a peer, followed by the peer's response.	3	Allagui (2014); Andujar (2016)
	Free-flow conversation practice in targeted language	Using MIM to converse with English native speakers or peers on any topic to learn the language.	2	Almekhlafy and Alzubi (2016); Lai (2016)
	Focused discussions on specific materials or topics	Using MIM to discuss particular course materials or other specific topics (e.g., sexual health) with peers (or with teachers/leaders)	15	Barhoumi (2015); So (2016); Wang et al. (2016);
Transmissive	Information delivery by teacher or students	Using MIM to disseminate information (e.g., reading materials, bite-sized multimedia materials, class announcements)	9	Bouhnik and Deshen (2014); Chai and Fan (2016);
Constructionist with peer feedback	Student individual or group production of an artifact with the help of peer feedback	Using MIM to produce a piece of essay through process writing (e.g., drafting, revising, editing), or to produce a digital video.	3	Fattah (2015); Liu and Shi (2016);
Helpline	Request for assistance concerning course work. Initiated by students	Using MIM to ask for help (from peers or teacher) regarding course subjects or questions.	7	Miller (2016) Butgereit (2007); Hazaea and Alzubi (2016);
Assessment	Submission of work for grading	Using MIM to post short course content, followed by problems which students had to solve individually.	2	Dambal et al. (2015); Tarighat and Khodabakhsh (2016)

*Note: The frequency of studies added up to more than 39 because MIM was utilized in more than one particular way in some studies.

facilitate the *structured request/question-and-response* learning activity can be found in Allagui's (2014) study. Fifty freshmen of two EFL classes at a university in Oman were grouped in pairs. Within each pair, one of the student (A) was given a specific task such as: Write an invitation in English to a friend to invite him/her to an end-of-term party. What information should you give to your friend? What does he/she need to do? The other student (B) was informed that: Your friend has invited you to an end-of-term party. You can accept or refuse the invitation. Give at least one reason. Both students (A) and (B) posted their messages on WhatsApp. The purpose of this *structured request/question-and-response* learning activity was to provide an opportunity for EFL students to practice their English skills. At the conclusion of the study, 84% of participants agreed that they liked using WhatsApp in the classroom; 80% liked the writing task; 90% agreed that they improved their English grammar; and 94% agreed that they were going to continue using WhatsApp in English outside the classroom. In another structured activity example, students were required to formulate a question in English as part of an attempt to develop EFL writing (Andujar, 2016). A different question had to be generated by a different student on WhatsApp every day. Each student had to provide at least one answer per question with no text length restriction. Students' grammatical errors were not corrected during the WhatsApp question-and-answer sessions.

The second type of learning activity involved using MIM to facilitate *free-flow English conversation practice* between EFL students and native English speakers. Unlike the *structured request or question-and-response* previously mentioned, students in *free-flow conversation practice* were not assigned any particular roles or sequence to perform. An example of this can be found in Almekhlafy and Alzubi's study (2016) in which 40 Arabian students conversed with 4 native English speakers on free-ranging topics, except sensitive topics such as religion. A majority of participants reported having a positive attitude toward WhatsApp and agreed that it helped them learn English. Analysis of interview data revealed that the use of WhatsApp raised participants' confidence and reduced the anxiety in using English. Another example is reported in Lai (2016). 45 seventh-grade students in Hong Kong formed WhatsApp groups (three students per group) on their own. A list of five highly used English verbs with Chinese translation was sent to each group every weekday. Students were required to text chat freely on any topics they liked, making use of the verbs sent to them.

The third activity involved using MIM as a platform for *focused discussions on specific topics*. Unlike *free-flow conversation*, the topics in *focused discussions* were specifically related to daily/weekly course content, or other pre-determined topics that were deemed important to participants. Willemse (2015), for example, explored the use of WhatsApp among 29 undergraduate nursing students at a university in South Africa for focused discussion among the teacher and students on related course topics (e.g., throat infection). The following extract of a WhatsApp conversation from Willemse's (2015) study is provided for illustrative purpose:

Educator: Bacterial tonsilitis [tonsillitis] is mainly caused by the bacterium called streptococcus [streptococcus]. There is high fever, difficulty in swallowing, and enlarged tonsils, sometimes with yellowish patches. The lymph glands at the angle between the lower jaw bone and the neck get enlarged and become painful. In virus tonsilitis [tonsillitis], yellowish patches do not occur, the fever is not that high, lymph gland enlargement in the neck is not so prominent and not so painful.

Participant 1: Why must you give saltwater gargles and not antiseptic gargle?

Participant 2: You can give antiseptic but saltwater is more accessible.

Participant 3: Saltwater could also be less harsh on the already sensitive/raw throat.

Educator: Antiseptic gargles should not be given as it destroys the normal flora of the mouth and has no effect on viruses. (p. 4)

In another study, Ng, Luk, and Lam (2016) described a “Principle of Accounting” class in Hong Kong where the lecturer posted several accounting related topics for students to discuss on WeChat after class. An example of a topic was: “We have learnt the topic of ‘Depreciation’. Among the 3 methods of calculation please explain only with the business-related reason(s) how a company choose a suitable method.” (p. 21) Students posted their opinions on the WeChat group, followed by comments from the lecturer. Farmer, Liu, and Dotson (2016) described the use of WhatsApp to form discussion on a specific topic (i.e., sexual/reproductive health) facilitated by trained health program leaders (Farmer et al., 2016). In this study, students in Kenya shared personal insights about sexual health and relationships, and provided feedback to each other on ways to promote sexual health for university students.

3.3.1.3. Transmissive. This function entails using MIM as a means to broadcast or disseminate information to students. Chai and Fan (2016), for example, utilized WeChat as part of a mobile-enabled flipped classroom setup to send messages to all students before class. Messages could be in the form of text, image, video, and audio related to the course content. Students read or watch these materials so that they could prepare for in-class sessions. Another example of using MIM for transmissive purpose was found in Plana et al.’s (2013) study involving 95 learners studying English at a Spanish university. During the 12-week study, texts and comprehension questions were created in SurveyMonkey. Students received links to the SurveyMonkey reading comprehension materials in a WhatsApp group every Monday, Wednesday, and Friday. They then clicked on the links to read the materials and answer comprehension questions. In this case, WhatsApp was used as a vehicle to transmit the SurveyMonkey links.

3.3.1.4. Constructionist with peer feedback. The notion of constructionist was first articulated by Seymour Papert (1986), who argued that students learn most effectively when they are constructing a meaningful product. An example whereby MIM was used to facilitate the production of an artifact was found in Fattah’s (2015) study. Fifteen students formed a WhatsApp group called “Writing Program”. Each week, students had to individually create an English essay on a specific topic. In the WhatsApp group, each student first articulated his/her own ideas about the topic (pre-writing), then wrote a draft essay (drafting). Next, students provided feedback on each other’s essay (reviewing). Students then revised their own essays based on peer feedback (editing) and posted the final version (publishing) in the WhatsApp group. In another example, undergraduate students in Hong Kong were asked to create a digital video scientific documentary (Miller, 2016). They worked in groups to write scripts, film and edit the video. WhatsApp was used to share relevant images and provide feedback.

3.3.1.5. Helpline. Butgereit (2007) reported using MIM as a helpline platform to guide school students to solve homework problems. The specific application used was MXit, a proprietary MIM software developed in South Africa, which ran on mobile phones and allowed participants to send text messages to one another. MXit also allowed for transmitting pictures and drawings but this feature was not utilized in the project. Nine undergraduates from the University of Pretoria served as volunteer tutors as part of their community based project to assist school students in their math homework. The tutors did not do any math calculations but carefully explained to the students how the problems were to be solved. Students reported that they felt that the MIM-based helpline was a success. Other studies reported students using MIM (e.g., WhatsApp) to seek help from peers and the teacher when they had difficulty in doing the reading homework (Hazea & Alzubi, 2016), or to ask clarification questions about subjects before mid-term or final examinations (Zhang & Xue, 2015). In the helpline activity, the request for help (e.g., questions) was always initiated by the students.

3.3.1.6. Assessment. Several studies used MIM as a means to conduct summative assessment. Summative assessment is used to determine student level of achievement regarding certain knowledge or skills; it is typically graded or marked. An example of using MIM for summative assessment purpose can be found in Dambal et al.’s (2015) study. 12 undergraduate medical students in an introductory ethics course formed a WhatsApp group. A series of short notes of 50–60 words long was then posted on the WhatsApp group. Each note was accompanied by a vignette of common ethical problem which students (individually) were required to solve. Students’ responses were then evaluated by two markers in order to determine how well the students performed. In another example, 17 EFL Persian students (individually) recorded a two-minute speech and shared recordings on WhatsApp (Tarighat & Khodabakhsh, 2016). The teacher scored each recorded speech as Good, Acceptable, or Not Acceptable which was then included in the students’ overall score at the end of the course.

3.3.2. Effects of using MIM on cognitive outcomes

The effect of new technology on student outcomes is one of the most important issues in education. According to the Vygotskian approach which views all human activity as mediated by tools (Vygotsky, 1978), the integration of technology into an environment is bound to transform that activity (Wertsch, 1991). New technology such as MIM may have certain pedagogical affordances that make certain types of outcomes more likely. In this section, we discuss the effects of using MIM on student cognitive outcomes such as participants’ learning performance (e.g., test scores), and the quality of group problem

solving (e.g., whether participants are able to post insightful interpretations on a topic based on relevant experience and literature or they merely repeat someone's ideas). To select eligible articles, we deployed the following more restrictive criteria:

- (a) Studies must have an experimental group and a control group.
- (b) Studies must report quantitative findings of the impact on students' cognitive outcomes such as learning performance, or quality of knowledge sharing.
- (c) Assessment of outcomes must be based on objective measures such as test scores, or relevant rubrics to measure quality.
- (d) Studies that merely relied on self-reported measures such as student questionnaire on learning were excluded.
- (e) Studies must provide statistical data such as mean, standard deviations, *t*-test, or ANOVA results. Studies that merely reported percentages of outcomes were excluded. Studies that reported inaccurate or confusing *p* values were also excluded.

A total of seven articles were found (Table 7). Six articles examined participants' learning performance (Andujar, 2016; Barhoumi, 2015; Chai & Fan, 2016; Lai, 2016; Shi & Luo, 2016; So, 2016), while one article investigated group problem solving (Kim et al., 2014). Three articles focused specifically on language learning (Andujar, 2016; Lai, 2016; Shi & Luo, 2016), one article on a research methods course (Barhoumi, 2015), one on visual communication course (Chai & Fan, 2016), one on introductory educational technology (Kim et al., 2014), and one on database management system (So, 2016). Five articles reported that there were no initial difference between experimental and control groups. However, two articles did not establish whether there was an initial difference between the two groups.

Before we discuss the impact of MIM on student cognitive outcomes, it will be useful to examine each of the seven articles more closely in order to understand how MIM was integrated into the classroom. We found six studies employing the first integration scenario (Fig. 6, after O'Brien & Hegelheimer, 2007).

In the first integration scenario, MIM was used to engage students in dialogic activities in class or after class concerning the content taught in a class, thereby providing more information, as indicated by the two-directional arrow connecting the class and MIM, with the plus sign. In other words, the MIM activity in the first integration scenario supplemented the content taught in class. For example, So (2016) sent key points and supporting multimedia materials to the WhatsApp group to consolidate the concepts presented in class, and posted related questions for students to discuss after class. In Andujar's (2016) study, WhatsApp did not substitute for explanation in class, but was used to engage students in structured question-and-response activities out of class on a daily basis to support their language practice. In another example, students were sent five English verbs each weekday on WhatsApp after school and they used MIM to text chat freely on any topics they liked, making use of the English verbs (Lai, 2016).

Students in Chai and Fan (2016) were also engaged in dialogic activities to supplement the course content. However, unlike the other six studies, they utilized the second integration scenario (Fig. 6) as in a flipped classroom setup. Before class commenced, students would receive course related materials (audio, images, and videos) sent through WeChat, and they could discuss the materials with the teacher and classmates in the WeChat group. During class, students practiced the content with the teacher's help. After class, students could continue course content discussion or seek clarification on unclear issues with the teacher and peers using WeChat group.

Overall, the research to date on the effectiveness of MIM on student cognitive outcomes can be summarized as cautiously optimistic when MIM was used to *supplement* course content in dialogic activities such as focused discussion and structured question-and-response. Five studies reported positive effect (Andujar, 2016; Barhoumi, 2015; Chai & Fan, 2016; Shi & Luo, 2016; So, 2016). In contrast, two studies reported either no effect or adverse effect of MIM use. Lai (2016) reported no significant difference in the vocabulary gain between the experimental and control groups. However, it should be noted that some students in the MIM group made very few or "naïve comments" (Novakovich, 2016) in the conversation, typically just one or two words (e.g., "yes", "no", "ok") which failed to attract their peers to respond. This "naïve" conversation could have mitigated possible vocabulary gain (Lai, 2016). Interestingly, a deeper examination on the MIM group actually revealed a positive correlation between students who chatted more frequently on MIM and vocabulary gain (Lai, 2016) – this suggested that frequent MIM use had a positive impact on students' command of vocabulary.

Kim et al. (2014) reported that MIM yielded lower *taskwork* scores when compared to the personal computer based instant messaging (PC IM) and bulletin board system (BBS) groups. *Taskwork* was defined as how well students accomplished a problem-solving task in relation to elements such as novelty, importance, and relevance. One possible reason why PC IM and BBS groups performed better in *taskwork* was that students in these two conditions could search the Internet for supporting resources *while* they were communicating with peers. Students using MIM, however, found it inconvenient to locate necessary resources when trying to communicate with peers at the same time, as stated by one participant, "multitasking is exceedingly cumbersome" (on mobile phones) (Kim et al., 2014, p. 39). The difficulty in locating necessary resources could have negatively impacted students' ability to do the task well. It should be noted that researchers in this study did *not* establish whether an initial difference existed between the MIM, PC IM, and BBS groups. Although conjectural, it is possible that participants in the PC IM and BBS groups had better problem solving ability to start with, compared to the MIM group.

Table 7

Experimental studies using MIM (EG: Experimental group using MIM, CG: Control group).

Study and type of outcome examined	Effects of using MIM on cognitive outcomes				Experimental design of MIM-supported educational activities
	Sample size	Availability of pre-test?	Statistical model	Results	
1 Andujar (2016) Learning outcome (Language learning context)	EG: 40 CG: 40	Yes	ANOVA	+ ($p < 0.05$) in favor of EG with regard to grammatical, lexical and mechanical accuracy.	EG: A different question had to be formulated by a different student each day, 7 days a week on any chosen topic. Each student had to give at least one answer per question. Sharing images and voice messages in English was allowed. Teacher participated as a student throughout the process. CG: No MIM treatment was received. <i>*No initial difference between EG and CG groups.</i>
2 Barhoumi (2015) Learning outcome (Research methods course context)	EG: 34 CG: 34	Yes	T-test	+ ($p < 0.05$) in favor of EG with regard to achievement test.	EG: The blended online course was conducted using continuity between 2 h per week in the classroom and 1 h per week of WhatsApp learning activities. The WhatsApp messenger is used to discuss content taught in-class. CG: Students participated in 2 h per week of in-class learning and an additional hour of face-to-face learning activities. <i>*No initial difference between EG and CG groups.</i>
3 Chai & Fan (2016) Learning outcome (communication course context)	EG: 60 CG: 58	Yes	T-test	+ ($p < 0.01$) in favor of EG with regard to design outcomes (problem-driven, information-driven and solution-driven cognition)	EG: Students received mobile-inverted teaching (flipped classroom), in which course materials were sent before class via WeChat official account, and students practiced knowledge in class, and were able to ask and answer questions via MIM. CG: Students received traditional teaching strategies (non-mobile-inverted teaching). <i>*No initial difference between EG and CG groups.</i>
4 Kim et al. (2014) Group problem solving (Education course context)	EG: 22 CG1: 12 CG2: 14	No	ANOVA	+ ($p < 0.001$) in favor of CGs with regard to novelty and relevance.	Students were required to discuss a problem in teams within a week. Students conducted their discussion in three groups using different platforms. EG: Mobile Instant Messaging (MIM) CG1: Personal computer based instant messaging (PC IM) CG2: Bulletin board system (BBS) <i>*This study did not establish whether there was an initial difference between The EG and CG groups.</i>
5 Lai (2016) Learning outcome (Language learning context)	EG: 24 CG: 21	Yes	T-test	No diff ($p > 0.05$) between EG and CG with regard to vocabulary gain. Nevertheless, in the EG group, a positive correlation was found between MIM chat frequency and vocabulary gain.	EG: A sample of five high-frequency English verbs was prompted each weekday for 3 months. Students were asked to chat freely on any topics they liked, using the prompted verbs as much as possible. Tutors would provide corrective feedbacks if students made mistakes. CG: No such treatment was received. <i>*This study did not indicate whether there was an initial difference between The EG and CG groups.</i>
6 Shi and Luo (2016) Learning outcome (Language learning context)	EG: 30 CG: 30	Yes	T-test	+ ($p < 0.05$) in favor of EG with regard to language translation test scores.	EG: Teacher shared translation materials on a WeChat public account. Students sent their translated texts, and teachers and classmates can comment on the translation. CG: No such treatment was received. <i>*No initial difference between EG and CG groups.</i>
7 So (2016) Learning outcome (Database mgmt. course context)	EG: 31 CG: 30	Yes	ANCOVA	+ ($p < 0.05$) in favor of EG with regard to course content test scores.	EG: Key points and supporting multimedia materials were provided in WhatsApp group to consolidate the concepts presented in class. The teacher posted questions and encouraged students to answer. Students could also ask and discuss any queries. CG: The use of WhatsApp was limited for administrative support only. <i>*No initial difference between EG and CG groups.</i>

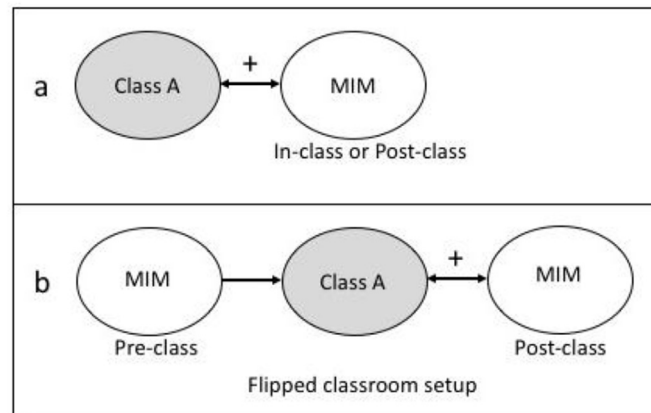


Fig. 6. Schematic integration scenarios of MIM.

3.4. RQ4: what are the social affordances, if any, of using MIM?

Table 8 lists studies that specifically examined whether MIM can facilitate the development of social presence among participants. Five studies utilized content analysis method to examine the manifestation of social presence, while one interviewed the participants (high school teachers). Common indicators of social presence as reported in the literature include affective responses (e.g., the expression of feelings, emotion, and self-disclosure), interactive responses (e.g., acknowledgement the comments of others, explicit reference to others' messages), and cohesive responses (e.g., vocatives, and salutations) (Rourke, Anderson, Garrison, & Archer, 2007; Smit & Goede, 2013). Expressions of affect such as emoticons, humor, and self-disclosure can help users express missing nonverbal cues in written form (Gunawardena & Zittle, 1997), start a conversation (Gorham & Christophel, 1990), convey good will (Gorham & Christophel, 1990), and create a friendly environment. Self-disclosure of personal information helps individuals know each other more, and establish trust (Cutler, 1995). Acknowledgement expressions include statements of appreciation of other people or contents of others' messages. They can

Table 8
Studies that examined social presence.

Study	Sample	Data analysis	Finding
Bouhnik and Deshen (2014)	12 high school teachers in Israel	Participant interview	Self-disclosure of personal details (e.g., "I upload personal things as well ... it creates a fun feeling with the class")
Miller (2016)	English for specific purpose course. Four female students in a HK university.	Content analysis of WhatsApp messages	Emoticons and salutations were found (e.g., "have a happy Chinese New Year!!!! [graphic emoticon]")
Rambe and Bere (2013b)	Information Technology course. 77 students in an South African university.	Content analysis of WhatsApp messages	Use of humor (e.g., "how do you know that I am here for the idol audition? I am gonna be the next SA model. You are so right sir, you are the next SA wooden mic model")
Robinson et al. (2015)	11 freshmen radiography students in the U.K.	Content analysis of WhatsApp messages	Expressions of humor; use of humor; expressions of compliment (e.g., "Well done about your assessments"); vocatives (e.g., "Tim, so impressed with your skeleton"); addressing group as we (e.g., "I feel we have the best team"); salutations (e.g., "Have a great time Leslie")
Smit and Goede (2013)	65 students in an information technology course in South Africa.	Content analysis of BBM messages	Expressions of appreciation (e.g., "Ooh ... thank you for telling me to review the semester tests")
Wang et al. (2016)	Language learning course. Two groups of students (n = 30 total), one from a third-year Mandarin class at an Australian university and the other an English class in a Taiwan university.	Content analysis of WeChat messages	Emoticons, followed by photos were the two features most frequently used to express emotion and to create a friendly atmosphere. Among the emoticons, smiling faces and thumbs-up were used most frequently.

help convey good will. Cohesive responses such as salutations (i.e., greetings) and vocatives (i.e., addressing participants by name) help users establish relationship with other people (Bussmann, 1998; Eggins & Slade, 1997; Rourke et al., 2007).

Findings of previous studies clearly suggest that social presence can be easily established in an MIM environment. For example, Wang et al. (2016) reported that the two most frequently used features to express affect were emoticons (72%) and photos (21%). Among emoticons, smiling faces and thumbs-up were used most frequently. Participants used pictures to show an event, to show objects, people, or places, and to show something being talked about. Anecdotal data suggested that MIM fostered more affective responses (e.g., praising other student's utterances) compared to a discussion board such as Black-Board online forum.

Overall, MIM appears to facilitate social presence due to two factors. The first factor is probably the friendly environment with lively features being integrated into one interface such as audio and video, and the easy availability of emoticons and stickers (Wang et al., 2016). Audio can help convey feelings and liven up the text chats, and emoticons can show how one is feeling (Wang et al., 2016). The main purposes of using emoticons include showing surprise, laugh, praise or embarrassment, and agreement. The use of multimedia elements enables users to conveniently demonstrate their *affective responses* with simply one click (Robinson et al., 2015).

The second factor is the immediacy of being alerted of message arrival, and being able to respond in a timely fashion (Robinson et al., 2015). This immediacy increased the likelihood of user interaction (Robinson et al., 2015). The increasing interactivity in the semi-synchronous interaction is conducive to social presence, compared with that in a sole asynchronous text-based discussion, such as BBS, which was accused of showing low interactivity (Garrison, Anderson, & Archer, as cited in Wang et al., 2016).

Students also perceived closer teacher-student relationship with using MIM (Andujar, 2016), as teachers became more approachable. Students felt more comfortable to ask teachers questions, and teachers also got to know students better. A teacher in Bouhnik and Deshen's (2014) study stated that, "even though I started off the year by telling them [the students] they can approach me anytime, they hesitated to call. With WhatsApp, they feel free." (p. 227).

3.5. RQ5: what are challenges, if any, of using MIM in education?

Although using MIM makes available positive envisions of promoting better learning contexts and outcomes, researchers also found challenges to implement it in education. Four categories of challenges emerged, namely insufficient facility support, informal language use, inappropriate utilization and other side-effects. Table 9 displays a summary of these challenges.

The most frequently reported challenge is about facilities, including device ownership, internet access and application access. First, despite the increasing smart phone ownership, it has not reached a level where every student owns one that is sufficiently functional to fulfill all learning purposes (Ngaleka & Uys, 2013). Secondly, users worry about the network infrastructure that provides poor internet connection (Allagui, 2014). This interruption will negatively interfere with learners' attention continuance and learning. Thirdly, learners complained about the small keyboard and screen on mobile phones constraining them from typing a lengthy opinion or response, and difficulty to search for resources on cellphones (Kim et al., 2014).

Another frequently reported challenge of using MIM in education, especially in foreign language learning context, is students' informal language use. When communicating on social media platforms, students tend to use informal language, such as shortenings, slangs, and emoticons (e.g. Almekhlafy & Alzubi, 2016). Educators showed concerns over this phenomenon (Bouhnik & Deshen, 2014). On the one hand, teachers tried hard to create more authentic language exposure and communicative opportunities. On the other hand, informal utterances would not reinforce the correct grammar and standard pragmatics of the targeted language.

Thirdly, regarding the pedagogical use, researchers reported several inappropriate means of using MIM. Cheating was one of them. Tarighat and Khodabakhsh (2016) found that at the beginning of the experimental period, students would "refer to" others' responses that had already been posted. Although easily identifiable, such plagiarism was unfavorable and required additional teacher interference and guidance. Besides, convergent conversation was sometimes hard to be

Table 9
Challenges of using MIM in education.

Challenges	Subcategories	f	Sample research
Insufficient facility support	Insufficient smartphone ownership	2	Bouhnik and Deshen (2014)
	Unstable Internet connectivity	4	Allagui (2014)
	Cellphone constraints, such as small keyboard and screen	3	Dambal et al. (2015)
Informal language use	The prevalent use of shortenings (e.g., <i>Thnx for this info.</i>)	3	Almekhlafy and Alzubi (2016)
Inappropriate utilization	Cheating	1	Tarighat and Khodabakhsh (2016)
	Incoherent conversations	1	Kim et al. (2014)
Other side effects	Time consuming	1	Hazaea and Alzubi (2016)
	Irrelevant or inappropriate information	2	Hazaea and Alzubi (2016)
	Information overload	2	Bouhnik and Deshen (2014)
	Interference with private life	4	So (2016)

realized, because some students only focused on typing their opinions without reviewing or considering others' postings (Kim et al., 2014).

Additionally, some other negative effects of using MIM were reported. For example, students thought using MIM was time consuming, and it sometimes contained irrelevant information (Hazaea & Alzubi, 2016), or too much information (Bouhnik & Deshen, 2014). They also disliked receiving instructional materials and messages *outside* school hours, which could interfere with their private lives (So, 2016), especially for adult learners with families (Rambe & Bere, 2013a). Although some instructors had no apprehensions about students messaging them through MIM, others did not feel comfortable using their private phone number in this way because they felt that work and private life should be kept separate (Khatoon et al., 2015).

4. Discussion

It is speculated that the use of MIM in education will continue expand in succeeding years, with the continuous growth of smartphone ownership. In this study, we identified 39 empirical studies and reviewed them in order to provide a comprehensive picture of how MIM has been used in the educational field, and what possible impact it has generated on student learning and social presence. The following Discussion section is divided into two main sub-sections: (1) implications of the current study, and (2) suggestions for future research. In the first sub-section, we revisited the major findings of all the research questions (RQs 2–5), and discussed several implications arising from the present review of the technological, pedagogical and social affordances of MIM.

4.1. Implications of the current study

First, the present review implies that MIM can foster communication more readily due to its various technological affordances. MIM can serve as a useful channel to facilitate the flow of information and idea sharing among students and teachers. Four most frequently mentioned technological affordances of MIM were revealed – temporal, user-friendly, minimal cost, and multi-modality features. Put another way, MIM, which is designed for mobile use, offers users a very convenient mode of communication compared to desktop computers and laptops. Using mobile phones with MIM, users can easily chat with peers or teachers anytime and anywhere they prefer. In addition, the integration of audio, text, and video into one interface makes MIM a very user-friendly 'all-in-one' multi-modal platform for users to send messages without cost as long as a free Wi-Fi network is available. Users can take a photo using the mobile phone built-in camera, attach it immediately to a MIM app such as WhatsApp or WeChat, type some text to accompany the photo, and send it to some other people very easily. There is no need to use a separate digital camera, save the photo to a computer or laptop, and later upload the photo unto WhatsApp or WeChat. No other technological tools (e.g., learning management system via desktop computers, or laptops) can rival mobile phone-enabled MIM in such temporal, user-friendly, minimal cost, and multi-modality affordances.

Second, the present review reveals six specific ways in which MIM can be used in education. In Table 6, we categorized and listed actual examples of these six MIM-supported educational activities. These examples can provide useful guidance or ideas for educators to try out in their classrooms. Educators can apply or modify these MIM supported activities to suit their teaching and learning contexts. More specifically, the present review suggests that MIM can support language learning when it is used to facilitate dialogic activities such as focused discussion, and structured question-and-response on specific topics outside school hours. For each particular dialogic activity, we provided two specific examples of education activity. We believe these examples can suggest useful guidelines for educators to implement in their own educational settings.

Among the five studies reporting positive effect of using MIM on content learning, three of them focused on language learning contexts. This finding supports the "communicative language teaching" initiative (Savignon, 1987), in which foreign language learners can learn the targeted language better through interaction, rather than through discrete grammar drilling. MIM can help foster interaction outside school hours because it is a ubiquitous social communication tool which allows learners to be engaged in dialogic discourses at anytime and anywhere. Furthermore, the quasi-synchronous nature of MIM and its keeping of chat records in history can help promote language development benefits such as negotiation for meaning (Smith, 2003; Sotillo, 2000). Negotiation for meaning is produced when learners perceive problems within a communication; the recipient then asks for message clarification and confirmation; this is followed by the sender repeating, elaborating, or simplifying the original message (Pica, 1994). Compared to real-time face-to-face interaction, the quasi-synchronous nature of MIM gives learners more space and time to think before responding, while the chat records help learners review the conversation contents easily (So, 2016).

The present review also suggests that MIM can foster the development of social presence in online interaction. This can have direct practical implication on fully online courses. Students in fully online courses do not meet face-to-face regularly, which can result in feelings of isolation and loneliness. Teachers may consider inviting their fully online students to introduce themselves using MIM particularly at the start of a course in order to facilitate affective or emotional expressions among the learners. Emotional expressions such as smiling faces and thumbs-up can help students convey nonverbal cues, promote good will, and start a conversation (Gorham & Christophel, 1990). Nonverbal cues help contribute to "the degree of social presence of a communication medium" (Gunawardena, 1995, p. 151). Social presence can help reduce feelings of stress and loneliness among online students (Whiteside, Dikkers, & Lewis, 2014).

Fourth, the present review enhances our theoretical understanding of social presence theory. This review reveals two specific factors that could help people project themselves socially and emotionally as real people in MIM. These factors are

due to MIM technological affordances, namely multi-modality, and presence awareness. Use of multi-modality elements such as audio, video, and emoticons via MIM gives users the ability to convey affective messages with simply one click (Robinson et al., 2015). Some MIM apps such as WeChat even allow users to design and launch their own set of emoticons in order to project their personal identities and feelings more uniquely. Presence awareness, which is created when a message notification arrives, helps increase the likelihood of user response (Robinson et al., 2015) when compared to asynchronous forums (Wang et al., 2016), or emails. Shirazi et al. (2014) reported that users consider MIM notifications highly important, that users rarely block the notifications, and that the time users explicitly click a notification message after it appears is typically very short (15 s median delay) when compared to emails.

Finally, with regard to addressing the challenges identified in previous studies, it might be useful to consider setting certain ground rules prior to using MIM. For example, norms such as formal language use (e.g., use proper pronunciations, and full sentences), and prescribed time-window for interaction could help overcome challenges such as MIM intruding into students' private or family life. Technically, students can also be taught how to turn off notifications from MIM, or how to allow notifications to appear only within certain time period. In addition, since the impact of using MIM and learning gain is related to how students perceive its usefulness, and how frequent they decide to use MIM (Lai, 2016), teachers may consider explicitly elaborating on the purposes and advantages prior to the implementation of MIM. By doing so, students will be more prepared to participate in the MIM-related activities, and achieve the expected learning outcomes.

4.2. Suggestions for future research

First of all, findings related to the possible effect of MIM on improving student cognitive outcomes, although interesting, should be viewed with some caution. For example, only seven quasi-experimental articles investigating the effectiveness of MIM on cognitive outcome were found to sufficiently meet our more stringent criteria for examining impact. Of these seven articles, two failed to establish whether there was any initial difference between the experimental and control groups. So far, articles examining social presence were merely one-group descriptive studies. No studies were found that actually compared occurrences of social presence between MIM and other forms of computer-mediated communications such as discussion forums. It will therefore be useful to conduct more comparison-based studies that empirically examined the impact of MIM on both cognitive outcomes and social presence. One possible research direction is to investigate the use of MIM versus threaded asynchronous forums in supporting student learning and social presence.

Second, one subject area – foreign language teaching and learning, is notably more explored in previous studies than other subjects. The possible impact of MIM on the learning of other subjects is insufficiently presented. Subjects such as history and business may provide ample opportunities for student discussions and communication, yet we do not have empirical evidence on whether using MIM is beneficial or not in these classes. Therefore, future research may consider exploring the use of MIM in other subject areas in order to enrich our understanding of all possible educational potentials of MIM tools.

Third, the majority of studies identified were conducted in higher education or adult education settings. Hitherto, only three studies have been conducted in secondary school level, and no work has been found in primary schools. However, statistics told us that among the 14 to 18-year-olds polled in the US, 87% said they “own and use” a smartphone (eMarketer, 2016) and a 2014 statistical figure showed that WhatsApp had a 160% increase in use by teens with mobile internet access in 2013 (MarketingProfs, 2014). Considering the enormous market expansion of MIM app among teenagers, there exists a big gap between the practice and research. We cannot neglect the use of teenagers if we want to fully exploit the potentials of MIM supporting teaching and learning. Future researchers are advised to bridge this gap.

Fourth, a majority of previous studies on MIM lasted from a few weeks to one semester. Short-duration studies tend to run the risk of novelty effect. Novelty effects with new system such as MIM can confound a study due to the tendency of participants to pay increased interest or attention to technology new to them (Clark, 1983). No studies in current review were extended beyond 1 year. It will therefore be useful for researchers to conduct longitudinal studies on MIM. A longitudinal study can be defined as a study where “information is repeatedly collected overtime on the same sample of individuals” (Goldstein, 1968, p. 95). In order for educators to evaluate the long-term effect of using MIM more adequately, longitudinal studies of at least two years should be conducted.

Fifth, we do not really know how different students may experience MIM and are engaged by it. One potentially useful research direction would be to examine distinct student behavioral and performance patterns taking a longitudinal MIM-supported course. To help us understand how different students might behave in their MIM usage according to their daily performance, a cluster analysis using different performance and behavioral measures could be run. Conducting such a longitudinal study will help us understand how various student cluster may evolve and yield useful guidelines to design appropriate MIM activity to engage different students.

Sixth, few studies interviewed instructors about their willingness and concerns to use MIM. The perspectives and experiences of instructor use of MIM are underrepresented in the literature. Teachers need to get prepared before they can teach students well. Therefore, adequate knowledge of how teachers perceive MIM use, is essential to understand why they choose to use it, and how to enhance the overall efficiency of using it to benefit both teachers and students. As Law (2008) suggest, teacher knowledge is critical to the successful adoption of technology in education. Future studies could be conducted to investigate teachers' voices rather than merely focus on students' perspectives.

5. Conclusion

The use of mobile communication services commonly known as mobile instant messaging (MIM) has gained considerable attention in recent years. Yet, to date no comprehensive review on how MIM applications can be used for teaching and learning has been conducted. To address this knowledge gap, we identified and analyzed 39 eligible articles in order to examine the possible technological, pedagogical, and social affordances of MIM.

Overall, our review found six technological affordances of MIM; out of which the temporal affordance is perceived to be the most important affordance. The research to date suggested that MIM can be effective in improving student learning when it is used to facilitate dialogic activities such as focused discussion, and structured question-and-response, particularly in the context of foreign or second language learning. Findings also suggest MIM can foster more affective expressions than other forms of computer-mediated communications. Several challenges of using MIM were found including internet access issues, improper language use and interference with private lives. Based on our review of the literature, we discussed several implications concerning MIM use in education, and suggested six directions for future research. We hope this review will promote further research among other scholars similarly interested in using MIM for teaching and learning purposes.

References

(*References marked with an asterisk indicate the studies included in this review).

- * Allagui, B. (2014). Writing through WhatsApp: An evaluation of students writing performance. *International Journal of Mobile Learning and Organisation*, 8(3–4), 216–231.
- * 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). Retrieved from <http://www.academia.edu/download/45411020/23.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.
- Anderson, M. (2015, October 29). Technology device ownership: 2015. Retrieved from <http://www.pewinternet.org/2015/10/29/technology-device-ownership-2015/>.
- * 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>.
- * 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.
- * Bouhnik, D., & Deshen, M. (2014). WhatsApp goes to school: Mobile instant messaging between teachers and students. *Journal of Information Technology Education: Research*, 13, 217–231.
- Bower, M. (2008). Affordance analysis—matching learning tasks with learning technologies. *Educational Media International*, 45(1), 3–15.
- Bower, M., Hedberg, J. G., & Kuswara, A. (2010). A framework for Web 2.0 learning design. *Educational Media International*, 47(3), 177–198.
- * Bozoglan, H., & Gok, D. (2016). Effect of mobile-assisted dialect awareness training on the dialect attitudes of prospective English language teachers. *Journal of Multilingual and Multicultural Development*, 1–16.
- Buchenscheit, A., Konings, B., Neubert, A., Schaub, F., Schneider, M., & Kargl, F. (2014). Privacy implications of presence sharing in mobile messaging applications. In *Proceedings of the 13th international conference on mobile and ubiquitous multimedia* (pp. 20–29). Melbourne, Victoria, Australia: ACM Press.
- Burden, K., & Atkinson, S. (2008). Evaluating pedagogical affordances of media sharing Web 2.0 technologies: A case study. *Proceedings Ascilite Melbourne*, 121–125.
- Bussmann, H. (1998). Phatic communion. In G. Trauth, K. Kazzazi, & K. Kazzazi (Eds.), *Routledge dictionary of language and linguistics* (p. 358). London: Routledge.
- * Butgereit, L. (2007). Math on MXit: Using MXit as a medium for mathematics education. In *Proceedings of meraka INNOVATE conference for educators* (pp. 18–20). Pretoria: CSIR. April 2007, pp 13. Retrieved on May 6, 2017 from https://www.researchgate.net/profile/Laurie_Butgereit/publication/30510225_Math_on_MXit_using_MXit_as_a_medium_for_mathematics_education/links/02e7e5236bfb1cfee000000.pdf.
- Caro-Alvaro, S., Garcia-Cabot, A., Garcia-Lopez, E., de-Marcos, L., & Martinez-Herráiz, J.-J. (2015). Evaluating the usability of mobile instant messaging apps on iOS devices. In *Presented at the ICSEA 2015: The Tenth International Conference on Software Engineering Advances* (pp. 286–289). Barcelona, Spain. Retrieved from https://www.thinkmind.org/index.php?view=article&articleid=icsea_2015_11_20_10234.
- Chaffey, D. (2016, October 26). Statistics on consumer mobile usage and adoption to inform your mobile marketing strategy mobile site design and app development. Retrieved from <http://www.smartinsights.com/mobile-marketing/mobile-marketing-analytics/mobile-marketing-statistics/>.
- * Chai, J. X., & Fan, K. K. (2016). Mobile inverted constructivism: Education of interaction technology in social media. *EURASIA Journal of Mathematics, Science & Technology Education*, 12(7) <https://doi.org/10.12973/eurasia.2016.1522a>.
- * Chen Hsieh, J. S., Huang, Y. M., & Vivian Wu, W. C. (2017). Technological acceptance of LINE in flipped EFL oral training. *Computers in Human Behavior*, 70, 178–190 <https://doi.org/10.1016/j.chb.2016.12.066>.
- Cheung, W. S., & Hew, K. F. (2009). A review of research methodologies used in studies on mobile handheld devices in K-12 and higher education settings. *Australasian Journal of Educational Technology*, 25(2), 153–183.
- Church, K., & de Oliveira, R. (2013). What's up with WhatsApp?: comparing mobile instant messaging behaviors with traditional SMS. In *Proceedings of the 15th international conference on Human-computer interaction with mobile devices and services* (pp. 352–361). ACM. Retrieved from <http://dl.acm.org/citation.cfm?id=2493225>.
- Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, 53(4), 445–459.
- Cutler, R. H. (1995). Distributed presence and community in cyberspace. *Interpersonal Computing and Technology: An Electronic Journal for the 21st Century*, 3(2), 12.
- * Dambal, A., Nimbai, N., S T, K., R K, R., Bhavane, A., Pise, G., et al. (2015). Perceptions of interns towards a module for teaching medical ethics using the Android smartphone application WhatsApp. *Journal of Evolution of Medical and Dental Sciences*, 4(82), 14270–14276 <https://doi.org/10.14260/jemds/2015/2030>.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319–340.
- Deloitte. (2014). Short messaging services versus instant Messaging: Value versus volume. Retrieved January 18, 2017, from <https://www2.deloitte.com/content/dam/Deloitte/in/Documents/technology-media-telecommunications/in-tmt-telecom-predictions-noexp.pdf>.
- * Ding, X. W. (2016). The effect of WeChat-assisted problem-based learning on the critical thinking disposition of EFL learners. *International Journal of Emerging Technologies in Learning (IJET)*, 11(12), 23 <https://doi.org/10.3991/ijet.v11i12.5927>.
- Eggins, S., & Slade, D. (1997). *Analyzing casual conversation*. Washington, DC: Cassell.
- eMarketer. (2015). Mobile messaging to reach 1.4 billion worldwide in 2015. Retrieved January 18, 2017, from <https://www.emarketer.com/Article/Mobile-Messaging-Reach-14-Billion-Worldwide-2015/1013215>.

- eMarketer. (2016). *Teens' ownership of smartphones has surged*. Retrieved January 18, 2017, from <https://www.emarketer.com/Article/Teens-Ownership-of-Smartphones-Has-Surged/1014161>.
- * 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), S54–S55.
- * Fattah, S. F. E. S. A. (2015). The effectiveness of using WhatsApp messenger as one of mobile learning techniques to develop students' writing skills. *Journal of Education and Practice*, 6(32), 115–127.
- Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2), 87–105.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine De Gruyter.
- Goldstein, H. (1968). Longitudinal studies and the measurement of change. *Journal of the Royal Statistical Society. Series D (The Statistician)*, 18(2), 93–117.
- Gorham, J., & Christophel, D. M. (1990). The relationship of teachers' use of humor in the classroom to immediacy and student learning. *Communication Education*, 39(1), 46–62.
- Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications*, 1(2), 147–166.
- Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *American Journal of Distance Education*, 11(3), 8–26.
- * Han, T., & Keskin, F. (2016). Using a mobile application (WhatsApp) to reduce EFL speaking anxiety. *GIST Education and Learning Research Journal*, (12), 29–50.
- * 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 <https://doi.org/10.5539/elt.v9n5p8>.
- Hwang, G. J., & Tsai, C. C. (2011). Research trends in mobile and ubiquitous learning: A review of publications in selected journals from 2001 to 2010. *British Journal of Educational Technology*, 42(4), E65–E70.
- Isaac, M., & de la Merced, M. J. (2015). *Why apps for messaging are trending*. The New York Times. Retrieved on April 29, 2017 from https://www.nytimes.com/2015/01/26/technology/why-apps-for-messaging-are-trending.html?_r=0.
- Keyes, A. (2014). *An app worth \$16 billion? 8 reasons why WhatsApp is so popular*. NBC News. Retrieved on May 1, 2017 from <http://www.nbcnews.com/nightly-news/app-worth-16-billion-8-reasons-whatsapp-so-popular-n34141>.
- * Khatoon, B., Hill, K. B., & Walmsley, A. D. (2015). Instant messaging in dental education. *Journal of Dental Education*, 79(12), 1471–1478.
- * Kim, H., Lee, M. Y., & Kim, M. (2014). Effects of mobile instant messaging on collaborative learning processes and outcomes: The case of South Korea. *Educational Technology & Society*, 17(2), 31–42.
- Kirschner, P., Srijbs, J. W., Kreijns, K., & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational Technology Research and Development*, 52(3), 47–66.
- Korpershoek, H., Harms, T., de Boer, H., van Kuijk, M., & Doolaard, S. (2016). A meta-analysis of the effects of classroom management strategies and classroom management programs on students' academic, behavioral, emotional, and motivational outcomes. *Review of Educational Research*, 86(3), 643–680.
- Kreijns, K., & Kirschner, P. A. (2001). The social affordances of computer-supported collaborative learning environments. In *Frontiers in education conference, 2001. 31st annual* (Vol. 1, p. T1F-12). IEEE. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=963856.
- * Lai, A. (2016). Mobile immersion: An experiment using mobile instant messenger to support second-language learning. *Interactive Learning Environments*, 24(2), 277–290 <https://doi.org/10.1080/10494820.2015.1113706>.
- Law, N. (2008). Teacher learning beyond knowledge for pedagogical innovations with ICT. In *International handbook of information technology in primary and secondary education* (pp. 425–434). Springer.
- Leung, O. (2016, November 15). *Chapter 1: What is mobile instant messaging?*. Retrieved January 18, 2017, from <https://dzone.com/articles/chapter-1-what-is-mobile-instant-messaging>.
- * Liu, R., & Shi, C. (2016, July). Investigating collaborative learning effect in blended learning environment by utilizing moodle and WeChat. In *International conference on blending learning* (pp. 3–13). Springer International Publishing.
- * Makoe, M. (2010). Exploring the use of MXit: A cell-phone social network to facilitate learning in distance education. *Open Learning*, 25(3), 251–257.
- MarketingProfs. (2014). *WhatsApp by the Numbers: Where It's popular; teen usage stats*. Retrieved January 18, 2017, from <http://www.marketingprofs.com/charts/2014/24497/whatsapp-by-the-numbers-where-its-used-most>.
- * Miller, L. (2016). Collaborative script writing for a digital media project. *Writing & Pedagogy*, 8(1), 215–228 <https://doi.org/10.1558/wap.v8i1.27593>.
- * Mi, G. M., & Meerasa, S. S. (2016). Perceptions on m-learning through WhatsApp application. *Journal of Education Technology in Health Sciences*, 3(2), 57–60.
- * Mohammadi, M., & Safdari, N. (2015). Pedagogical values of mobile-assisted task-based activities to enhance speaking skill. In F. Helm, L. Bradley, M. Guarda, & S. Thouesny (Eds.), *Critical CALL – proceedings of the 2015 EUROCALL conference, Padova, Italy* (pp. 416–420). Research-publishing.net. Retrieved on May 6, 2017 from <https://doi.org/10.14705/rpnet.2015.000368>.
- * Nassar, D. (2016). Using social network as an education enhancement tools a case study of using WhatsApp in Princess Nourah University. *Journal of Educational & Instructional Studies in the World*, 6.
- * Ngaleka, A., & Uys, W. (2013). M-learning with WhatsApp: A conversation analysis. In *International Conference on e-Learning* (p. 282). Academic Conferences International Limited. Retrieved from <http://search.proquest.com/openview/d5bebb577d879e5cfeec5c635e0a8924/1?pq-origsite=gscholar>.
- * 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 *Proceedings of the 2016 international symposium on educational technology (ISET)* (pp. 18–22). Beijing: IEEE press. Retrieved from May 6, 2017 from <https://doi.org/10.1109/ISET.2016.10>.
- Nielsen, J. (1994). *Usability engineering*. Elsevier.
- Norman, D. A. (1988). *The psychology of everyday things*. Basic books.
- Novakovich, J. (2016). Fostering critical thinking and reflection through blog-mediated peer feedback. *Journal of Computer Assisted Learning*, 32(1), 16–30.
- O'Brien, A., & Hegelheimer, V. (2007). Integrating CALL into the classroom: The role of podcasting in an ESL listening strategies course. *ReCALL*, 19(2), 162–180.
- Papert, S. (1986). *Constructionism: A new opportunity for elementary science education*. Massachusetts Institute of Technology, Media Laboratory, Epistemology and Learning Group.
- Pica, T. (1994). Research on negotiation: What does it reveal about second-language learning conditions, processes, and outcomes? *Language Learning*, 44, 493–527.
- Pimmer, C., Mateescu, M., & Gröbhel, U. (2016). Mobile and ubiquitous learning in higher education settings. A systematic review of empirical studies. *Computers in Human Behavior*, 63, 490–501.
- * Plana, M. G.-C., Escofet, M. I. G., Figueras, I. T., Gimeno, A., Appel, C., & Hopkins, J. (2013). Improving learners' reading skills through instant short messages: A sample study using WhatsApp. In *Paper presented at global perspectives on computer-assisted language learning, glasgow, the great britain*. Retrieved from http://s3.amazonaws.com/academia.edu.documents/35967655/270_GutierrezColon.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1485926978&Signature=vPgbe6q%2FRK7Q17669VFS7Zcf030%3D&response-content-disposition=inline%3B%20filename%3DImproving_learners_reading_skills_through.pdf.
- Quan-Haase, A. (2008). Instant messaging on campus: Use and integration in university students' everyday communication. *The Information Society*, 24(2), 105–115. <https://doi.org/10.1080/01972240701883955>.

- * Rambe, P., & Bere, A. (2013a). Using mobile instant messaging to leverage learner participation and transform pedagogy at a South African University of Technology: Using instant messaging to leverage participation. *British Journal of Educational Technology*, 44(4), 544–561 <https://doi.org/10.1111/bjet.12057>.
- * Rambe, P., & Bere, A. (2013b). Using social embeddedness to explore ubiquitous learning in mobile environments at a South African university of technology. In *International Conference on e-Learning* (pp. 353–362). Academic Conferences International Limited. Retrieved from <http://search.proquest.com/openview/17c5535bb6818eeebd335ca862cd4172/1?pq-origsite=gscholar>.
- * Rambe, P., & Chipunza, C. (2013). Using mobile devices to leverage student access to collaboratively-generated resources: A case of WhatsApp instant messaging at a South African university. In *Proceedings of the international conference on advanced information and communication technology for education* (pp. 331–337). Atlantis Press. Retrieved on May 6, 2017 from <https://doi.org/10.2991/icaicte.2013.66>.
- Robey, D., Anderson, C., & Raymond, B. (2013). Information technology, materiality, and organizational change: A professional odyssey. *Journal of the Association for Information Systems*, 14(7), 379.
- * Robinson, L., Behi, O., Corcoran, A., Cowley, V., Cullinane, J., Martin, I., et al. (2015). Evaluation of WhatsApp for promoting social presence in a first year undergraduate radiography problem-based learning group. *Journal of Medical Imaging and Radiation Sciences*, 46(3), 280–286 <https://doi.org/10.1016/j.jmir.2015.06.007>.
- Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (2007). Assessing social presence in asynchronous text-based computer conferencing. *International Journal of E-learning & Distance Education*, 14(2), 50–71.
- Rovai, A. P. (2002). Building sense of community at a distance. *The International Review of Research in Open and Distributed Learning*, 3(1). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/viewArticle/79>.
- Savignon, S. J. (1987). Communicative language teaching. *Theory Into Practice*, 26(4), 235–242.
- Schwarz, O. (2011). Who moved my conversation? Instant messaging, intertextuality and new regimes of intimacy and truth. *Media, Culture & Society*, 33(1), 71–87.
- * Shi, Z., & Luo, G. (2016). Application of WeChat teaching platform in interactive translation teaching. *International Journal of Emerging Technologies in Learning (IJET)*, 11(9), 71 <https://doi.org/10.3991/ijet.v11i09.6113>.
- Shirazi, A. S., Henze, N., Dingler, T., Pielot, M., Weber, D., & Schmidt, A. (2014). Large-scale assessment of mobile notifications. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 3055–3064). New York, NH: ACM Press.
- * Smit, I., & Goede, R. (2013). Dooyeweerd is watching you: Using instant messaging to prepare for assessment. In *International Conference on e-Learning* (p. 386). Academic Conferences International Limited. Retrieved from <http://search.proquest.com/openview/0bf0791cee0aa8dad01906c5601db427/1?pq-origsite=gscholar>.
- Smith, B. (2003). Computer-mediated negotiated interaction: An expanded model. *The Modern Language Journal*, 87, 38–54.
- * 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>.
- Sotillo, S. (2000). Discourse functions and syntactic complexity in synchronous and asynchronous communication. *Language Learning & Technology*, 4, 82–119.
- Statista. (2017). Most popular messaging apps 2016. Retrieved January 18, 2017, from <https://www.statista.com/statistics/258749/most-popular-global-mobile-messenger-apps/>.
- * Tarighat, S., & Khodabakhsh, S. (2016). Mobile-assisted language assessment: Assessing speaking. *Computers in Human Behavior*, 64, 409–413 <https://doi.org/10.1016/j.chb.2016.07.014>.
- Tencent, I. (2016). *The 2016 WeChat data report*. Retrieved January 18, 2017, from <http://blog.wechat.com/2016/12/29/the-2016-wechat-data-report/>.
- Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of college attrition*. Chicago, IL: University of Chicago Press.
- Tu, C. H. (2000). On-line learning migration: From social learning theory to social presence theory in a CMC environment. *Journal of Network and Computer Applications*, 23(1), 27–37.
- Unuth, N. (2017). Why WhatsApp is so popular? *LifeWire*. Retrieved on May 1, 2017 from <https://www.lifewire.com/reasons-why-whatsapp-is-popular-3426372>.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher mental process*. Cambridge, MA: Harvard University Press.
- * 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).
- Wertsch, J. V. (1991). *A sociocultural approach to socially shared cognition*. Retrieved from <http://psycnet.apa.org/books/10096/004>.
- WhatsApp. (2016). *About WhatsApp*. Retrieved January 18, 2017, from <https://www.whatsapp.com/about/>.
- Whiteside, A., Dijkers, A., & Lewis, S. (2014). The power of social presence for learning. *EDUCAUSE Review*. Retrieved on May 6, 2017 from <http://er.educause.edu/articles/2014/5/the-power-of-social-presence-for-learning>.
- * Willemse, J. J. (2015). Undergraduate nurses reflections on WhatsApp use in improving primary health care education. *Curationis*, 38(2) <https://doi.org/10.4102/curationis.v38i2.1512>.
- Wu, W. H., Wu, Y. C. J., Chen, C. Y., Kao, H. Y., Lin, C. H., & Huang, S. H. (2012). Review of trends from mobile learning studies: A meta-analysis. *Computers & Education*, 59(2), 817–827.
- * Zhang, Z., & Xue, Y. (2015). An investigation of how Chinese university students use social software for learning purposes. *Procedia - Social and Behavioral Sciences*, 186, 70–78 <https://doi.org/10.1016/j.sbspro.2015.04.084>.