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Comparing Asynchronous and Synchronous Interaction Using Online Technology

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Abstract – The move from traditional face-to-face classroom learning to the use of information and communication technology (ICT) has been implemented by universities in Malaysia and abroad vigorously with computer-mediated communication (CMC) systems. These technologies promote interaction among tertiary level students in collaboration where they can have discussions with peers for collaborative tasks by means of posting messages (asynchronous) and instant messaging (synchronous). This review paper focused on comparative studies of asynchronous and synchronous interaction among university students using online tools. The quantitative and qualitative research studies were reviewed preliminarily based on the types of CMC used, looking at the theories, methods, respondents, and findings. This paper also discusses the online tools used for interaction such as Wiki and Skype, and concludes with an understanding of students' experience of different online systems and tools in their communication that may affect their learning.

Keywords: Asynchronous, computer-mediated communication, interaction, Skype, synchronous, Wiki

Introduction

A number of universities in Malaysia and other countries are actively implementing online learning, through learning management system (LMS) and virtual learning environment (VLE) at undergraduate and postgraduate levels (Embi, 2011; Goi & Ng, 2009; Hussain, 2004; Kirkwood, 2009). Computer-mediated communication (CMC) systems facilitate asynchronous or synchronous interaction among individuals in an online environment. In addition, educational technologies such as WebCT, Moodle or Blackboard are widely used in collaborative learning (Alavi, Yoo & Vogel, 1997; Williams, Duray & Reddy, 2006). Thus, asynchronous and synchronous interaction using online tools, and Wiki and Skype are reviewed in this paper.

Asynchronous Learning Network (ALN) is defined as environments where students use computers to communicate and work with their peers and instructors (Mayadas, 1999). One of the benefits of asynchronous interaction is that the participants have more time to think and reflect on the course content and contribute (Biesenbach-Lucas, 2003). Asynchronous interaction takes place through a discussion forum in a private webpage where students discuss their task collaboratively. Synchronous interaction using a CMC tool involves real-time participation among students, such as live chat using text, audio and video-conferencing (Martin, Parker, & Deale, 2012). Providing synchronous elements to online courses can enhance meaningful interactions (Repman, Zinskie & Carlson, 2005).

Computer-mediated communication

Computer-mediated communication (CMC) has started since the late 1960s. Murray Turoff was the first to introduce computer conferencing in 1970 to offer a setting for scholarly community for exchanging information and effective problem-solving (Hiltz & Turoff, 1978). Some studies on

asynchronous discussion also indicate that using writing to communicate with peers online is easier to control or take charge. This is because there is no need for immediate feedback in the writing process, so students have sufficient time to think and validate so as to convey meaning clearly (Koschmann et al., 1996). However, in a face-to-face team, members may interact through facial expressions, such as smiling, body language and gestures, and such interaction does not occur in online teams (Macdonald, 2003). Moreover, the process of collaboration becomes more visible when students in an online team use text messages to communicate, thus, postings among students on discussion boards can be used to verify both their joint effort and contribution in the procedure. Consequently, the result of the teamwork can reflect students' collaboration by means of a written essay or report.

According to Chou (2002), asynchronous interaction is more suitable and sufficient for a course that needs memorising factual knowledge. However, the author suggests that synchronous interaction is more appropriate when the course objective is to improve online interaction skills. Thus, synchronous interaction is as important as asynchronous interaction depending on the context and nature of task, though some online interaction and collaboration studies have merely used asynchronous system (e.g. Biesenbach-Lucas, 2003; Elgort, Smith & Toland, 2008). Some universities use the LMS platform and other social media software that consist of features of live chat and discussion board to facilitate students' collaborative learning and writing. There are a handful of comparative studies of asynchronous and synchronous communication and most of these compared text-conversations and real-time chat among undergraduates and graduates. Their framework is based on collaborative and social constructivist theories. These studies have used, inter alia, content analysis, interviews, observation and survey as the main methods of analysis (e.g. Bonk et al., 1998; Chou, 2002; Davidson-Shivers et al., 2001; Hrastinski, 2007; Schullo et al., 2005). A few major studies have indicated considerable differences between asynchronous and synchronous interaction that **were** mainly found in qualitative content analysis in smaller groups. Table 1 presents a summary of the comparative studies.

The findings in these studies indicate that asynchronous discussions promote more complex ideas (Bonk et al., 1998), more attention on the task (Chou, 2002), more reflective statements (Davidson-Shivers et al., 2001), and effective for collaborative writing (Mabrito, 2006). Synchronous discussions allow students to interact more frequently (Bonk et al., 1998), exchange socio-emotional interactions (Chou, 2002), teacher-student as well as student-student can communicate effectively (Haythornthwaite, 2001; Schullo et al., 2005), and the chat sessions are satisfying (Spencer & Spencer, 2002). However, Ng and Detenber (2005) found that synchronous discussions were viewed as more useful and influential but this form of discussion has no considerable impact on student's participation. Moreover, Schwier and Balbar (2002) found that synchronous interaction was less efficient in dealing with content, and students spent lesser amount of time on course task in the chat discussions (Mabrito, 2006). Thus, the studies suggested that asynchronous interaction was more appropriate for thinking and discussing complicated views (Hrastinski, 2008), while learners favoured synchronous communication as there were more social communications. Despite the utilisation of CMC among business corporations and educational communities, the effectiveness of these tools should be realised, where asynchronous and synchronous systems should also facilitate knowledge sharing in group interaction and collaboration.

Table 1: Comparative Studies of Asynchronous and Synchronous Interaction

Source	Type of CMC	Purpose of Study	Methods	Respondents	Findings
Bonk et al. (1998)	Text-discussion board and chat	To explore how to use the Web to foster collaboration and interaction	Content analysis	65 pre-service teachers	Students conveyed more complicated views in asynchronous interactions and engaged frequently in synchronous discussions
Chou (2002)	Text-discussion board and chat	To examine the patterns of learner-learner	Content analysis	Number of undergraduates not indicated	Students concentrated on the subject in asynchronous discussions, and exchanged

		interaction			socio-emotional relations in synchronous discussions
Davidson-Shivers et al. (2001)	Text-discussion board and chat	To investigate how graduates participated in online discussion	Content analysis, survey	14 graduates	Students stated more reflective comments in the asynchronous discussions, and put some remarks in the synchronous discussions
Haythornth-waite (2001)	Text-discussion board, chat, e-mail, and audio	To explore how group members exchange information online	Interviews, survey	14 graduates	Class used discussion board and chat for communication, and e-mail for intra-team communication
Hrastinski (2007)	Text-discussion board and chat	To examine how synchronous chat complementing asynchronous discussion affect participation	Content analysis, interviews, surveys	8 graduates	Not easy to acquire asynchronous discussions initiated with a few students. Combining asynchronous and synchronous interaction enhance participation
Mabrito (2006)	Text-discussion board and chat	To examine students' collaborative writing in synchronous and asynchronous interaction	Content analysis, survey	16 undergraduates	Asynchronous interaction were effective for collaborative writing. Students spent less time focusing on tasks in synchronous sessions
Ng & Detenber (2005)	Text-discussion board and chat	To investigate the effects of two features of CMC and students' perceptions of online discussion	Survey	153 undergraduates	Synchronous discussions were observed as more informative and persuasive but did not have significant impacts on students' intention to participate
Schullo et al. (2005)	ElluminateLive (synchronous) and WebCT (mainly asynchronous)	To investigate the use of synchronous system as a supplement to existing courses	Content analysis, interviews, surveys, observations	70 graduates, 5 instructors	Synchronous interaction allowed instructors to build connections with and among students more effectively
Schwier & Balbar (2002)	Text-discussion board and chat	To experiment synchronous and asynchronous interaction in a theory course	Not specified	7 Graduates	Synchronous interaction contributed to stability and sense of community but was less effective in dealing with content
Spencer & Spencer (2002)	Text-discussion board and chat	To investigate the effects of synchronous chat in supplementing asynchronous online courses	Content analysis, interviews, survey	133 students	Students found synchronous sessions satisfying, various hypotheses were examined but few were statistically significant.

Interaction through online tools

Distance educators have classified interactions in distance learning in several ways. Although there are many classifications available, the classification suggested by Moore (1989) has been largely recognised. According to Moore, there are three types of interaction: (1) interaction between student-student, (2) interaction between student-instructor, and (3) interaction between student-content. This classification has been influential to researchers even in recent studies. For instance, some researchers agreed that most communications have reflected student-instructor, student-content and student-student

interactions, thus receiving considerable attention as they believe that such form of interaction can promote collaboration (e.g. Balaji & Chakrabarti, 2010; Howarth, 2006). However, Hillman et al. (1994) identified that the interaction between student and interface also plays an important role in the distance learning environment. Hence, Moore and Kearsley (1996) suggested that the learning interaction can be categorised into four types: student-content, student-instructor, student-student, and student-interface. The first three are most frequently used to assess interactions, thus, this review focused on student-student interaction for collaboration.

Student-student interaction occurs in several modes within the course environment. These interactions among students take place through email, discussion boards, video- and audio-conferencing, or chatting, and interaction with peers helps the student to understand the course content (Dewey, 1996). Garrison (1990) stated that students who interacted on a regular basis with other students were more motivated and participated actively in their learning. Nonetheless, Freed (2004) reported that interaction between instructor-student and student-student remained as the major barrier in the online distance learning environment. It is vital for online distance learning instructors to design and develop a learning environment to promote student-content, student-instructor, and student-student interactions (Anderson & Garrison, 1997; Garrison & Cleveland-Innes, 2005). Besides, Olson and Wisher (2002) observed the difficulties of many students, who lacked high-speed computers and Internet connections to respond promptly during interaction. In addition, Ko and Rossen (2001) proposed that if the size of the class was too small, engaging students in interaction became rather difficult.

McGreal and Elliott (2008) proposed some of the most stimulating technologies and features used in online instruction, and these multimedia applications offer various opportunities for educators. For instance, audio chat and web-conferencing on Skype are commonly used for teaching and learning while mobile technologies are also explored along with wikis, blogs, and other instant messaging in a virtual world. However, the availability of technology to students and their skill levels in using the medium can support or hinder collaborative dynamics as the technology can be the cause of either frustration or motivation (Brindley, Blaschke & Walti, 2009). Asynchronous system hinders the discussion of complicated problems and conversations that require immediate response, and breaks in between communication can delay initial postings and responses. Brindley et al. (2009) state that tools which are more suitable for collaborative learning such as Wiki and Skype are readily obtainable on the Internet. However, these tools are not necessarily introduced to students or incorporated into traditional and virtual classroom efficiently. Table 2 illustrates various online interaction tools. Two categories are relevant to this review: Wiki and Skype.

Wiki is an asynchronous system with free open-sources that permits multiple writers to create and write on a page in the website. Skype is a synchronous system that consists of voice call, video call and instant chat that comes free or with very low rates. Apart from personal computers, Skype can be run steadily on smart phones and tablets across multiple platforms. Besides, both Wiki and Skype can be used for online interaction among students to carry out their group projects. The former offers discussion forum with delays in time to response, while the latter provides real-time chat with instant responses. The use of the Internet in educational settings provides opportunities for interaction and collaboration between students living at a distance. The similarities between asynchronous and synchronous systems are that both types of interactions are user-friendly and requiring basic ICT skills, and they are both time efficient and not costly. This could be the reason why online learning is gradually becoming popular.

Table 2: Online Interaction Tools (Adapted from Kask, 2009)

Name	Categories	Type of Communication	Comments
Blackboard, WebCT	Message Board Forum, Chat, Email	Synchronous and asynchronous	Learning Management System (LMS) provides a learning environment to students though it is costly.

Elluminate	Whiteboarding, Chat, VoIP, Video	Synchronous and asynchronous	Application allows voice and video communication and costly. Good for presentation of material.
GoToMeeting, Zoho	Whiteboarding, Chat, VoIP, Video	Synchronous and asynchronous	Web conferencing allows people to meet and do presentation and it is low cost. Suitable for short term use or long term assignments.
Facebook, Myspace, Nexopia	SNS, Chat	Synchronous and asynchronous	Web 2.0 technology supports social participation and it is free to users.
MediaWiki, Wiki	Wiki discussion forum	Asynchronous	Free open-source allows for multiple writers and suitable for collaborative writing tasks.
Moodle	CMS, Forum, Chat	Synchronous and asynchronous	Free open-source but requires an existing web server to run on, and accessible to a SQL database.
Messenger	Chat	Synchronous	Instant messaging with no costs, and can be functioned as an email.
Google Wave	Email, Chat	Synchronous and asynchronous	Application allows groups to share documents for free, and email is available to facilitate group tasks.
Skype	VoIP, Video, Chat	Synchronous	Accessible in multiple platforms (Windows, MacOS, Linux, etc.), and can be run on few mobile devices. Free for basic features, but at a cost for other features.

Wiki as a tool for asynchronous interaction

Students working in a group have been a challenge for both instructors and students as they are frequently dissatisfied with its content and process. While content can be the goal of a course instruction, the process of learning becomes the roots to understanding of content as part of the goal. Thus, content exists within the process of acquiring that content, not outside of it (Tobin & Tippins, 1993). The establishment of new technology such as Wiki could possibly offer a solution for asynchronous interaction (Karasavvidis, 2010).

Wiki discussion forum

Wiki is known as server software that permits users to produce and edit content of a piece of writing, and it can be used to coordinate a group using any Web browser (Cunningham, 2002). Wiki is an integrated Web environment that also allows users to simply produce and uphold a Web presence for their subjects in collaboration with others. There are lists of Wiki software platforms available such as MediaWiki, WikiMatrix, XWiki, Tiki Wiki, WikiFoundry, and so on. WikiFoundry (previously known as Wetpaint) is a free website hosting service where anyone can create their own Wiki site. The system consists of features where students can access from any place at any time through an Internet connection. Further key features of the system are areas for the group members to post messages and respond to others postings, create forums or topics for discussion. Members have the opportunity to reply the messages in a manner that is not time and place dependent, as long as a computer connected to the Internet is accessible. Each member can create new threads to the discussion topics or respond to the comments of other members in the forum. Moreover, all members have access to the above features and able to view, download, or print out the information.

A Wiki consists of features exist in traditional content management systems (CMS) such as blogs and discussion forums. A CMS is a computer application that permits creating, deleting, editing, publishing, modifying content, and also maintenance from a central interface (Boag, 2009). It can also upload files

to share information and download files sent by group members. The opening view of a forum shows the subject heading for the postings. The group member has the choice of either reading just the threads of a discussion forum or expanding the thread list to expose all threads or the responses to these threads. Individual messages can be viewed by clicking on the subject heading and then proceed through the thread and read each message.

Černá, Poulová and Draessler (2011) conducted a survey via an online questionnaire on social software applications at a university and the respondents' satisfaction towards the software. The data were collected from more than three hundred students at the University of Hradec Králové. The results show that wikis can be served as platforms for knowledge incorporation and collaboration in developing common knowledge.

In relation to knowledge incorporation, wikis websites are wholly editable as any user can read, write or add content to a Wiki site. In a study, Augar, Raitman and Zhou (2004) used Wiki for an ice-breaking activity at Deakin University, Australia, to facilitate online interactions among group members. The findings reveal that Wiki is indeed a useful tool for facilitating online education and can enhance the process of teaching and learning online. The features in a Wiki Webpage show that it is an exceptional tool for collaboration in an online environment which is also a valuable system for teaching and learning.

In another study, Chu and Kennedy (2011) reported the use of Google Docs and MediaWiki as collaboration tools for co-constructing knowledge in an online group project. Twenty two undergraduates from the Information Management program at The University of Hong Kong participated in the study. All students have used MediaWiki for the major project and Google Docs for their final year project. Questionnaires and telephone interviews were conducted after completion of the final projects. They found that some of the students had positive experiences from using the tools where MediaWiki was effective in knowledge management, while Google Docs features were more user-friendly. However, Judd, Kennedy and Cropper (2010) investigated a learning activity which involved a large group of 177 undergraduates studying psychology at The University of Melbourne. There were 30 groups that consisted of 20-30 students and Wiki was used in the investigation. The authors found that although the features in Wiki are designed to facilitate collaboration, it does not constantly promote collaborative learning. This is due to little use of Wiki commenting feature and thus many students' contribution were superficial.

In another study, Witney and Smallbone (2011) have utilised Wiki to support group assessment for full-time undergraduate students. They observed the main constraint to the use of online tool was that student preferred traditional face-to-face teamwork. Elgort, Smith and Toland (2008) examined the perceptions of students and lecturers using wikis as a platform for group project in two postgraduate Master's level courses. The authors highlighted that students' attitude to group work are mixed and utilising Wiki is insufficient to improve these attitudes, though on the positive side the students considered Wiki as useful for sharing knowledge and organising information.

Skype as a tool for synchronous interaction

The synchronous, real-time interactions with free software such as Skype can actually enhance conventional classroom teaching and learning, and engage students to communicate, share and write on various projects. Skype is a software program using Voice over Internet Protocol (VoIP) technology (Fryer, 2014). The software is free for download and users can also make audio calls and video conferences over the Internet everywhere in the world without any costs (Tsukamoto, Nuspliger & Senzaki, 2009).

Skype instant messaging

A Skype network can be used as a real-time interactive chat among group members. Skype provides services that enable users to communicate with their peers either by voice with a microphone or by video with a webcam and instant messaging by text over the Internet. The name 'Skype' was derived

from 'sky' and 'peer' where originally it was a hybrid peer-to-peer and client-server system (Bryant, 2006). Its free version is often used among teachers and students to fulfill their educational goals. For instance, Skype is being used for communication among scholars in completing projects from different parts of the world as well as locally by real-time chat.

Skype is also used in the classroom implemented by the teacher to facilitate sharing of ideas synchronously among students which makes the classroom more interactive (Sivula, 2011). It also enables teachers to collaborate with other teachers around the world for resources and getting to know the experts in the same field (Eaton, 2010). All synchronous dialogues that emerged in Skype Chat were automatically archived by date.

In the survey of Černá et al. (2011), the authors found Skype an exclusive social communication application. Indeed, Skype is an example of a twenty-first century educational tool as it can basically support the teaching and learning environment, changing from traditional classroom learning to successful online collaborative learning. For instance, online technologies promise massive transformation in language learning (Mullen, Appel & Shanklin, 2009), and students are allowed to talk with an author via Skype (Foote, 2008). However, Sivula (2011) utilises Skype for courses involved a team in a collaborative project, claiming that problems do occur within the team interaction while completing the assignment, whether applied traditionally or online.

Team members can share resources and information within their team through real-time meeting at a chosen time in Skype. Kearsley and Schneiderman (1999) suggested that learning activities should: (1) take place in a group setting (e.g. collaborative teams); (2) be task-based, and (3) have an external focus (authentic). Skype facilitates interaction by allowing students to form groups and they can also use their smartphones, iPads, iPods, tabs and a range of personal computers to interact with team members using Skype software.

Conclusion

The review suggests that online interaction systems have encouraged collaboration, thus CMC has become a topic of interest. Indeed, online collaboration offers new opportunities in learning with the arrival of technological innovations. In tertiary education, students need to generate in-depth understanding in their learning through managing interaction effectively and utilise online technology for collaborative tasks. Such management entails students' interaction with resources, teachers, and peers. This type of interaction focuses online collaboration and this explains how a course should be designed to promote student participation and satisfaction. From this review, it is suggested that asynchronous interaction is good for students to practise and to improve writing skills, while synchronous is good for developing students' social interaction or communication skills. In terms of pedagogical aspect, online collaboration involves learning resources and supports active learning which enables students to construct knowledge and attain their learning goals. For instance, students can perform collaborative writing through CMC interaction. In terms of social aspect, constant social interaction may also encourage students' readiness to participate in online collaboration. Thus, it is significant to study further in order to understand more thoroughly concerning the usefulness of CMC for interaction and collaboration either asynchronous or synchronously in completing collaborative tasks.

References

Alavi, M., Yoo, Y., & Vogel, D. R. (1997). Using information technology to add value to management education. *Academy of Management Journal, 40,* 1310-1333.

Anderson, T. D., & Garrison, D. R. (1997). *New roles for learners at a distance.* In C. Gibson (Ed), *Distance learners in higher education: Institutional responses for quality outcomes* (pp. 97-112). Madison, WI: Atwood Publishing.

Augar, N., Raitman, R., & Zhou, W. (2004). Teaching and learning online with wikis. In *Beyond the comfort zone: proceedings of the 21st ASCILITE Conference, Perth, 5-8 December* (pp.95-

104).ASCILITE. Retrieved from http://dro.deakin.edu.au/eserv/DU%3A30005482/zhou-teachingandlearning-2004.pdf

Balaji, M. S., & Chakrabarti, D. (2010). Student interactions in online discussion forum: Empirical research from 'media richness theory' perspective. *Journal of Interactive Online Learning*, *9*(1), 1-22.

Biesenbach-Lucas, S. (2003). Asynchronous discussion groups in teacher training classes: Perceptions of native and non-native students. *Journal of Asynchronous Learning Networks*, *7*(3), 24-46.

Boag, P. (2009). 10 things to consider when choosing the perfect CMS. *Smashing Magazine.* Retrieved from http://www.smashingmagazine.com

Bonk, C. J., Hansen, E. J., Grabner-Hagen, M. M., Lazar, S. A., & Mirabelli, C. (1998). Time to "connect": Synchronous and asynchronous case-based dialogue among preservice teachers. In C. J. Bonk and K. S. King (Eds), *Electronic collaborators: Learner- centered technologies for literacy, apprenticeship, and discourse* (pp. 289-314). NJ: Lawrence Erlbaum Association.

Brindley, J., Blaschke, L. M., & Walti, C. (2009). Creating effective collaborative learning groups in an online environment. *The International Review of Research in Open and Distance Learning*, *10*(3). Retrieved from ttp://www.irrodl.org/index.php/irrodl/article/view/675/1271?

Bryant, T. (2006). Social software in academia. *Educause Quarterly*, *29*(2), 61.

Černá, M., Poulová, P., & Draessler, J. (2011, September). Software applications in academic setting awareness and satisfaction. In *Interactive Collaborative Learning (ICL), 2011, 14th International Conference on* (pp. 525-531). IEEE.

Chou, C. C. (2002, January). A comparative content analysis of student interaction in synchronous and asynchronous learning networks. In *System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on System Sciences* (pp. 1795-1803). Retrieved from http://www.computer.org/csdl/proceedings/hicss/2002/1435/05/14350134b.pdf

Chu, K.W.S., & Kennedy, D. M. (2011). Using online collaborative tools for groups to co-construct knowledge. *Online Information Review*, *35*(4), 581-597.

Cunningham, W. (2002). What is wiki. *WikiWikiWeb.* Retrieved from http://www. wiki.org/wiki.cgi.

Davidson-Shivers, G. V., Muilenburg, L. Y., & Tanner, E. J. (2001). How do students participate in synchronous and asynchronous online discussions? *Journal of Educational Computing Research*, *25*(4), 351-366.

Dewey, J. (1996). *Democracy and Education*. New York: Free Press.

Eaton, S. E. (2010). How to use Skype in the ESL/EFL classroom. *The Internet TESL Journal, 16*(11). Retrieved from http://iteslj.org/Techniques/Eaton-UsingSkype.html

Elgort, I., Smith, A. G., & Toland, J. (2008). Is wiki an effective platform for group course work? *Australasian Journal of Educational Technology*, *24*(2), 195-210.

Embi, M. A. (2011). e-Learning in Malaysian institutions of higher learning: Status, trends and challenges. Keynote Address. Proceedings of the International Lifelong Learning Conference (ICLLL 2011) (pp.14-15). Kuala Lumpur: MOHE

Foote, C. (2008). See Me, Hear Me: Skype in the Classroom. *School Library Journal*, *54*(1), 42-43.

Freed, K. (2004). *A history of distance learning.* Retrieved from http://www.media-visions.com/ed-distlrn.html

Fryer, W. A. (2014). Skype in the Classroom. *Publications Archive of Wesley Fryer*, *1* (1).

Garrison, D. R., & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *The American Journal of Distance Education*, *19*(3), 133-148.

Garrison, D. R. (1990). An Analysis and evaluation of audio teleconferencing to facilitate education at a distance. *The American Journal of Distance Education*, *4*(3), 13-24.

Goi, C. L., & Ng, P. Y. (2009). E-learning in Malaysia: Success factors in implementing e-learning program. *International Journal of Teaching and Learning in Higher Education*, *20*(2), 237-246.

Haythornthwaite, C. (2001). Exploring multiplexity: Social network structures in a computer-supported distance learning class. *The Information Society*, *17*(3), 211-226.

Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education*, *8*(2), 30-42.

Hiltz, S. R., & Turoff, M. (1978). *The network nation: Human communication via computer*. Reading, PA: Addison-Wesley.

Howarth, P. (2006). Increasing student interaction. Teaching English. Retrieved from http://ltr.sagepub.com/content/10/3/245.short

Hrastinski, S. (2007). Using chat as a complement to discussion board in small-group online seminars: How is student participation affected? *International Journal of Knowledge and Learning*, *3*(4), 483-500.

Hussain, R. M. R. (2004). E-learning in higher education institutions in Malaysia. *E-mento*, *5*(7), 72-75.

Judd, T., Kennedy, G., & Cropper, S. (2010). Using wikis for collaborative learning: Assessing collaboration through contribution. *Australasian Journal of Educational Technology*, *26*(3), 341-354.

Karasavvidis, I. (2010). Wiki uses in higher education: Exploring barriers to successful implementation. *Interactive Learning Environments*, *18*(3), 219-231.

Kask, B. (2009). Synchronous and Asynchronous Communication: Tools for Collaboration. Retrieved from http://sites.wiki.ubc.ca/etec510/Synchronous_and_Asynchronous_Communication: ToolsforCollaboration

Kearsley, G., & Schneiderman, B. (1999). *Engagement theory: A framework for technology-based learning and teaching*. Retrieved from http://home.sprynet.com/~gkearsley/engage.htm

Kirkwood, A. (2009). E-learning: you don't always get what you hope for. *Technology, Pedagogy and Education*, *18*(2), 107-121.

Ko, S., & Rossen, S. (2001). *Teaching online: A practical guide*. Boston: Houghton Mifflin Company.

Koschmann, T., Kelson, A., Feltovich, P., & Barrows, H. (1996). Computer-supported problem based learning: a principled approach to the use of computers in collaborative learning. In T. Koschmann (Ed.), *CSCL theory and practice of an emerging paradigm* (pp. 83-119). NJ: Lawrence Erlbaum Association.

Mabrito, M. (2006). A study of synchronous versus asynchronous collaboration in an online business writing class. *The American Journal of Distance Education*, *20*(2), 93-107.

Macdonald, J. (2003). Assessing online collaborative learning: process and product. *Computers & Education*, *40*, 377-391.

Martin, F., Parker, M., & Deale, D. (2012). Examining interactivity in synchronous virtual classrooms. *International Review of Research in Open and Distance Learning*, *13*(3), 228-261.

Mayadas A. F. (1999). *What is ALN?* Retrieved from http://www.aln.org/alnweb/aln.htm.

McGreal, R., & Elliott, M. (2008). Technologies of Online Learning (E-learning). In T. Anderson (2008), *Thetheory and practice of online learning* (pp. 115-135). Athabasca, AB: Athabasca University Press.

Moore, M. G. (1989). Editorial: Three types of interaction. *The American Journal of Distance Education*, *3*(2), 1-7.

Moore, M, G., & Kearsley, G. (1996). *Distance education: A systems view*. Belmont: Wadsworth Publishing Company.

Mullen, T., Appel, C., & Shanklin, T. (2009). Skype based tandem language learning and web 2.0. *Handbook of Research on Web*, *2*, 101-118.

Ng, E. W., & Detenber, B. H. (2005). The impact of synchronicity and civility in online political discussions on perceptions and intentions to participate. *Journal of Computer-Mediated Communication*, *10*(3). DOI: 10.1111/j.1083-6101.2005.tb00252.x

Olson, T., & Wisher, R. A. (2002). The effectiveness of web-based instruction: An initial inquiry. *The International Review of Research in Open and Distance Learning*, *3*(2). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/103/182?

Repman, J., Zinskie, C., & Carlson, R. D. (2005). Effective use of CMC tools in interactive online learning. *Computers in the Schools*, *22*(1-2), 57-69.

Schullo, S., Venable, M., Barron, A. E., Kromrey, J. D., Hilbelink, A., & Hohlfeld, T. (2005, November). Enhancing online courses with synchronous software: an analysis of strategies and interactions. In *Proceedings of the National Educational Computing Conference, Philadelphia*. Retrieved from http://etec.hawaii.edu/otec/classes/645/aera_audio_conference.pdf

Schwier, R. A., & Balbar, S. (2002). The interplay of content and community in synchronous and asynchronous communication: Virtual communication in a graduate seminar. *Canadian Journalof Learning and Technology/La revue canadienne de l'apprentissageet de la technologie*, *28*(2). Retrieved from http://www.cjlt.ca/index.php/cjlt/article/viewArticle/81

Sivula, M. (2011). Using Skype as an academic tool: Lessons learned. *eLearn Magazine*, 1-4. Retrieved from http://scholarsarchive.jwu.edu/technology/1

Spencer, D. H., & Spencer, H. (2002). A field study of use of synchronous computer-mediated communication in asynchronous learning networks. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=FE5F825417CD3E69EB30972A73655864?doi=10.1.1.194.4824&rep=rep1&type=pdf

Tobin, K., & Tippins, D. (1993). Constructivism as a referent for teaching and learning. *The practice of constructivism in science education*, *1*, 3-22.

Tsukamoto, M., Nuspliger, B., & Senzaki, Y. (2009). Using Skype to connect a classroom to the world: Providing students an authentic language experience within the classroom. In *CamTESOL Conference on English Language Teaching*, 5, 162-168.

Williams, E. A., Duray, R., & Reddy, V. (2006). Teamwork orientation, group cohesiveness, and student learning: a study of the use of teams in online distance education. *Journal of Management Education, 30* (4), 592-616

Witney, D., & Smallbone, T. (2011). Wiki work: Can using wikis enhance student collaboration for group assignment tasks? *Innovations in Education and Teaching International*, *48*(1), 101-110.