ELSEVIER

Internet and Higher Education 9 (2006) 117–131

THE INTERNET AND HIGHER EDUCATION

Introducing an informal synchronous medium in a distance learning course: How is participation affected?

Stefan Hrastinski *

Department of Informatics, Jönköping International Business School, Box 1026, SE-551 11, Jönköping, Sweden

Accepted 27 March 2006

Abstract

Achieving active participation has been argued to be an intrinsic part of learning and has become a central issue in debates on online education. This research examines whether an emerging synchronous communication medium, instant messaging (IM), may enable students in participating more actively in a distance learning course. In doing this, it is first evaluated how the system was used. When comparing two offerings of the course, where the first was delivered asynchronously and the second was complemented with an IM system, results indicated that the first class operated with a higher level of participation. However, when comparing students that adopted the IM system with those that did not it was found that the adopters operated with a higher level of participation. Since the results are tentative, the paper is concluded by calling for further research that tests the results of this study in both similar and different contexts.

Keywords: Distance learning; Participation; Computer-mediated communication; Synchronous media; Instant messaging

1. Introduction

Computer-mediated communication (CMC) has supported work groups for almost thirty years (Hiltz & Turoff, 1978). Currently, the most obvious trend when studying research on information and communication technology and its relation to education, is the increased interest in using various forms of CMC for interpersonal communication (Maor, 2003). Students have social needs and, thus, interacting with others motivates them (Münzer, 2003). Moreover, according to Johnson and Johnson (1999), "the degree of emotional bonding that exists among students has a profound effect on the quality of work performed" (p. 206). This recognition of the social needs of learners has led to a shift in research from individually-centered towards more socially-oriented learning environments (Hung, 2001). Many researchers (e.g., Bober & Dennen, 2001; Brown, 2000; Tuovinen, 2000) seem to agree upon that social and informal communication between learners is an essential element of learning environments. When learners interact with each other, they learn from each other and share personal perspectives which help them to validate their own viewpoints while being exposed to and coming to understand other positions (Bober & Dennen, 2001; Bowden & Marton, 1998).

* Corresponding author. Tel.: +46 36 10 17 74.
E-mail address: hrst@jibs.hj.se.

1096-7516/$ - see front matter © 2006 Elsevier Inc. All rights reserved.
doi:10.1016/j.iheduc.2006.03.006

However, a lack of informal communication has been reported which is unfortunate since it is "particularly important for creating bonds of community and group identity, and … important for [computer-supported collaborative learning] environments" (Haythornthwaite, 2001, p. 214).

Technologies include different degrees of formality and those that demand a high degree of formality can disrupt informal relations. Brown and Duguid (1998) argue that technologies that include a high degree of formality "leave little room for the informal, the tacit, and the socially embedded — which is where know-how lies and important work gets done" (p. 105). Learning environments used in online educational settings, such as Blackboard and WebCT, have been questioned since these are currently designed to support formal communication (Britain & Liber, 2004; Contreras-Castillo, Favela, Perez-Fragoso, & Santamaria-del-Angel, 2004). For example, a date and time has to be decided when using synchronous chat systems, and students may in some cases feel inhibited from contributing in asynchronous discussion boards since contributions can be accessed by all participants including the instructor (Contreras-Castillo et al., 2004). Informal communication is more spontaneous since it "[takes] place at the time, with the participants, and about the topics at hand" (Beuschel, Gaiser, & Draheim, 2003; Fish, Kraut, & Chalfonte, 1990, p. 2). Keller (2005) has suggested that a successful implementation of a learning environment depends on, among other factors, whether it supports informal communication and is designed for participation.

Technology for informal communication should provide the following characteristics: (a) access to a suitable population of others; (b) an environmental mechanism that brings people together; (c) the effort needed to initiate and conduct a conversation should be low; and (d) a visual channel (Fish et al., 1990). Interestingly, most available instant messaging (IM) systems (e.g., MSN Messenger, ICQ, Lotus Workplace Messaging) have these characteristics. IM is a synchronous communication medium that can be used to maintain a list of "friends". These friends can be contacted, when being online and running the software, by text messages or initiating a chat, audio or video conferencing session.

IM systems, which are discussed more thoroughly in the next section, have been reported to better support social and informal communication in distance learning: "In traditional classroom buildings, the common spaces such as hallways provide the venue for this informal communication; IM services can enhance the distance learning environment by providing the 'virtual hallways' for students and instructors to meet" (Nicholson, 2002, p. 363). However, in a recent study (Hrastinski, 2005a) on group work in an English language class, distance learners used IM spontaneously but to support information exchange (e.g., ask/answer a question) and task support (e.g., planning work) rather than social support (e.g., talk about other things than class work). Since the results are inconclusive, there is a need for further research. The study also indicated that project groups that adopted an IM system operated with a higher level of participation. It will be evaluated whether the introduction of an IM system will also result in that students in general will participate more actively in a distance learning course. Thus, the following research question underlies this study: *How does the possibility to communicate synchronously via an IM system affect student participation in a distance learning course?* When addressing the research question it is also needed to understand how an IM system may actually be used by the students.

The importance of student participation in educational settings is often emphasized in the literature (Bento & Schuster, 2003; Wang, Sierra, & Folger, 2003). In this study participation is defined as "a process of taking part and also to the relations with others that reflect this process" (Wenger, 1998, p. 55). Student participation has been reported to improve learning (e.g., Fredericksen, Picket, Shea, Pelz, & Swan, 2000; Hiltz, Coppola, Rotter, Turoff, & Benbunan-Fich, 2000; Leidner & Jarvenpaa, 1995). Moreover, participants that interact interpersonally have been argued to be less likely to drop out (Münzer, 2003; Schweizer, Paechter, & Weidenmann, 2003) which is especially a problem reported in distance education (Carr, 2000; Rovai, Wighting, & Lucking, 2004).

The paper is organized as follows: A background to previous research on IM and informal and synchronous media is presented. Then, the theories that guided the analysis of student participation are discussed. This is followed by a discussion of the underlying method of the study. Then, the results of the study are described. Finally, an analysis and major conclusions are presented.

2. Background

In this section, previous research on IM is reviewed. Since few have studied IM in educational settings, it will first be discussed what we know about synchronous media in general. Synchronous media such as IM make it possible to communicate in real-time. In educational settings, synchronous media have been the basis of relatively few studies in

comparison with asynchronous media (Hrastinski, 2005b; Romiszowski & Mason, 2004). Other examples of synchronous communication media are chat, audio and video conferencing. In contrast, asynchronous communication media do not occur in real-time and include e-mail, discussion forums and mailing lists.

Synchronous interaction may be experienced as richer than asynchronous interaction since "it provides immediate feedback so that interpretation can be checked" (Daft & Lengel, 1986, p. 560). Text-based IM is not considered as rich as, for example, face-to-face communication since it does not provide cues via body language and tone of voice. However, e-mail has been reported to be used and experienced as a rich medium. In a study on senior managers, Markus (1994) concluded that the choice of communication media often is a response to the socially-constructed appropriateness of particular media rather than a rational individual decision. Moreover, Walther (1992) showed that experienced computer users rated e-mail and CMC as rich or richer than telephone and face-to-face conversations. Similar arguments have been put forward in research on asynchronous media (Swan & Shea, 2005). However, there should be no doubt that text-based media cannot mediate body language and tone of voice fully even though attempts have been made in IM systems by supporting, for example, graphic emotional icons.

When university classes supported by synchronous CMC have been compared with conventional ones, it has been reported that most members contributed to discussions and also an overall increase in participation (Leidner & Jarvenpaa, 1995). Even though there are many advantages with communicating synchronously, asynchronous media are more popular. As mentioned above, most researchers interested in CMC in educational settings focus on asynchronous communication. However, it has been argued that improved technology will lead to that synchronous CMC will be more widely used (Wellman, Salaff, Dimitrova, Garton, Gulia, & Haythornthwaite, 1996). One example of the increased use of synchronous media is IM.

Wallén (2004) reported that IM is the second most popular electronic communication medium after e-mail. Its users are primarily adolescents that use it to interact socially (Boneva, Quinn, Kraut, Kiesler, Cummings, & Shklovski, 2006) but employees also commonly use it for communication with co-workers (Shiu & Lenhart, 2004). Further, a "mass adoption" of IM systems by students at European and American universities has been reported (Beuschel et al., 2003). Because many students seem to like and already know how to use IM systems, they may also have the potential to become commonly used in educational settings.

Cameron and Webster (2005) have reviewed IM research. They state that since few studies have examined IM systems in depth, there is little knowledge of how they are used in practice. Also, many of the reviewed studies did not draw on a theoretical base. According to Cameron and Webster, managers have begun to recognize IM systems' potential to support informal interaction. This has led to corporations installing IM software on employees' workstations. It has been predicted that corporate use of IM systems will grow from 18.3 million in 2001 to 229 million users in 2005 (Cameron & Webster, 2005). Since both work and learning groups "share the problem of creating and sustaining a positive work and learning environment" (Haythornthwaite, 2000, p. 201) IM systems may also be useful in educational settings. So far few studies have examined the use of IM systems in such settings. There are two notable exceptions. Contreras-Castillo et al. (2004) collected quantitative data (questionnaires and electronic logs) from 43 students in two Mexican universities. They found that IM helped students to reduce feeling isolated and increased collaboration. Also, students who interacted more seemed to be more satisfied with the course. Nicholson (2002) collected questionnaire data from 30 students in a distance learning program and reported that "students who used IM services found it easier to communicate, felt a stronger sense of community, and had more venues for informal and social communication" (p. 363).

3. Analyzing online participation

The importance and challenge of examining participation in online educational settings will be discussed. Social network analysis, which may be suitable when analyzing how the IM system was used and affected student participation, is outlined. By adopting a social network approach it will be possible to survey how students' social networks are affected when IM is introduced.

3.1. Online participation

Learning as participation in the social world is at the core of several influential learning theories (e.g., Lave & Wenger, 1991; Vygotsky, 1978; Wenger, 1998). Wenger (1998) defines participation as "a process of taking part and

Table 1
Taxonomy of participation in online courses (Bento and Schuster, 2003)

	Low interaction with content	High interaction with content
High interpersonal interaction	"Social participants"	"Active learners"
Low interpersonal interaction	"Missing in action"	"Witness learners"

also to the relations with others that reflect this process" (p. 55). Moreover, he writes that it is a complex process that combines doing, talking, thinking, feeling and belonging. The view of learning as an essentially social process motivates an emphasis on student participation and collaboration in learning communities. In empirical studies such factors have been reported to enhance learning outcomes, which have been measured as perceived learning by students and teachers, grades, and quality assessment of assignments (Fredericksen et al., 2000; Hiltz et al., 2000).

Participation has become "a central issue in debates around online education" (Masters & Oberprieler, 2004, p. 319). Often participation is measured as the number of messages in a discussion board (e.g., Arbaugh, 2000; Mazzolini & Maddison, 2003). However, Bento and Schuster's (2003) taxonomy adds a dimension when participation is being evaluated (see Table 1). They consider an "active learner" to interact frequently with peers but also with course content. Active learners are different from "social participants" since they interact frequently with peers but less with course content. Further, "witness learners" are distinguished from those who are "missing in action". Witness learners learn by taking up a position in the periphery, which often is referred to as "legitimate peripheral participation" (Lave & Wenger, 1991). They are actively engaged with course content (Bento & Schuster, 2003) and may interact with peers more actively later on (Lave & Wenger, 1991).

3.2. Social network analysis

Social network analysis provides a set of techniques for understanding patterns of relations between and among people, groups and organizations (Garton, Haythornthwaite, & Wellman, 1999). It has been used extensively in many disciplines such as sociology, informatics, computer science, communication science, business administration and psychology (Preece, 2000; Wellman et al., 1996). One of the most intriguing challenges in research on distance learning during the 1990s and ever since has been to understand the relations between learners (Moore, 1989). Social network analysis seems particularly suitable for examining those relations because the most common unit of analysis is the interactions between actors. By analyzing interactions, social networks emerge where particular types of exchanges connect individuals and support groups (Haythornthwaite, 2001). Social network analysis helps answer questions like who talks to whom, about what, using which media, and how these factors change over time (Preece, 2000). The advantage of the social network approach compared to other ways of analyzing interactions is the possibility to empirically assess group behavior (Haythornthwaite, 2001).

An individual can maintain associations with others that range from weak acquaintance to strong close friendship based on the relations that tie them and the desire to be with or work with each other (Haythornthwaite, 2000, p. 198). Weak ties are based on few exchanges of a similar type while strong ties are characterized by many exchanges of many types (Haythornthwaite, 2001). The importance of both strong and weak ties has been emphasized in the literature. Those who maintain strong ties are more likely to share resources such as information. However, their access to such resources is limited since they only maintain strong ties with a limited number of individuals. Persons that are weakly tied are less likely to share information. Although, when they do, the types of resources and ideas are more diverse (Garton et al., 1999; Granovetter, 1973).

Social network analysts either study relationships of a whole community (whole network) or of a group of people in a larger community (ego-centered network). The first approach is suitable when studying a network with clearly identifiable boundaries where membership may be restricted such as in the distance learning course examined in this study (Wasserman & Faust, 1994). In a whole network analysis, every person is surveyed about every other, implying that this approach is not feasible in larger groups. Pictures of whole networks, entitled sociograms, can show to which members different types of resources circulate (Moreno, 1934). In a dense network most members are tied to each other as opposed to a sparse one where resources do not flow as easily from one part of the network to another. The density of a whole network is defined as "the number of connections maintained and expressed as a proportion of the total number of possible connections" (Haythornthwaite, 2002, p.180).

Computer-supported social networks arise "when computer networks link people as well as machines" (Wellman et al., 1996, p. 214). Such networks have been shown to successfully maintain strong supportive ties, diverse weak ties and especially intermediate strength ties. Computer-supported social networks are characterized by people with shared interests that may have more in common than with those they live nearby (Garton et al., 1999). Distance learners are often geographically dispersed and share an interest in a subject matter. Since they seldom or never meet in-person, CMC may be the only way to support interpersonal relations.

4. Method

4.1. Research setting

A distance learning course that does not include any face-to-face meetings entitled Business English Online (BEO) has been investigated during two subsequent offerings. "The course is aimed at those who need to improve their business communication skills but cannot attend a daytime course. The emphasis is on using English for business and aims at developing reading and writing skills in particular, as well as increasing vocabulary" (Soames, 2004, p. 1). Students that usually enroll can be described as computer literate adult learners, most of them working and some living abroad (Soames, 2004). The course involves group discussions, and continuous assessment of individual and group work. Ever since the course was first offered in 2001, it has been delivered asynchronously and participants have communicated mainly via e-mail and discussion boards. However, there have been exceptions since some students voluntarily chose to communicate synchronously (face-to-face, telephone, IM) with fellow students and the teacher. In 2004, which was the fourth offering of BEO, an IM system was introduced and associated with an introductory activity that was mandatory. IM was introduced to support synchronous interaction since waiting for answers from group members had caused a feeling of annoyance during the previous offerings. This may be a reason why many have preferred to work individually and have only engaged in a one-to-one relationship with the tutor (Lindh, Hrastinski, & Soames, 2005). In this study, the third offering (fall 2003) of the course will be compared with the fourth one (fall 2004) with the aim to evaluate the introduction of an IM system and its effect on participation in the course. Moreover, students in BEO 04 that adopted the IM system will be compared with those that did not.

4.2. Data collection

Ideally, several sources of evidence support research findings and conclusions since they then become more convincing (Benbasat, Goldstein, & Mead, 1987; Yin, 2003). In doing this, both quantitative and qualitative methods were brought together. There are two reasons for combining the two methods (Cavaye, 1996). Firstly, it enables the building of a fuller, richer description of IM system use. Secondly, it enables cross-validation of findings through triangulation since, for example, data was collected on how participation is affected via both questionnaires and interviews.

Research on learning technology has been accused of a lack of cumulativity (Hoadley & Pea, 2002). Therefore, it was decided not to re-invent the wheel and develop new instruments for data collection. This study draws especially on the work of Haythornthwaite (2000, 2001) who has surveyed how social networks consisting of distance learners interact by using various media. Moreover, a measure on participation was adapted from a questionnaire developed by Webster and Hackley (1997).

4.2.1. Quantitative data collection

Two questionnaires were designed for the study. The first questionnaire aimed to collect data on BEO 03 students' sense of participation and social networks. The second one, distributed to BEO 04 students, also examined prior use of IM systems and self-reported number of hours spent interacting with content and other students. Thus, the questionnaires made it possible to investigate: (1) how the introduction of the IM system affected participation; and (2) for what kinds of exchanges between whom the system was used as compared with other media.

Drawing on the work of Haythornthwaite (2000) both questionnaires contained questions on "how often [e.g., daily, weekly, monthly] they had engaged in the following types of exchanges with each other member of the class: (1) collaborating on class work; (2) giving or receiving information or advice about class work; (3) socializing; and (4) giving or receiving emotional support (described as help in a minor or major upset)" (p. 202). For each type of exchange the students were asked to indicate which means of communication were used. In order to assess the impact of

IM on a distance learning course, students and instructor's full set of ties were surveyed (Cummings, Butler, & Kraut, 2002). Thus, it was decided to collect data not only on the use of IM, but all means of communication since IM may affect use of other media. In order to compare IM adopters and non-adopters, students were divided into two groups based on frequency of communication. The following frequency estimates per month were used (the course lasted for about two and a half months): "Daily communication was scored as 20, daily to weekly as 12, weekly as 4, weekly to monthly as 2.5, and monthly as 1" (Haythornthwaite, 2001, p. 215). Total frequency of interaction for a student was taken as the sum of the frequencies of interaction via each medium and exchange. The self-reported frequency is not believed to be objectively accurate, but will make it possible to compare different frequent communicators' use of IM and other means of communication. Adjustments were made for the missing questionnaire data by taking the responses others gave for interaction with the student during the time period (Haythornthwaite, 2001).

Researchers commonly interpret and classify data collected from electronic communication logs. However, in this study it is perceptions of exchanges and media use that were of primary interest because of three reasons. Firstly, since one of the aims of the study is to compare the use of an IM system with all other means of communication it was deemed not possible to log or transcribe all types of communication. Note that supporting CMC media do not prevent other means of communication such as meeting face-to-face and talking on the telephone (Brook & Oliver, 2003; Haythornthwaite, 2001). Secondly, it is the user's interpretation of whether communication was giving, for example, emotional support that is of primary importance and not the researcher's interpretation (Haythornthwaite, 2001). Thirdly, this approach will complement earlier research since few studies have been conducted from the students' point of view (Keller & Cernerud, 2002).

In both questionnaires a measure on students' sense of participation was included. Using this measure, it was possible to compare whether participation in BEO 04, where an IM system was used, was higher than in BEO 03. This complemented data on social networks. The measure was adapted from a questionnaire initially developed by Webster and Hackley (1997) and complemented with additional items from Haythornthwaite (2000). It consisted of the following items: (1) I felt like the class worked together; (2) I felt that the class included social interaction; (3) as a student, I felt part of the class; (4) I felt comfortable interacting with other participant(s); (5) computers depersonalize communications and social relationships (reverse-coded); and (6) as a student, I felt personally involved in the course. The items were measured on a seven-point ordinal scale ranging from "strongly disagree" to "strongly agree".

In the questionnaires, data that describes the students were also collected. The BEO 03 students consisted of three males and thirteen females. The BEO 04 students consisted of five males and nine females. Their mean age was 31 years with ages ranging from 24 to 42 years. Response rates were 88% for class BEO 03 (14 out of 16 students), and 93% for class BEO 04 (13 out of 14 students). Overall response rate was 90% from 28 respondents. One of those was the teacher, responsible for both BEO 03 and BEO 04. She was only asked to submit social network data since the study examined IM from a student's perspective.

4.2.2. Qualitative data collection

Six interviews with students from BEO 04 were recorded and transcribed. Each transcribed interview was sent to the respondent for approval. The aim was to get a richer view of: (1) student opinions on using the IM system in the course; (2) how the IM system was used as compared with other communication media; and (3) how IM use may affect participation. Three students that were classified as adopters and three that were classified as non-adopters were chosen to be interviewed. The interviews were conducted via telephone since the students were geographically dispersed. The main disadvantage of this approach is the lack of visual cues, which may aid in the researcher's interpretation (Robson, 2002). When interviews will be carried out in a fairly short period of time Yin (2003) suggests using focused interviews. However, he states that "the interviews may still remain open-ended and assume a conversational manner" (p. 90). Consequently, an interview guide that contained quite broad questions was used. The data from the interviews was categorized according to the research questions and depending on whether the particular student was classified as an IM adopter on non-adopter.

5. Results

Based on the second questionnaire and interviews, the first section describes how students in BEO 04 used IM, including comparisons with other means of communication. Then, data from the questionnaires on student participation are compared for BEO 03 and BEO 04, and for IM adopters and non-adopters.

Table 2
Frequency range, mean frequency and number of years of IM use for adopters and non-adopters

	Frequency range	Mean frequency	IM use (years)
IM adopters ($n=6$)	26–64	43	1.8
IM non-adopters ($n=7$)	0–20	7	1.2

5.1. Overall communication patterns

By examining the overall pattern of IM use, students were divided into two groups, IM adopters and non-adopters (Chen, Yen, & Huang, 2004). As discussed in the method, frequency estimates were used and total frequency of interaction for a student was taken as the sum of the frequencies of interaction via each medium and exchange. When analyzing the frequencies, seven students were clustered around low frequencies, which ranged between 0 and 20 (see Table 2). These were labeled non-adopters and the remaining seven students were labeled adopters. One of the adopters did not complete the questionnaire and therefore responses others gave for interaction with the student were used (Haythornthwaite, 2001). As displayed in Table 2, the mean frequency of communication was 43 for the IM adopters and 7 for the non-adopters. The students' IM experience was measured as the number of years of claimed IM use (Chen et al., 2004). As displayed in the table, the adopters had more experience of IM.

In Fig. 1, IM communication is illustrated. During the first part of the course students were expected to complete two group projects. The initial letter denotes which group each student belonged to — there were four groups (A–D). In group A there were two students and in the other groups there were four students. The teacher (T) mainly communicated asynchronously, via e-mail and the discussion board, with students. By interpreting the figure, it is apparent that the IM system was mainly used for communication within the groups.

In Table 3, network densities are displayed for each type of exchange and communication media weekly and monthly. Network density indicates the number of reported ties relative to the maximum possible number of ties. The maximum number of ties for BEO 04, including the instructor is 210 ($15\times(15-1)$). The most commonly used communication media at least weekly were e-mail followed by discussion board, and at least monthly e-mail followed by IM. Surprisingly, the students often did not report the use of class-wide discussion boards as

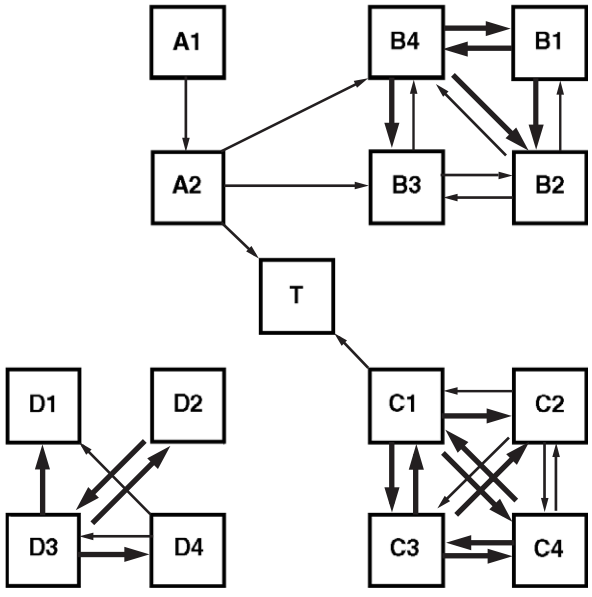

Fig. 1. IM network — all relations, communication frequency at least one time (thin arrow) and at least ten times (thick arrow).

Table 3
Network density by means of communication and type of exchange for BEO 04 ($n=13$)

		Collaborative work (CW)	Information exchange (IE)	Socializing (SO)	Emotional support (ES)
Weekly	Diss board	–	0.08	–	–
	IM	0.03	–	–	–
	E-mail	0.05	0.09	–	–
	Phone	–	–	–	–
	Face-to-face	0.01	0.01	0.01	–
	All	0.09	0.18	0.02	0.01
Monthly	Diss board	–	0.08	–	–
	IM	0.13	0.10	–	–
	E-mail	0.17	0.22	–	–
	Phone	0.01	–	–	–
	Face-to-face	0.01	0.01	0.01	0.01
	All	0.32	0.41	0.02	0.01

communication with peers even though BEO 03 posted 219 messages and BEO 04 250 messages. The IM system was primarily used for collaborating on class work and giving or receiving information or advice about class work within the groups. Moreover, it was used as a complement to rather than replacement of e-mail:

> We have had some projects where you have worked in groups and then we have used it a bit to decide when and where and how we should organize our work. It is mostly in that way we have used [IM]. Then, after that we maybe have used e-mail. We have mainly used e-mail to send stuff but we have organized work by using [IM]. (Interview B4, IM adopter)

One reason for the fairly low network densities on IM communication is that some students wanted to work individually which seemed to be the underlying reason for choosing a distance learning course. Drawing on previous research on IM in a distance learning class it was expected that students would report a high level of social support (Nicholson, 2002). However, most students chose not to communicate socially and simply did not express a need for such exchanges:

> I didn't have a need to socialize with others in this course. I felt that I wanted to complete the credits and I wanted to do it by myself. I wasn't interested in group work. (Interview A2, IM non-adopter)

> [In a distance learning course] I don't have any direct need to interact. That was why I took the course (Interview B3, IM non-adopter).

The class did not seem to have achieved the critical mass (Markus, 1987) needed to get communication via the IM system started (Li, Chau, & Lou, 2005) since most students reported that others seldom were online. Notably, one woman (B3) who likes to communicate socially via IM with friends and had done it frequently for 4.5 years did not want to communicate socially with other students: "When I use [IM] normally it is only socially and that is maybe why I hesitated since I don't have that relation to any of these people I never have met" (Interview B3, IM non-adopter).

5.2. IM use and its relationship with participation

The overall research question, how the possibility to communicate synchronously via an IM system affects participation in a distance learning course, has been investigated in two ways. First, the BEO 03 and BEO 04 classes are compared by using two measures on participation, social network density and students' sense of participation. Then, students in BEO 04 classified as IM adopters and non-adopters are compared by sense of participation, and on the number of hours students engaged in interpersonal interaction and in working with content. Data was not collected on the number of hours students engaged in interpersonal interaction and in working with content for BEO 03 students, which could have strengthened the comparison between the two classes. Moreover, social network data for IM adopters and non-adopters were not compared since densities are calculated on the overall network. For example, IM adopters communicated with non-adopters and vice versa.

Table 4
Network densities by class and type of exchange for communication via discussion board, IM, e-mail and all media

		BEO 03 (n=14)				BEO 04 (n=13)			
		CW	IE	SO	ES	CW	IE	SO	ES
Weekly	Diss board	0.14	0.15	–	0.01	–	0.08	–	–
	IM	0.01	0.01	0.01	0.01	0.03	–	–	–
	E-mail	0.10	0.14	–	0.03	0.05	0.09	–	–
	All	0.15	0.32	0.04	0.07	0.09	0.18	0.02	0.01
Monthly	Diss board	0.25	0.19	–	0.01	–	0.08	–	–
	IM	0.02	0.01	0.02	0.01	0.13	0.10	–	–
	E-mail	0.20	0.18	0.03	0.04	0.17	0.22	–	–
	All	0.38	0.40	0.08	0.09	0.32	0.41	0.02	0.01

5.2.1. BEO 03 vs. BEO 04

When comparing the overall network density data it is obvious that the BEO 04 network is not denser than the BEO 03 network (see Table 4). In fact, all densities when including all media, except for monthly information exchange, are lower for the BEO 04 class. It should be noted that network densities are dependent on the size of the network and it is therefore not recommended to do comparisons across networks of different sizes (Scott, 1991). However, in this study the networks were of similar sizes.

The media reported to be used by the BEO 03 students were primarily e-mail and discussion board. Five students in this class voluntarily chose to use IM. As mentioned above, BEO 04 students mainly communicated via e-mail, IM and discussion board. Surprisingly, most of the BEO 04 students did not report that they communicated with others when using the discussion board even though they posted more messages per student than the BEO 03 class. The mean number of messages posted by each participant in BEO 03 and BEO 04 was 13 and 17 respectively. It seems like some of the BEO 03 students felt that they were participating in discussions with peers while most students did not feel that they communicated with others even though it was mandatory to contribute to each discussion. Thus, some posted messages and replies but still did not feel that they were communicating with fellow students.

As has been described in the method, the questionnaires contained a measure on students' sense of participation. Initially, it consisted of six items but the fifth item was removed to increase reliability (Cronbach's alpha=.81). The items were measured on a seven-point ordinal scale ranging from "strongly disagree" to "strongly agree" and were also combined into the categories strong (6–7), intermediate (3–5) and weak (1–2) sense of participation to simplify interpretation. Drawing on the data, the percentage of items indicating strong sense of participation was 54% for BEO 03 and 26% for BEO 04 students (see Table 5). Even though an IM system was introduced in BEO 04, lower means on the seven-point scale indicate that these students especially seemed to feel less part of the class (item 3; M=5.6, 3.0; SD=1.3, 1.8), and neither felt that the class included social interaction (item 2; M=4.1, 2.3; SD=1.5, 1.3) nor that the class worked together (item 1; M=4.0, 3.0; SD=1.8, 1.8). Descriptive statistics for all items are displayed in Appendix A.

5.2.2. IM adopters vs. non-adopters

The measure on students' sense of participation was also compared for IM adopters and non-adopters in BEO 04 (Cronbach's alpha=.78). Drawing on the data, the non-adopters' sense of participation was weaker (see Table 6). The IM adopters as compared with the non-adopters, especially seemed to feel more like the class worked together (item 1; M=4.0, 2.1; SD=1.1, 1.9) and more comfortable when interacting with other participant(s) (item 4; M=6.2, 4.3,

Table 5
Students' sense of participation by class

	Strong	Intermediate	Weak	Total
	N (%)	N (%)	N (%)	N (%)
BEO 03 (n=14)	38 (54)	24 (34)	8 (11)	70 (100)
BEO 04 (n=13)	17 (26)	26 (40)	22 (34)	65 (100)

Pearson Chi-square ($d.f.$=2)=14.5, p<.005.

Table 6
Students' sense of participation by adopters and non-adopters

	Strong	Intermediate	Weak	Total
	N (%)	*N* (%)	*N* (%)	*N* (%)
Adopters ($n=6$)	9 (30)	17 (57)	4 (13)	30 (100)
Non-adopters ($n=7$)	8 (23)	9 (26)	18 (51)	35 (100)

Pearson Chi-square ($d.f.=2$)=11.1, $p<.005$.

SD=1.0, 2.3). Descriptive statistics for all items are displayed in Appendix B. It was also examined whether different frequencies of IM use may be related with high or low time spent interacting with content and interpersonal interaction. The IM adopters compared with the non-adopters, spent more hours communicating interpersonally ($M=15$, 6; SD=10, 4) and working with content ($M=86$, 60; SD=72, 31), even though this issue needs to be examined more thoroughly.

6. Discussion

The overall research question of this study was to investigate whether the possibility to communicate synchronously via an IM system affected student participation in the course. In doing this, two comparisons were made. The first one was between two offerings of the course where the first offering only included asynchronous media while the second was complemented with a synchronous media, IM. The results of this comparison indicate that the degree of participation was higher in the class that did not use IM. However, then the degree of participation by students in the second offering that adopted the IM system was compared with the degree for those that did not adopt the system. The results of this comparison indicate that the degree of participation was higher for those that adopted the IM system. Thus, the research question cannot be definitely answered on the basis of the results.

How can it be explained that, on the one hand, a class that used an IM system operated with a lower degree of participation than a class that did not, while on the other hand, students that adopted an IM system were related with a higher degree of participation than those that did not? Of course, it is impossible to give a definite answer to this question. It is most likely that many other independent variables affected student participation. However, commonly mentioned variables such as pedagogy (e.g., Hiltz et al., 2000), participation by instructors (e.g., Mazzolini & Maddison, 2003), instructor style (e.g., Webster & Hackley, 1997), moderation techniques (e.g., Veerman, Andriessen, & Kanselaar, 2000), assessment of contributions (e.g., Macdonald, 2003) and support in technical matters (e.g., Jelfs & Colbourn, 2002) seem to be fairly constant between the two offerings. In fact, the researcher and teacher agreed to make no conscious changes in the course so that the effect of introducing IM could be monitored. One difference that most likely affected the results is that the two classes consisted of different students. In the BEO 04 class, the IM system was primarily used to support communication within project groups. In another study, results indicated that a higher frequency of IM use in project groups was related with a higher degree of participation (Hrastinski, 2005a). IM use did not enhance class-wide communication and sense of participation in class. One reason may be that students had different learning styles — there might have been more "missing in action" and "witness learners" in the BEO 04 class (Bento and Schuster, 2003). Some students in the BEO 04 class seemed so determined to work individually that they did not care if the faculty encourages communication among students:

> I didn't study at a distance to create relations to 20 others via the Internet. I think … that it was quite pointless to struggle to achieve some kind of solidarity and communication in the class. I think it should have been more individual. (Interview B3, IM non-adopter)

This finding might also be explained by Wenger's (1998) theory on barriers between communities and Putnam's (2000) argument that "strong in-group loyalty" may create "strong out-group antagonism" (p. 23).

From the results of this study, it is clear that introducing a medium that is widely used for communication in non-educational settings does not necessarily mean it will be adopted by students. In this context it seems that many of the participants wanted to study individually and therefore wanted to communicate with other students as little as possible. Thus, they chose to be witness learners and stay in the periphery throughout the course (Bento & Schuster, 2003; Lave & Wenger, 1991). The fact that some distance learners choose to study individually has been acknowledged by other

researchers. For example, Garrison and Anderson (2003) have written that it is known that "some students actively choose distance education formats — including e-learning — that allow for study that is independent of intense contact and the temporal restraints associated with paced and interactive forms of education delivery" (p. 44). This has been a reoccurring issue during all deliveries of BEO (Lindh et al., 2005), which cannot be addressed simply by introducing new media — many students still prefer to work individually. However, it seems like the IM medium has simplified communication among active learners who do value a direct contact with project group members.

A surprising finding is that the respondents seldom used the IM system for social exchanges. In fact, it was primarily reported to be used to collaborate on work and exchange information. Contreras-Castillo et al. (2004) have also reported that an IM system was used for collaboration among course participants. However, previous research on IM in an educational setting has concluded the opposite: "[IM was used] for social interaction and discussion about the school, rather than course material and group work" (Nicholson, 2002, p. 371). Together, these three studies underlie that an IM system will not by default be used for particular types of exchanges — this is probably dependent on many so far unknown factors. However, one consistent finding across this and several other studies is that both students (Contreras-Castillo et al., 2004; Nicholson, 2002) and employees (Cameron & Webster, 2005) find the medium useful for informal or spontaneous communication.

In the theoretical framework of this paper it was argued that participation is a complex process that cannot be reduced to counting the number of posts or logins during a time period. It cannot be assumed that those that contribute less or not at all are "passive recipients rather than actively engaged in learning" (Romiszowski & Mason, 2004, p. 399). In the paper, this argument was strengthened by empirical data even though it was not the purpose of the paper. As mentioned above, BEO 03 members posted 13 messages per participant while BEO 04 members posted 17 messages per participant in the discussion board. However, self-reported data displayed higher network densities for the first group. These conflicting results may be interpreted in several ways. Either, social network surveys may be subject to insufficient construct validity or, more likely, other factors influence whether students feel that they are communicating with peers when posting messages. Such factors may be the quality of the postings or equality of participation but also, which is supported by the data from this study, that students in BEO 03 of some reason felt more part of the class and, thus, engaged in conversations with each other rather than just submitting information to a database.

6.1. Limitations

The advantage of examining a small population is that IM use could be examined more in-depth by adopting several data collection methods. However, a disadvantage is that the presented results are based on a rather small population of adults engaged in a first-year business English course. Since the study is exploratory the results are tentative and need to be tested, especially in other contexts.

The major methodological issue of this study is that it may be subject to internal validity. When designing a comparative study the groups may be naturally occurring or created specifically for the study (Robson, 2002). In the empirical studies the groups were naturally occurring. It was not known which students that would enroll in the two offerings of BEO and which of them that would adopt IM. This raises issues about internal validity since the groups that were compared (BEO 03 vs. BEO 04, IM adopters vs. non-adopters) probably differed in many ways. Thus, the possibility that other variables, such as student characteristics, affected the results cannot be excluded.

In this study, students' were asked to estimate whom they talked with, how often and by which media, and also to estimate the number of hours they spent interacting with other students and course content retrospectively. As discussed in the Method section, self-reported frequency is not believed to be objectively accurate, but made it possible to compare different frequent communicators' use of IM and other means of communication. It was found that the number of student postings did not corroborate with self-reported frequencies, at least not for communication in the discussion board, which was the only medium where electronic logs were available. Likewise, Picciano (2002) has argued that actual and perceived interaction may differ. Different arguments might be put forward in favor for self-reported frequencies or frequencies based on electronic logs. What this finding really illustrates is that it may be a limitation to draw conclusions solely on one of the two data collection methods since they seem to be complementary. By combining the two methods, it was found that some students might not feel that they are communicating with peers even when they are submitting a high frequency of postings.

The study aimed to better grasp the complexity of online participation. In doing this, it was intended to move beyond labeling a class or specific students as more active participants than others based on how many messages they posted or how many times they logged into a learning environment. The measures were based on students' sense of participation, densities of social networks, time spent interacting with others and time spent working with content. This initial attempt can surely be further developed by, for example, refining existing measurements and adding new ones. A minor improvement has been made in Hrastinski (2005a) in which the number of items in the measure on students' sense of participation was extended. Moreover, a diary approach was used where students continuously recorded communications, which probably is a more reliable but time-consuming way of collecting social network data.

6.2. Further research

Even though this study was focused on synchronous media in general and IM in particular the implications of the study may be broader. Since this is an exploratory study there is no doubt that most of the results need to be tested and further elaborated on in other contexts. In the Introduction, reports on the increasing popularity of IM were cited. Since both students and employees are already using IM there are many possibilities for researchers interested in exploring this medium. However, it should be reminded that all studies on IM that have been reviewed focus on exchanging text messages which also characterizes research on CMC in general (Hrastinski, 2005b). Within IM systems people can also spontaneously engage in audio and video conferencing with one or several others, which may enable richer communication (Daft & Lengel, 1986). For example, the teacher would like to conduct audio conversations with students so that they can also practice speaking English. In short, more research that tests the findings in this study, research that further elaborates on the usefulness of IM in education, and research on informal audio and video conferencing are needed.

One of the contributions of this research was to develop a more detailed way of measuring the complex process of online student participation. This is of general interest since student participation is a central issue in online education (Bento & Schuster, 2003; Masters & Oberprieler, 2004). In this study, an initial attempt was made to measure student participation by combining several data collection methods. A slightly different approach was presented in Hrastinski (2005a). However, it should be reminded that these are initial attempts which surely will benefit by being further developed by other researchers.

7. Conclusion

The introduction of the IM system was relatively successful — most students chose to use IM even though it was voluntary to do so. Students primarily chose to use it to sustain weak ties and communication was most often initiated in a spontaneous way. They used IM to collaborate on work and exchange information within groups rather than to socialize and exchange emotional support. The findings on how participation is affected are inconclusive. Consequently, there is a need for more research that tests and builds upon these results in both similar and different contexts.

Acknowledgements

My work has benefited by comments on earlier drafts from, among others, Sven Carlsson, Christina Keller, Jörgen Lindh and Carol-Ann Soames. An earlier version of this article was presented at the 22nd Conference of the Australasian Society of Computers in Learning in Tertiary Education, Brisbane. This research was supported in part by the Swedish Research School of Management and IT.

Appendix A

Questionnaire items in the measure on students' sense of participation by class

	BEO 03 ($n=14$)			BEO 04 ($n=13$)		
	Mean	SD	Min–Max	Mean	SD	Min–Max
1. I felt like the class worked together.	4.0	1.8	1–7	3.0	1.8	1–6

Appendix A (*continued*)

	BEO 03 (n=14)			BEO 04 (n=13)		
	Mean	SD	Min–Max	Mean	SD	Min–Max
2. I felt that the class included social interaction.	4.1	1.5	2–6	2.3	1.3	1–5
3. As a student, I felt part of the class.	5.6	1.3	2–7	3.0	1.8	1–6
4. I felt comfortable interacting with other participant(s).	5.7	1.1	4–7	5.2	2.0	1–7
5. As a student, I felt personally involved in the course.	5.7	1.2	3–7	5.1	1.6	2–7

Appendix B

Questionnaire items in the measure on students' sense of participation by IM adopters and non-adopters

	IM adopters (n=6)			IM non-adopters (n=7)		
	Mean	SD	Min–Max	Mean	SD	Min–Max
1. I felt like the class worked together.	4.0	1.1	3–6	2.1	1.9	1–6
2. I felt that the class included social interaction.	2.7	1.0	1–4	2.0	1.4	1–5
3. As a student, I felt part of the class.	3.5	1.9	1–6	2.6	1.7	1–5
4. I felt comfortable interacting with other participant(s).	6.2	1.0	5–7	4.3	2.3	1–7
5. As a student, I felt personally involved in the course.	5.0	1.5	3–7	5.1	1.7	2–7

References

Arbaugh, J. B. (2000). An exploratory study of the effects of gender on student learning and class participation in an Internet-based MBA course. *Management Learning*, *31*(4), 503−519.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly*, *11*(3), 369−386.

Bento, R., & Schuster, C. (2003). Participation: The online challenge. In A. Aggarwal (Ed.), *Web-based education: Learning from experience* (pp. 156−164). Hershey, PA: Idea Group Publishing.

Beuschel, W., Gaiser, B., & Draheim, S. (2003). Communication needs of online students. In A. Aggarwal (Ed.), *Web-based education: Learning from experience* (pp. 156−164). Hershey PA: Idea Group Publishing.

Bober, M. J., & Dennen, V. P. (2001). Intersubjectivity: Facilitating knowledge construction in online environments. *Educational Media International*, *38*(4), 241−250.

Boneva, B., Quinn, A., Kraut, R., Kiesler, S., Cummings, J., & Shklovski, I. (2006). Teenage communication in the instant messaging era. In R. Kraut, M. Brynin, & S. Kiesler (Eds.), *Domesticating information technology.* Oxford: Oxford University Press.

Bowden, J., & Marton, F. (1998). The University of learning: Beyond quality and competence in higher education. London: Kogan Page.

Britain, S., & Liber, O. (2004). *A framework for the pedagogical evaluation of virtual learning environments.* Retrieved 15 Feb, 2006, from the World Wide Web: http://www.jisc.ac.uk/uploaded_documents/VLE%20Full%20Report%2006.doc

Brook, C., & Oliver, R. (2003). Online learning communities: Investigating a design framework. *Australian Journal of Educational Technology*, *19*(2), 139−160.

Brown, J. S. (2000). Growing up digital: How the web changes work, education, and the ways people learn. *Change*, *32*(2), 11−20.

Brown, J. S., & Duguid, P. (1998). Organizing knowledge. *California Management Review*, *40*(3), 90−111.

Cameron, A. F., & Webster, J. (2005). Unintended consequences of emerging communication technologies: Instant messaging in the workplace. *Computers in Human Behavior*, *21*(1), 85−103.

Carr, S. (2000). As distance education comes of ages, the challenge is keeping the students. *Chronicle of Higher Education*, *46*(23), A39−A41.

Cavaye, A. L. M. (1996). Case study research: A multi-faceted research approach for IS. *Information Systems Journal*, *6*(3), 227−242.

Chen, K., Yen, D. C., & Huang, A. H. (2004). Media selection to meet communication contexts: Comparing e-mail and instant messaging in an undergraduate population. *Communications of the Association for Information Systems*, *14*, 387−405.

Contreras-Castillo, J., Favela, J., Perez-Fragoso, C., & Santamaria-del-Angel, E. (2004). Informal interactions and their implications for online courses. *Computers & Education*, *42*(2), 149−168.

Cummings, J. N., Butler, B., & Kraut, R. (2002). The quality of online social relationships. *Communications of the ACM*, *45*(7), 103−108.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, *32*(5), 554−571.

Fish, R.S., Kraut, R.E., Chalfonte, B.L. (1990). *The VideoWindow system in informal communications*. Paper presented at the Conference on Computer-Supported Cooperative Work, Los Angeles.

Fredericksen, E., Picket, A., Shea, P., Pelz, W., & Swan, K. (2000). Student satisfaction and perceived learning with on-line courses: Principles and examples from the SUNY learning network. *Journal of Asynchronous Learning Networks*, *4*(2), 7−41.

Garrison, D. R., & Anderson, T. (2003). *E-learning in the 21st century: A framework for research and practice.* London: RoutledgeFalmer.

Garton, L., Haythornthwaite, C., & Wellman, B. (1999). Studying on-line social networks. In S. Jones (Ed.), *Doing internet research: Critical issues and methods for examining the net* (pp. 77−105). Thousand Oakes: Sage Publications.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, *78*(6), 1360−1380.

Haythornthwaite, C. (2000). Online personal network: Size, composition and media use among distance learners. *New Media & Society*, *2*(2), 195−225.

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

Haythornthwaite, C. (2002). Building social networks via computer networks: Creating and sustaining distributed learning communities. In K. A. Renninger, & W. Schumar (Eds.), *Building virtual communities: Learning and change in cyberspace* (pp. 159−190). Cambridge: Cambridge University Press.

Hiltz, S. R., Coppola, N., Rotter, N., Turoff, M., & Benbunan-Fich, R. (2000). Measuring the importance of collaborative learning for the effectiveness of ALN: A multi-measure, multi-method approach. *Journal of Asynchronous Learning Networks*, *4*(2), 103−125.

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

Hoadley, C., & Pea, R. D. (2002). Finding the ties that bind: Tools in support of a knowledge-building community. In K. A. Renninger, & W. Schumar (Eds.), *Building virtual communities: Learning and change in cyberspace* (pp. 321−354). Cambridge: Cambridge University Press.

Hrastinski, S. (2005a). *Instant messaging use and its effect on student participation in online group work*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Montreal.

Hrastinski, S. (2005b). *Research on computer-mediated communication in education: Summarizing the past to prepare for the future*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications, Montreal.

Hung, D. (2001). Theories of learning and computer-mediated instructional technologies. *Educational Media International*, *38*(4), 281−287.

Jelfs, A., & Colbourn, C. (2002). Virtual seminars and their impact on the rôle of the teaching staff. *Computers & Education*, *38*(1–3), 127−136.

Johnson, D. W., & Johnson, R. T. (1999). *Learning together and alone: Cooperative, competitive, and individualistic learning.* Needham Hights: Allyn and Bacon.

Keller, C. (2005). Virtual learning environments: Three implementation perspectives. *Learning, Media and Technology*, *30*(3), 299−311.

Keller, C., & Cernerud, L. (2002). Students' perceptions of e-learning in University education. *Journal of Educational Media*, *27*(1–2), 55−67.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge: Cambridge University Press.

Leidner, D. E., & Jarvenpaa, S. L. (1995). The use of information technology to enhance management school education: A theoretical view. *MIS Quarterly*, *19*(3), 265−291.

Li, D., Chau, P. Y. K., & Lou, H. (2005). Understanding individual adoption of instant messaging: An empirical investigation. *Journal of the Association for Information Systems*, *6*(4), 102−129.

Lindh, J., Hrastinski, S., Soames, C.A. (2005). *Same, same but different: A longitudinal study of group work in a distance learning course*. Paper presented at the 4th European Conference on e-Learning, Amsterdam.

Macdonald, J. (2003). Assessing online collaborative learning: Process and product. *Computers & Education*, *40*(4), 377−391.

Maor, D. (2003). The teacher's role in developing interaction and reflection in an online learning community. *Educational Media International*, *40*(1–2), 127−138.

Markus, M. L. (1987). Toward a "critical mass" theory of interactive media: Universal access, interdependence and diffusion. *Communication Research*, *14*(5), 491−511.

Markus, M. L. (1994). Electronic mail as the medium of managerial choice. *Organization Science*, *5*(4), 502−527.

Masters, K., & Oberprieler, G. (2004). Encouraging equitable online participation through curriculum articulation. *Computers & Education*, *42*(4), 319−332.

Mazzolini, M., & Maddison, S. (2003). Sage, guide or ghost? The effect of instructor intervention on student participation in online discussion forums. *Computers & Education*, *40*(3), 237−253.

Moore, G. (1989). Three types of interaction. *The American Journal of Distance Education*, *3*(2), 1−6.

Moreno, J. L. (1934). *Who shall survive? A new approach to the problems of human interrelations.* Washington, DC: Nervous and Mental Disease Publishing Company.

Münzer, S. (2003). An evaluation of synchronous co-operative distance learning in the field: The importance of instructional design. *Educational Media International*, *40*(1–2), 91−100.

Nicholson, S. (2002). Socialization in the "virtual hallway": Instant messaging in the asynchronous web-based distance education classroom. *Internet and Higher Education*, *5*(4), 363−372.

Picciano, A. G. (2002). Beyond student perceptions: Issues of interaction, presence, and performance in an online course. *Journal of Asynchronous Learning Networks*, *6*(1), 21−40.

Preece, J. (2000). *Online communities: Designing usability, supporting sociability.* Chicester, UK: John Wiley & Sons.

Putnam, R. (2000). *Bowling alone: The collapse and revival of American community.* New York: Simon & Schuster.

Robson, C. (2002). *Real world research: A resource for social scientists and practitioner–researchers.* Malden, MA: Blackwell Publishing.

Romiszowski, A., & Mason, R. (2004). Computer-mediated communication. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 397−431). New Jersey: Lawrence Erlbaum.

Rovai, A. P., Wighting, M. J., & Lucking, R. (2004). The classroom and school community inventory: Development, refinement, and validation of a self-report measure for educational research. *Internet and Higher Education*, *7*(4), 263−280.

Schweizer, K., Paechter, M., & Weidenmann, B. (2003). Blended learning as a strategy to improve collaborative task performance. *Journal of Educational Media*, *28*(2–3), 211−224.

Scott, J. (1991). *Social network analysis: A handbook.* Newbury Park, CA: Sage Publications.

Shiu, E., & Lenhart, A. (2004). *How Americans use instant messaging.* Retrieved 15 Feb, 2006, from the World Wide Web: http://www.pewinternet.org/pdfs/PIP_Instantmessage_Report.pdf

Soames, C. A. (2004). *Technical, organizational and pedagogical aspects of teaching business English online.* Jönköping: Jönköping International Business School.

Swan, K., & Shea, P. (2005). The development of virtual learning communities. In S. R. Hiltz, & R. Goldman (Eds.), *Learning together online: Research on asynchronous learning networks* (pp. 239−260). Mahwah, NJ: Lawrence Erlbaum.

Tuovinen, J. E. (2000). Factors influencing the success of computer mediated communication (CMC) environments in university teaching: A review and case study. *Educational Media International*, *37*(2), 16−24.

Wallén, J. (2004, 25 Aug). Två miljoner svenskar chattar. *Computer Sweden*, 8.

Walther, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. *Communication Research*, *19*(1), 52−90.

Wang, M., Sierra, C., & Folger, T. (2003). Building a dynamic online learning community among adult learners. *Educational Media International*, *40*(1–2), 49−61.

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications.* Cambridge: Cambridge University Press.

Webster, J., & Hackley, P. (1997). Teaching effectiveness in technology-mediated distance learning. *Academy of Management Journal*, *40*(6), 1282−1309.

Veerman, A. L., Andriessen, J. E. B., & Kanselaar, G. (2000). Learning through synchronous electronic discussion. *Computers & Education*, *34*(3–4), 269−290.

Wellman, B., Salaff, J., Dimitrova, D., Garton, L., Gulia, M., & Haythornthwaite, C. (1996). Computer networks as social networks: Collaborative work, telework, and virtual community. *Annual Review of Sociology*, *22*, 213−238.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity.* Cambridge: Cambridge University Press.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Yin, R. K. (2003). *Case study research: Design and methods.* Thousand Oaks, CA: Sage Publications.