The Measurement of Social Presence in an Online Learning Environment

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Several studies have accentuated the significance of examining social factors that impact communication and learning in online learning environments (Feenberg, 1989; Hackman & Walker, 1990; Lea, 1992; Sanders & Wiseman, 1990; Walther, 1992, 1996). Online education serves a multicultural cross section of students. McIsaac and Gunawardena (1996) have suggested that future research should explore the relationship between media and the socio-cultural construction of knowledge. Further, the cultural effects of technology and courseware transfer in distance education should be examined. Social presence is the degree of person-to-person awareness, which occurs in the computer environment. Social presence is an important key to understanding person-to-person telecommunication (Short, Williams, & Christie, 1976). Some studies (Dillon & Walsh, 1992; Garrison, Anderson, & Archer, 2000; Rice, 1984, 1993; Spears & Lea, 1992) have postulated that social presence possesses potential for future study. Gunawardena (1995) argues that social presence is necessary to enhance and improve effective instruction in both traditional and technology-based classrooms. When the level of social presence is low, interaction is also low (Garramone, Harris, & Anderson, 1986). A lack of social presence will lead to a high level of frustration, an attitude critical of the instructor's effectiveness and a lower level of affective learning (Rifkind, 1992).

OVERVIEW OF THE PROBLEM

Current instruments are unable to measure the complicated issue of online social presence. Literature review reveals that most studies adopted the four items proposed by Short et al. (1976) to measure social presence, personal-impersonal, sensitive-insensitive, warm-cold and sociable-unsociable, and applied a semantic differential technique (Osgood, Suci, & Tannenbaum, 1957), except Gunawardena and Zittle (1997). There are several difficulties encountered in the use of Short et al.'s (1976) social presence instrument. First, these four items are too general to measure the computer-mediated communication (CMC) user's perception of social presence. Social presence in a CMC learning environment is a complicated human perception and is, obviously, more complicated than just these four items. Many different variables are cited in the literature (Tu, 2000) that may contribute to the degree of social presence, such as the recipients, topics, privacy, task and so forth. Second, the semantic differential technique may be faulty in that respondents tend to ascribe different definitions and meanings to the keywords. Third, Gunawardena and Zittle (1997) created a new social presence instrument that is still unable to capture a thorough perception of social presence. This is so because it doesn't consider several important variables of social presence, privacy, recipients and topics, and some of the questions are created for specific groups of students.

Social presence theory was not originally designed to explain CMC. In fact, it was initially studied in face-to-face (FTF), audio and closed-circuit television encounters. Unlike traditional media, CMC provides very different characteristics, such as multiple identities, anonymity and so forth. To provide discipline for the instruc-

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tional design of distance education, these questions must be examined and answered. And, an appropriate instrument must be created for the measurement of level of social presence.

The current CMC application of social presence has not been clearly defined (Rafaeli, 1988; Svenning & Ruchinskas, 1984; Walther, 1992). The pervasive application of CMC as an educational communication tool requires that social presence be redefined. A clear understanding of social presence is necessary to direct research and to provide practitioners with clear guidelines for instructional design for distance education.

LITERATURE REVIEW
Social Presence
Social presence is a significant factor in improving instructional effectiveness. Therefore, it is one of the most significant factors in distance education. Hackman and Walker (1990) investigated the effects of conveyance system design and social presence in the form of teacher immediacy behavior on perceived student learning and satisfaction in the televised classroom. They conclude that system design and teacher immediacy behavior strongly impact student learning and satisfaction. Gunawardena and Zittle (1997) report similar findings in a CMC system. Social presence is a strong predictor of satisfaction within a CMC environment. Also, it is considered to be an element of interpersonal communication in an online learning environment. Perse, Burton, Kovner, Lears and Sen (1992) studied college students' utilization of e-mail, and concluded that students used CMC more when they felt that e-mail conveyed more of an interpersonal presence.

Social presence is based on user's perception and the attributes of media. The users are asked to judge the degree of social presence (Perse et al., 1992; Walther & Burgoon, 1992). Lack of non-verbal cues in CMC causes an impersonal feeling, doubted to be inherent to the system (Walther & Burgoon, 1992; Walther, 1996). Recent studies show that online users have perceived CMC as a high social-presence medium (Gunawardena, 1995; Gunawardena & Zittle, 1997; Perse et al., 1992). Therefore, social presence can be cultured by teleconference users and leaders, or encouraged by initial learning sessions (Johansen, Vallee, & Spangler, 1988). Gunawardena (1995) suggested that by successfully "inculturating" themselves within CMC, learners promote their levels of social presence and allow themselves an opportunity for greater participation. In spite of the characteristics of the medium, student perceptions of the social and human qualities of CMC will depend on the social presence created by the instructors/moderators and the online community (Gunawardena, 1995; Gunawardena & Zittle, 1997). Therefore, the instructor or the moderator must utilize their interaction skills and techniques, rather than that of the medium. This will enhance students' perceptions of social presence on CMC.

Online Privacy
Unlike conventional privacy, online privacy has not been clearly defined. In fact, different researchers propose conflicting theories.

Feeling of Privacy
The feeling of privacy is one of the factors affecting the social psychology of online communication (Champness, 1973; Christie & Holloway, 1975). In Champness's (1972b) study, public-private factor is one of distinctions from different communication media. The closed-circuit television conversations were rated as less private than either the audio or the face-to-face conversations. It was found that video teleconferencing reminds the user of the whole area of electronic eavesdropping and produces consequent negative reactions. Tu (2000) agreed that greater depth in future research must be conducted.

Online communications exist with varying degree of perceived privacy. People with low perceived privacy usually can be approached for permission without disturbing the interactions to be observed (King, 1996). Their communications are more personal. Vice versa, when one has the high in perceived privacy, less personal messages are produced. In other words, a decreased interactive communication environment is created.

Illusion of privacy
Convenience may override privacy risk because users are unable to visualize the negative impacts, although less private environments may decrease user's tendency of online interaction. This is called Illusion of Privacy (Neumann, 1995). Oftentimes, users don't have cues around them about who else is there, especially in online environments where there are lurkers – people who only observing activities and never participate in them. It is difficult for some users to consider negative consequences that they can't actually see in their minds, and the sharing of information about them is hard to visualize. Therefore, people do not ask themselves what bad things could happen to them as a result of people knowing all these things about them. Consequently, the illusion is created that users think they are much more private than they really are. In other words, certain users think that they are invisible if they participate the online

activities. Online users continue to say things that they wouldn't say in regular communication settings, even though they are warned (Denning & Lin, 1994). This is in conflict with the feeling of privacy discussed earlier.

Risk-taking behavior

Online user's behaviors do not correlate with their perceptions of online privacy. Witmer (1997) explained this phenomenon as Risk-Taking Behavior. It was found that online users feel personally and technically secure in CMC, and felt that they had little or nothing to lose if their activities were discovered by unintended others. This, then, indicates that the perceived risk is low among users who engage in risky CMC on these newsgroups. In fact, some users may think that "it won't be me if does occur."

Nonchalant attitude

Some educational online users express a nonchalant attitude to online privacy because students think that all class-related communications are class work and not personal (Friedman, 1990) nor confidential. Students take for granted that no one will be interested in their personal information, even they deliver it online. In fact, by collaborating and examining each other's work, some instructors thought that students learned from each other, with the teacher actively structuring students' computer use so that files were largely public (Friedman, 1990; Tu, 1999).

System Privacy

System privacy refers to the security of CMC technologies, and concerns the likelihood that someone may read, send or resend a message to or from you. Kerr and Hiltz (1982) found that more than one-third of online users agreed with the statements, "Information can come into the wrong hands," and, "Outsiders can see private messages." Certain groups of CMC users are more security conscious and protect themselves against the possibility of information falling into the wrong hands.

Existing Studies on Social Presence

The methodology and the instruments that have been utilized in studies on social presence are reviewed. Significant findings correlate with three stages of social presence theory development: (a) the emergence of the social presence theory, (b) the application of the social presence theory to CMC, and (c) the application of social presence in education using CMC. Researchers determined the existence of social presence factors when the social presence theory emerged and then investigated the attributes of media and their effect on social presence. The impor-

tance of the user's perception of social presence and the attributes of media emerged when applications of the social presence theory were examined. Finally, it was recognized that instructors and moderators could influence the perception of social presence.

Emergence of the Social Presence Theory

Champness (1972a) investigated attitudes toward three forms of communication in a laboratory setting: face-to-face, audio and close-circuit television. Thirty-six pairs of managerial government workers engaged in six-minute discussions, using each medium, in a completely controlled setting. After each discussion, subjects were asked to complete a 24-item, media attitude questionnaire according to a semantic differential scale (Osgood et al., 1957). Factor analysis using orthogonal and oblique rotation was applied to analyze the data. Three factors emerged: aestheticism, evaluation and privacy. The social presence factor was fused with the *Aesthetic Appeal* factor. Two of the four items in the scale, sensitive-insensitive and sociable-unsociable, (Short et al., 1976) were found to be associated with the *Aesthetic Appeal* factor.

Short et al. (1976) argued that face-to-face encounters should be rated as the most sociable medium, the video medium was second, and the audio medium was rated the least sociable. However, it was extremely difficult to determine whether the social-presence factor was the discriminator among the media. It was hypothesized that social presence could be a good discriminator between/among communication media and was investigated in later studies. Privacy, the third factor, was reported to be a significant discriminator. The video medium was considered to be a more public medium because a camera was seen as intrusive, a reflection of attitudes toward eavesdropping that carried over into the laboratory. The privacy factor was found to be a significant factor in CMC by later studies.

Champness (1972b) conducted a second study in the same year to distinguish differences in the social presence factor among variations of the same telecommunication system. Three media – audio, video and face-to-face – were examined using 90 government workers, grouped into sets of three. Two groups were in the same room while the other was alone in a different room. An instrument that included four social presence items – sociable-unsociable, sensitive-insensitive, personal-impersonal and warm-cold – was used. Factor analysis revealed the presence of four factors. The first factor was a fusion of the social presence factor and the *Aesthetic Appeal factor.* Two subjects in the same room received a

higher score than one subject alone in the video setting. The degree of social presence varies between different media and different versions of the same communication medium. The degree of social presence varies according to the characteristics of the medium and by the different context arrangements.

Christie (1973) conducted a study to separate the social presence factor from the aesthetic appeal factor and to determine whether visual contact has a significant effect on the degree of social presence. Thirty-six businessmen were divided into six groups of six subjects each, and five different media were used to discuss a modern business problem: face-to-face, close-circuit TV, speakerphone, a high-fidelity speakerphone and a multi-speaker audio system. Afterwards, they completed a 30-item semantic differential questionnaire. The social presence factor emerged through factor analysis as separate from the *Aesthetic Appeal* factor. The multi-speaker audio system rated significantly higher in social presence than the other two audio media and was significantly lower in social presence than the two visual media. This study established that social presence is different from the *Aesthetic Appeal* factor and that the visual element confers a significant variable for different media.

Christie (1974) conducted a study similar to the previous three, but also evaluated written media, including the business letter. Fifty-six subjects completed a 58-item semantic differential questionnaire. The social presence factor was clearly defined by personal-impersonal, hot-cold, humanizing-dehumanizing and sensitive-insensitive. Furthermore, the business letter was persistently rated as containing the lowest degree of social presence of all media studied. This suggested that text-based media, such as CMC, have a lower degree of social presence, which is not necessarily the truth (Walther, 1996).

Application of Social Presence in CMC

CMC media were examined from the aspect of social presence upon the introduction of computer technology as a communication medium.

Garramone, Harris and Anderson (1986) investigated the motivations and the satisfactions, the relationship between interactive use of the bulletin board and the perception of social presence in a group of correspondents to a political computer bulletin board. Of the 117 users telephoned for the survey, 95% were male, ranging in age from 11 to 64 years with an average 16-year educational level. Social presence was measured by an instrument that used a three-item, five-point Likert scale, similar to the instruments used in previous studies (Champness, 1972a; Champness,

1972b; Christie, 1973, 1974): sociable, personal and sensitive, respectively. Social presence in the relationship between interactive use and personal identity satisfaction was assessed through correctional analyses and concluded that interactive users of the bulletin board perceived it as having a greater social presence than non-interactive users. Further, interactive users perceived that personal identity significantly enhanced the perception of social presence. Non-interactive users perceived that personal identity, surveillance and diversion were elements that related significantly to their appreciation of social presence. Steinfield (1986) examined what independent factors best explained the amount of e-mail used in an organizational setting. Subject's perceptions of the attributes of e-mail were measured by 220 business employees using a 17-item, seven-point, semantic differential scale adopted from Ruchinskas (1982) and Svenning (1982). The questionnaire used was designed to reflect the attributes of e-mail, ease of use, utility, person ability or social presence, and confidentiality. Through the application of factor analysis and regression analyses, social presence and privacy emerged as significant factors. Four items – personal-impersonal, warm-cold, sociable-unsociable and formal-informal – loaded higher on the social presence factor, while confidential-not confidential and private-public had a higher loading on the privacy factor. It was found that: (a) social presence had the largest standardized regression coefficient with the social use of e-mail, which forms the hypothesis of the inherent property of the medium; and (b) the perceived privacy of e-mail was not related to task-oriented use.

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Application of Social Presence in Education

Perse et al. (1992) examined the use of e-mail and bulletin boards and if computer experience, computer attitude and social presence would predict a higher level of CMC use by students in a college-level physical science class. One hun-

dred thirty undergraduate students, with equal gender representation – seniors (21.7%), juniors (42.5%), sophomores (26.7%), and freshmen (7.7%) – answered the questionnaire. Like previous studies, four items – sociable-unsociable, warm-cold, personal-impersonal, and sensitive-insensitive – were used to evaluate the degree of social presence through a semantic differential technique with a five-point scale. The Pearson correlation and a stepwise multiple regression were used for statistical analysis. It was concluded that social presence is a significant predictor of CMC use. Students responded that e-mail was a sociable, warm, personal and sensitive medium that links to higher levels of CMC. In other words, students feel that e-mail is able to deliver social presence leading to the creation of better interpersonal relationships. Perse et al. (1992) explained that the development of positive relationships is possibly related to self-rated computer expertise, daily computer use and feeling comfortable with computers.

Gunawardena (1995) conducted two studies in distance education utilizing computer conferencing to examine whether social presence was largely the attribute of the communication medium or the user's perception of the medium. Sixty students were asked to respond to a questionnaire composed of 17 items, utilizing a five-point scale with semantic differential techniques, including such items as stimulating, personal, sociable and so forth. Standard deviation and mean were utilized for statistical analysis. A qualitative investigation and analysis were used to capture student reactions to the computer conference. The results revealed that students felt that CMC is a medium that is "interactive," "active," "interesting" and "sociable." Further, it was found that students create social presence by projecting their identities and building online communities through CMC, despite its lack of non-verbal and social context cues. She suggests that instructors or moderators must create an environment that trains users to create social presence in a text-based medium and build awareness in an online learning community.

Gunawardena and Zittle (1997) continued to examine the social presence in a CMC environment determining the effectiveness of social presence as a predictor of learner satisfaction in a text-based medium. Fifty students, 62% female, with a mean of age of 40 years from five universities, participated in an inter-university virtual computer conference. A 52-item questionnaire with a five-point Likert scale was used to measure seven different areas, such as social presence, active participation, attitude, barriers, confidence, perception of equal participation and training. Of the 52-two items, 14 were related to social presence, such as "messages were impersonal," "CMC is an excellent medium for social interaction," "I felt comfortable introducing myself" and so forth, a different format from the semantic differential technique used in previous studies. It was found that social presence is a significantly effective predictor of satisfaction. Students who perceived a higher degree of social presence increased the socio-emotional experience by using "emoticons" to express missing non-verbal cues in the text-based environment. It is suggested that while designing and creating an online learning experience, the skills that intensify social presence must be identified and used.

Weakness of Existing Studies

There are several weaknesses that exist in studies of social presence. These issues must be resolved before any meaningful investigation about social presence in CMC can occur.

Definition

Social presence has been defined as the degree of salience of another person in an interaction and the consequent salience of an interpersonal relationship (Short et al., 1976; Walther & Burgoon, 1992). Most researchers have adopted this definition, however, it does not provide a clear concept of social presence. The components of social presence and what affects the degree of social presence in the CMC setting are missing. Social presence theory has been seen as a vague concept because it lacks a clear definition (Rafaeli, 1988). Therefore, a more accurate definition must be developed through investigation.

Instrument

Review of the social presence literature reveals that most studies adopted the four social presence measurements from Short et al. (1976) – personal-impersonal, sensitive-insensitive, warm-cold and sociable-unsociable – utilizing a semantic differential technique (Osgood et al., 1957). The exception is Gunawardena and Zittle (1997). Several difficulties are encountered in the use of Short et al.'s (1976) measurement of social presence. First, these four items are too general to measure the CMC user's perception of social presence. Social presence in a communication medium is a complicated human perception and is, obviously,

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more complicated than just these "four" items. Many different variables are cited in the literature that may contribute to the degree of social presence: recipients, topics, privacy, task, social relationships, communication styles and so forth. Second, the semantic differential technique may be faulty in that respondents tend to ascribe different definitions and meanings to keywords. Third, the social presence instrument developed by Gunawardena and Zittle (1997) fails to capture a thorough perception of social presence because several important variables are not considered: privacy (Champness, 1972b), recipients (Walther, 1992) and topics (Argyle & Dean, 1965; Walther, 1992). And, some questions are created for specific groups of students (Tu, 2000).

Non-education Participants

Several studies (Champness, 1972a; Champness, 1972b; Christie, 1973, 1974; Garramone et al., 1986; Steinfield, 1986) were conducted in non-education settings and are difficult to apply to a learning environment, particularly in the area of distance education. The facility of social presence to create an interactive learning environment must be investigated in an educational setting.

Single CMC System

Most studies (Champness, 1972a, 1972b; Christie, 1973, 1974) were conducted using one or two CMC systems: e-mail, bulletin board or real-time discussion. None examine the differences among CMC systems. Although CMC systems share some characteristics, they differ in their operations and functions (Blocher, Amato, & Storslee, 1996) and these differences may impact the degree of social presence.

Laboratory Setting

Several studies discussed in this article were conducted in a laboratory setting. The normal pattern of the discussions may have been preempted by the limitation of the amount of CMC communication time in these experiments. Both Gunawardena (1995) and Walther (1992) noticed that CMC users normally took longer to develop social interaction and interpersonal relationships than face-to-face communicators. Studies have shown that CMC groups are unable to accomplish some tasks as quickly as face-to-face groups. However, Weisband (1992) found that they produced as many messages as face-to-face groups and arrived at the same decisions if given enough time.

METHOD

The Social Presence and Privacy Questionnaire (SPPQ) was developed, and then was exposed to content validation and construct validation (Crocker & Algina, 1986).

Instrument Development

This perception of a social presence and privacy instrument was developed and based on two instruments: CMC attitude instrument (Steinfield, 1986) and perceived privacy (Witmer, 1997). Both instruments were created for different groups. Steinfield created his instrument to examine business users' attitudes toward CMC. Witmer's instrument was developed specifically for an online newsgroup concerning the topic of sex. Steinfield's instrument has 16 items using a semantic differential scale while Witmer's instrument has 32 items using the Likert scale. These two instruments were adopted, and several items were removed that were specific for the groups for which they were developed. The literature review suggested several items; these were created and added to evaluate CMC users' perceptions of social presence and privacy. The final instrument contains 59 items, including demographic data. A Likert scale format is uniformly used for all items, except the demographic data.

Content Validation

These eight objectives were utilized in content validation:

1) social presence: degree of salience of another person in an interaction and the consequent salience of an interpersonal relationship;

2) privacy: private, safe, security, confidentiality, and reliability;

3) utility: CMC general use;

4) ease of use;

5) interactivity: two-way exchanges, immediacy;

6) language: online language and cues used;

7) CMC experience & competence: CMC experience and level of comfort; and

8) demographics: gender, age, and access to computers.

Objectives 3 and 4 were not the intention of this study, but they appeared in Steinfield's (1986) instrument. Each objective is covered by a different number of items. The eight objectives are weighted differently because they are not in a parallel relationship.

Five qualified content experts in the field of social presence and privacy domains were selected as a panel. They completed a questionnaire accompanied by detailed instructions and a list of objectives. Each objective was numbered from 1 to 8, with N/A as number 9. The panelists were asked to perform an item-matching task (Klein & Kosecoff, 1975) by selecting the best match for a specific objective. If an object match was not made, item 9 (N/A) was applied which

was a critical validation. Three "lemon" items – in other words, items not measuring any of the objectives – were introduced in this content validation to assess the "accuracy" of the panel.

Data analysis

Data collected from these procedures were useful in addressing item validity. The data derived from this procedure were used to determine which items failed to "match" the objectives they were designed to measure, the clarity the test items, the best way to rewrite the test items and the adequacy of the individual members of the panel of experts.

The judges matched on 58% to 80% of the items: Objective 8-Demographics (87%); Objective 3-Utility (87%); Objective 7-CMC experience and competence (80%); Objective 1- Social Presence (76%); Objective 5-Interactivity (70%); Objective 2-Privacy (63%); Objective 4- Ease of use (47%); and Objective 6-Language (44%).

Three lemon items were applied to examine a content expert's effectiveness measured by the number such items detected. Within five content experts, no one matched all three lemon items. Therefore, it was unnecessary to remove any panelist from the analysis.

Revision of items was based on the statistical data obtained from the content expert validation. Items from Objectives 2 and 6 were revised because of the low percentage of matches from the content experts. Items from Objectives 3 and 4 were discarded. Each individual item was revised and rewritten, or removed if the percentage of matches for that item was lower than 60%.

The final questionnaire – evaluating e-mail, bulletin board and real-time discussion – contains 17 social presence items and 13 privacy items, each with a five-point Likert scale and 12 demographic responses.

The chi-square test for independence among the five content experts was used to analyze data that were presented in a contingency table format (Table 1). The chi-square (X^2) with degree of freedom 28 was 13.51, $p < .05$. Because the critical value of X^2 (28) is 41.337, the null hypothesis was accepted, as there was no significant difference of item matching of the five content experts.

Construct Validation

Construction validation was applied because content validity evidence alone was not sufficient because it pertains to the content of the test, whereas descriptions and decisions were made based on examinee responses to the test items. Subjects were 310 inservice and preservice teachers responding the Social Presence and Privacy Questionnaire through an online format, 166, and article-and-pencil format, 112. Participation was voluntarily.

Exploratory factor analysis was utilized to determine the emergence of the three dimensions of social presence, social context, online communication and interactivity. Orthogonal rotation and oblique rotation were used to improve the interpretability of the results. Items producing Eigenvalues greater than 1.00 were considered significant factors. Screen testing with visual inspections was also used to support and determine the number of factors/clusters to be extracted.

Table 1. Contingency Table

Objectives	Content Experts					Total
	1	**2**	**3**	**4**	**5**	**Total**
1 Social Presence	6 (7.09)	9 (7.88)	6 (7.09)	7 (6.89)	10 (9.06)	38
2 Privacy	14 (12.31)	10 (13.68)	11 (12.31)	15 (11.97)	16 (15.73)	66
3 Utility	2 (2.42)	3 (2.69)	3 (2.42)	3 (2.36)	2 (3.10)	13
4 Ease of Use	2 (1.31)	2 (1.45)	0 (1.31)	1 (1.27)	2 (1.67)	7
5 Interactivity	3 (2.61)	4 (2.90)	4 (2.61)	1 (2.54)	2 (3.34)	14
6 Language	0 (2.24)	4 (2.49)	2 (2.24)	2 (2.18)	4 (2.86)	12
7 CMC exper. & comp.	7 (5.60)	5 (6.22)	7 (5.60)	4 (5.44)	7 (7.15)	30
8 Demographics	2 (2.42)	3 (2.69)	3 (2.42)	2 (2.36)	3 (3.10)	13
Total	36	40	36	35	46	193

• Numbers in parentheses are expected frequencies.

RESULTS

Demographics

Age of the subjects ranged from below 18 years old to above 45 years old, and the majority were between 18 and 35 years old: 18-25 years old (28.6%); and 26-35 years old (26.0%). Ethnic representation is as follows: Caucasian (82.6%), Latino (7.8%), Asians and Pacific Islanders (3.7%), African Americans (1.9%) and American Indian or Alaska native (1.5%). The majority (75.2%) was female and most considered their computer expertise intermediate (64.5%) and novice (26.74%). Most subjects accessed computers at home (87.5%), classrooms (58.3%) and computer labs (55.7%).

About one-third of the respondents had been using the Internet for 1-2 years (34.9%) and 3-4 years (30.9%). With CMC use, more than one-third (34.9%) of the respondents have been using e-mail one or two years, while more than half of respondents have only been using bulletin board (56.0%) and real-time discussion (57.5%) less than one year.

Respondents spent slightly more time on real-time discussion (3.37 hours) than on e-mail (3.08 hours) and bulletin board (1.58 hours). Most e-mail messages are short and concise since they are considered to be casual written conversation. CMC users spend more time in real-time discussions because of CMC's lack of non-verbal cues. Respondents spent most of their time on reading messages, e-mail (39.9%), bulletin board (59.52%) and real-time discussion (46.4%). This can be explained by receiving a large number of online messages that must be read and processed.

Factor Analysis

Factor analysis was performed on 30 questionnaire items drawn from the literature on social presence, risky behaviors and computer privacy. There were five factors – social context, online communication, interactivity, system privacy and feeling of privacy – that emerged, with Cronbach's coefficient alpha ranging from .74 to .85 (.75, .85, .78, .84, and .79, respectively). These five factors accounted for 82.33% of the variance and were extracted using varimax rotation. With a cutoff of .45, three items were removed from the loading, items number 15, 17, and 29, respectively.

When the factors are checked for reliability by splitting into online questionnaire, article-and-pencil questionnaire and three CMC systems, the coefficients and factor structures are almost the same. The main discernable difference is that the order of extraction differs for the split samples.

Social Context

The five variables that loaded on the social context factor were: CMC as a social form, as an informal and casual way to communicate, as a personal communication form, as a sensitive means and as comfortable with familiar persons.

More than half of the subjects rated CMC as social (79%), informal (78%), personal (59%) and comfortable to talk with familiar people (84%), while one-third rated it as a sensitive media (38%). Respondents strongly perceived e-mail as a social form of communication (92%), an informal/casual way to communicate (88%) and a comfortable way to talk to a person who is familiar (99%). Sensitivity received the lowest rating of the social context factors and differs among the three CMC systems. More than 50% of the subjects felt that e-mail is a sensitive means of communicating with others, while 43% of subjects disagreed that a bulletin board is a sensitive means of communication. The opinions about real-time discussion being a sensitive means of communication was evenly split among agree, uncertain and disagree, perhaps due to its one-to-many characteristic. Normally, users felt that it is not as sensitive as e-mail, despite the fact that one-on-one communication can be accomplished in a private chat room. On the other hand, 34% of subjects agreed and strongly agreed that bulletin board is impersonal. Since the bulletin board is a more public communication form (one-to-many), personal communication is considered inappropriate. The level of privacy CMC users perceive has impact on the degree of social presence. Therefore, if personal communication appears on a bulletin board, it may decrease the degree of social presence.

Online Communication

The second factor, online communication, included five variables: CMC conveys feeling and emotion, and the language used in CMC is stimulating, expressive, meaningful and easily understood. Overall, in the three systems of CMC, more than half of subjects strongly agree and agree that CMC language is stimulating (58%), easy to express (58%), meaningful (67%) and easy to understand (61%) in the text-based environment. E-mail communication received a higher rating in this factor than other items in conveying feeling and emotion (84%), ease of expression (74%), meaningfulness (81%) and ease of understanding (74%). Since e-mail has been perceived as a more private and more personal online communication form, e-mail users feel freer to use online socio-emotional language to express their ideas or communication intentions.

Bulletin board communication had the lowest rating in both conveying feeling and emotion as well as stimulating items, while e-mail and real-time discussion received higher ratings. More than

one-quarter of the subjects strongly agreed and agreed that it was difficult to convey feeling and emotion (31%) on a bulletin board, and that it was not a stimulating communication form (23%). This result indicates that CMC language on bulletin board can be prone, cold and task-oriented.

Interactivity

The third factor, interactivity, consisted of four variables: CMC as pleasant, immediate, responsive and comfortable when dealing with familiar topics. Subjects have very positive responses on pleasant (73%), immediate replies (48%), responsive to messages (70%) and familiar topics (81%). Subjects have positive responses on e-mail and real-time discussion in pleasantness, responsiveness and comfort with familiar topics. In the immediate replies item, real time discussion was rated 66%, while 22% for bulletin board and 56% for e-mail communication. This is not surprising because of the synchronous characteristics of real-time discussion providing immediate replies. The item of responsiveness to messages has similar results to immediate of replies. E-mail and real-time discussion were rated 88% and 73% on responsiveness. Although e-mail and bulletin boards are asynchronous communication forms, e-mail received the highest rate on the responsiveness item because users perceive e-mail as one-to-one, private and personal communication. Therefore, subjects rated e-mail more responsive than bulletin board and real-time discussion.

System Privacy

The fourth factor, system privacy, included the variables the system operator and someone may repost messages sent to or from you; someone may accidentally send and receive messages rather than the intended recipients; CMC as technically reliable; possibility of embarrassment; and identity concerns. Subjects were slightly negative on system privacy. More than one-third of the subjects responded that it was likely that system operator might read and/or repost messages sent to or from them (40%), and 49% felt there was a likelihood that someone else might read and/or repost messages sent to or from them. Subjects trusted the system operator more than someone else, possibly because they were not familiar with the responsibility of the system operator. Among the three systems, e-mail was the only item where 32% felt that the system operator was unlikely to read and/or repost their messages. Forty-five percent (45%) responded that it is unlikely they might accidentally send messages to someone other than the intended recipients, while 35% of subjects responded that it is likely. The respondents presented an even response on this item regarding bulletin board and real-time discussion communication forms. However, on e-mail form, more than 40% of the subjects rated this item likely (42%) and unlikely (51%). It seems that most subjects trust e-mail more than bulletin board and real-time discussion.

Forty-nine percent (49%) of the respondents felt that it is likely someone might obtain their personal information from the messages. Significantly more than half of the respondents (66%) felt that CMC is fairly reliable. Eighty-two percent (82%) felt that e-mail is reliable.

Subjects responded neutrally on the possibility of being embarrassed on bulletin board (46%) and real-time discussion (40%), while 55% declared it would never happen or be unlikely to happen on e-mail, possibly because it is perceived as a one-to-one communication. However, e-mail can be used as a one-to-many communication form, a listserv e-mail message or an e-mail with multiple recipients that the recipients may or may not notice.

More than half of subjects responded that they were not concerned that their identity would be traced on all three systems (53%): e-mail (55%), bulletin board (50%), and real time discussion (53%).

Feeling of Privacy

The fifth factor, feeling of privacy, included the variables confidential means, feeling of privacy, importance of privacy, level of security/secret, risk of sharing personal topics and professional embarrassment.

Subjects perceive three types of CMC as not private, not confidential media, neutral on the secure/secret and not risky media. It is no surprise that subjects (58%) responded to the privacy of CMC as extremely important and fairly important to them. Examined individually, 86% of subjects responded that privacy of e-mail is extremely and fairly important to them, while one-third of subjects responded that they are neutral about bulletin board (37%) and real-time discussion (34%) communications. In other words, subjects were uncertain about the importance of privacy of bulletin board and real-time discussion because these methods are perceived as more public than e-mail.

More than half of the subjects rated CMC as not confidential (74%) and not private (52%). However, a significant percentage of subjects felt that e-mail has a higher level of confidentiality (28%) and privacy (50%). In other words, subjects feel e-mail is a more confidential and private communication medium. Slightly less than half of subjects (47%) felt that they are neutral on the security/secrecy about their online participation. However, 47% of subjects responded that

they felt e-mail to be extremely and fairly secure, while they were neutral on security/secrecy of bulletin board (49%) and real time discussion (45%). In fact, one-third of subjects felt not secure/secret on bulletin board (33%) and real-time discussion (34%).

Although subjects rate CMC media as not private and not confidential, but they feel that online privacy is very important to them, slightly more than one-third of subjects (40%) responded that they were neutral on CMC as a safe media to share personal and sensitive topics online. This is a controversial finding. Subjects seem to feel that their online communications are not confidential, but they are willing to "take risks" to discuss and share their personal and sensitive topics online. This finding, Risk Taking Behavior, is similar to Witmer's (1997) of online newsgroup users' perception of privacy online.

Relationship of Social Presence and Privacy

Correlations between social presence – social context, online communication and interactivity – and privacy – system privacy and perception of privacy – were computed. The correlation between social presence and privacy was significant, $\underline{r}$ (319) = .30 p < .01. There was a significant relationship between social presence and privacy. Inter-correlations between five factors were computed. It appeared that all of the inter-correlations were significant at the level of .01 (Table 2).

DISCUSSIONS

The respondents perceive a positive level of social presence in online learning environment and are neutral on online privacy. Three dimensions – social context, online communication and interactivity – and online privacy are important factors in impacting the level of social presence.

The level of social presence is not only determined by the attributes of media (online communication) and users' perceptions (social context), but also the activities in which the users are engaged (interactivity). Although online privacy showed a significant correlation with social presence, it is a weak correlation. This correlation may vary with different subjects, media and contexts. Therefore, it is not clear whether online privacy should be included as a dimension of social presence.

The respondents perceive the three CMC systems – e-mail, bulletin board and real time discussion – differently because they are rated differently in some items. In some situations, bulletin board and real-time discussion appear to have similar ratings. In other situations, e-mail and bulletin boards appear to have similar ratings. The need to distinguish these three CMC systems as different becomes very important, although not all CMC users are familiar with the differences. For instance, e-mail can be viewed as one-to-one e-mail and one-to-many e-mail (listserv or multiple recipients); and real-time discussion can be viewed as a one-to-one communication form (private chat) and a many-to-many communication form (public chat). Because the different forms of CMC may affect the level of social presence, it is highly recommended that one must select the most appropriate online communication forms to increase online interaction.

Several recommendations are made from this study. The five factors that emerged in this study have Cronbach coefficient alpha values ranging from .74 to .85. This value range is medium-low. Future development must improve the validity. The current instrument, although showing strong content and construct validity, cannot be considered as representing the range of online

Table 2. Correlations among five factors

	F1 (Interactivity)	**F2** (System privacy)	**F3** (Communication)	**F4** (Feeling of Privacy)	**F5** (Social Context)
F1	1				
F2	.596**	1			
F3	.494**	.482**	1		
F4	.146**	.239**	.201**	1	
F5	.215**	.208**	.209**	.346**	1
Mean	3.75	3.48	3.73	3.10	2.89
SD	.45	.51	.46	.55	.51
# of cases	321	321	321	321	321

**. Correlation is significant at the .01 level.

social presence. There were three items discarded because of low factor loading. These three items must be scrutinized. These items may contain more than one variable. Therefore, they were unable to load on any specific factor. Perhaps these variables should be more thoroughly examined from a qualitative viewpoint to reach a better understanding of how they might apply.

Future studies should include other sample populations outside of education to determine if CMC is perceived differently among groups who engage in other online interaction behaviors via CMC.

CONCLUSIONS

Social presence is compromised of three dimensions: social context, online communication and interactivity, and online privacy. In this validation process, the Social Presence and Privacy Questionnaire (SPPQ) shows content and construct validities. However, this instrument provides only a first step in understanding and measuring the level of social presence in the CMC learning environment. Further exploration of the SPPQ instrument requires improved testing of construct validity and alternatives. The instrument will be most useful when the various perceptions represented in the charts can be shown to relate to online interaction. 🌐

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