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Integrative review of social presence in distance education: Issues and challenges

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The purpose of this review is to provide an overview of the evolution of social presence research in the field of distance education and identified problems in investigating this construct. The researchers took an integrative review on existing social presence studies to answer three questions: (a) How definitions of social presence evolved since its establishment (b) How research focus shifted (c) What problems exist in social presence measurement. A total of 189 empirical studies in the area of distance education from 1976 to 2013 were selected and reviewed. The results of the study suggested that social presence was still illusive and difficult to define. Moreover, because of its ambiguity, many doubts and problems were identified in measuring social presence. Lastly, this review specified the limitations of similar studies, and provided guidance for future investigations.

Key words: Integrative review, social presence, learning environment.

INTRODUCTION

Last three decades have witnessed the exponential development of online education, promoted by the advances of information technologies. When individuals participate in distance learning events, their abilities to establish interpersonal contact with others can be greatly diminished.

Research focuses have been put in exploring how to improve distance learning by enhancing its social context and integrating diverse types of interaction. One element, social presence, has drawn great attention in the last three decades as a significant factor in sustaining and facilitating interaction in technology-mediated environments.

The theoretical underpinnings of social presence

Previous studies in the field of human communication have identified three concepts closely related to social presence. They are intimacy (Argyle and Dean, 1965), immediacy (Wiener and Mehrabian, 1968), and interactivity (Rafaeli, 1988, 1990). Intimacy is the feeling of close connection with others (Argyle and Dean, 1965). Immediacy is used to assess the psychological distance between communicators which is conceptualized by Wiener and Mehrabian (1968). Immediate behaviors communicate liking (and closeness) while non-immediate behaviors communicate disliking (and distance)

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(Mehrabian, 1971). Interactivity (Rafaeli, 1988) is a characteristic of different communication settings. It reflects to what extent the transmission happens later on is dependent on earlier (previous) transmissions (Rafaeli, 1988). Built upon these, the construct of social presence was firstly established as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships …" (Short et al., 1976, p. 65).

In the recent three decades, there is a sharp increase in studies of social presence. There are several reasons for conducting an integrative review of the social presence research. First, the review study systematically examines the entire social presence body of research in light of its nature, instrument, variables, effects, and empirical evidence does not exist. The most recent comprehensive review (Biocca et al., 2003) of social presence dates back to more than ten years ago. Second, there lacks a consensus as to what constitutes social presence across various studies. Third, due to the dramatic change in educational environments, how social presence is initiated, maintained, and felt by the participants in the new learning environment would not stay the same. There is a need to summarize and update the empirical evidence about the effects of social presence.

Research purpose

The overall goal of this integrative review is to summarize the accumulated understanding and knowledge about social presence in distance teaching and learning practices. It bears multiple purposes by reviewing social presence theories, analyzing various conceptualizations, examining existing empirical evidence, and evaluating methodological approaches (Broom, 1993). This integrative review will result in a more comprehensive understanding about social presence and highlight the important unresolved research issues. This study attempts to answer three research questions: (a) How definitions of social presence evolved since its establishment (b) How research focus shifted (c) What problems exist in measuring social presence.

METHOD

The methodology that guided this study was the integrative review approach as outlined by Cooper (1998). It is the most comprehensive way of reviewing that allows the inclusion of various types of research studies of the same interest (Cooper, 1998). Studies were mainly reviewed and analyzed both qualitatively and quantitatively. The integrative approach takes three main stages as listed below.

Data collection

Data collection involves an extensive search of the literature. The researcher used two complementary strategies to locate studies to ensure that this review included the most exhaustive set of documents relevant to social presence. First, a computer search was conducted of six scholarly databases. They were Education Research Complete, Academic Search Complete from Ebscohost databases, ERIC from CSA database, PsycINFO from APA PsyncNET database, Education from Jstor database, and ProQuest Dissertations and Theses database.

The researchers requested the retrieval of all peer-reviewed documents containing the search term "social presence" in key words or article document titles. Since from the year of 1999, social presence was identified as one factor of the frame work named "community of inquiry" (Rourke et al., 1999), the researcher also requested the retrieval of all peer-reviewed documents containing the search term "community of inquiry" in article titles and "social presence" in general. A search of these databases indicated more than 300 documents. When the data were delimited as empirical studies, over 200 documents remained. Second, the "ancestry approach" (Polit and Beck, 2008, p. 109) was used as a complementary strategy. It obtained additional relevant articles from the review of citations in the literature already located.

Evaluation of data

The basic unit of evaluation was each individual study identified in the previous step. A study had to meet several criteria to be included in this review. First, the data was screened for peer-reviewed empirical studies. Reviews and abstracts were excluded because this study was trying to use the empirical evidence to answer the research questions.

Second, each study was examined to decide whether it pertained to the focus of social presence. The study must also be relevant to distance education. Thus, excluded studies were interested in pure psychological factors in human relationships and organization/company management. After screening, 189 empirical studies (112 of them were journal articles and 77 of them were doctoral dissertations or master's thesis) were selected for the integrative review.

Data analysis

An initial reading of the studies during the search process helped the researchers to develop a codebook used in analysis to document all relevant study characteristics (Swider, 2002). A summary table was developed to record a wide range of characteristics of each study. The summary table had three sections. One researcher did the majority of the coding, and generated the tables. The other research read, revise and validated the table. Finally, the researchers arrived at an agreement of the table.

The first section of the summary table was about basic demographic information, including publication characteristics (year, author, journal/conference), study targets (educational status of the participants, the discipline, the institutional information) and the setting in which the study took place (e.g., web, videoconferencing, audio-conferencing, and etc.). To answer the first and second research question, the second section recorded definitions of social presence and variables used to represent social presence. The last section collected information related to the last research question. Information relevant to the measurement instruments, methodological design, analysis approaches, and the study results were recorded.
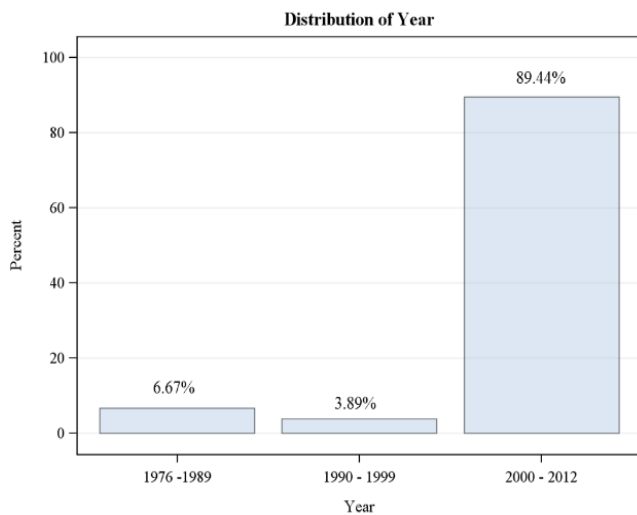
Figure 1. Distribution of studies by years.

Figure 2. Distribution of media.

RESULTS

Trends of the publication

In total, 189 empirical studies were selected for this integrative review, of which 112 studies were peer reviewed journal articles and 77 studies were dissertations. Seventy four out of 77 dissertations were Ph.D. studies while the rest of three were Master's theses. This study reviewed empirical studies spanning the years from 1976 to 2012 (Figure 1). The majority of the studies (89.44%) took place between the year of 2000 and 2012 and half of the studies were conducted after 2008 (median=2008).

For study targets, 88.95% of participants were students, including undergraduate students, graduate students, postsecondary students, second level residential school students, high school students, and adult learners. There were also 8.84% instructors participating the studies, including university faculty, pre-service teachers, high school instructors, and professional instructional designers. Four studies had both students and instructors as participants. The remaining 2.21% participants were web users of academic blogs, groups or events. While 88.70% of the participants studied or worked in the higher education setting, 11.30% were not from higher education.

Previous studies investigated social presence with various types of media in technology-mediated environments (Figure 2). The web played a dominant role (86.14%) which included the general online learning environment, as well as the specific use of some web applications, such as wikis, blogs, and Twitter. The next mostly used media type was video (6.02%), including
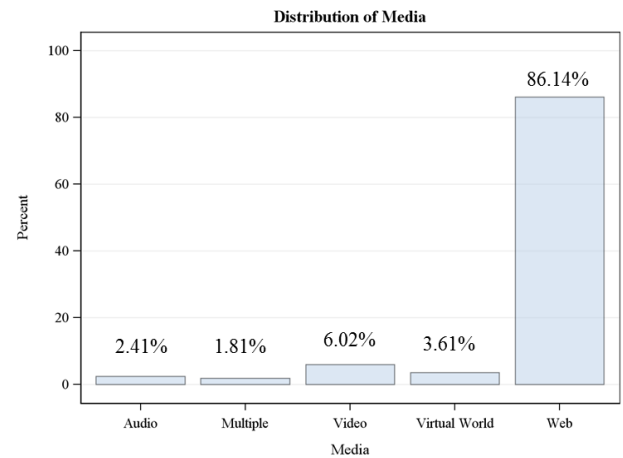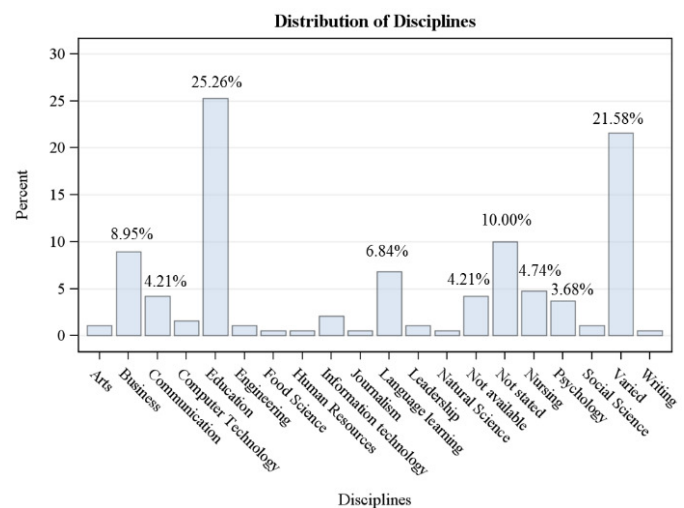

Figure 3. Distribution of disciplines.

video conferencing, video lectures, and televised classroom. Audio, such as audio conferencing or MP3 audio was used in 2.41% of the studies. In addition, 3.61% of the studies were conducted in a virtual world, which used Second Life exclusively.

As reported in Figure 3, previous social presence studies were associated with a variety of disciplines. However, most studies were clustered in certain disciplines, such as Education (25.26%), Business (8.95%), Language Learning (6.84%), Nursing (4.74%), and Psychology (3.68%). A large group of studies (21.58%) also selected participants without relation to the disciplines. Ten percent of the studies did not specifically report participants' disciplines. Moreover, for studies not conducted in higher education, there was no disciplinary

classification.

The evolution of social presence definitions

The conceptualization of social presence went through five main stages, including (a) a quality of medium, (b) telepresence and copresence, (c) psychological involvemenet, (d) intelligence involvement, and (e) performable conceptualizations.

A quality of medium. The concept of social presence was first established by Short, Williams, and Christie (1976) in the field of social psychology in tele-communication. After examining different types of media, they postulated that due to the inability of some communication media to project non-verbal cues, the interpersonal communication via such media would be hindered. They implied that different types of communication media embodied social presence in various degrees, and therefore social presence was perceived "as a quality of the medium itself" (Short et al., p.65). Such statements were in concert with some other researchers (Daft and Lengel, 1984; Sproull and Kiesler, 1986; Trevino et al., 1987) who also implied that the medium might affect social presence directly.

Telepresence and Copresence. Social presence was viewed as an experience when multiple people were transported to the same place, which was related to the notion of telepresence and copresence (Collins and Murphy, 1997; Lombard and Ditton, 1997, September). Telepresence originated within the industry area to describe the importance of a control of the machine at a distance (Martin, 1981). It was elaborated to describe a sense of shared space of remote participants (Buxton, 1993; Lombard and Ditton, 1997, September). Copresence described the awareness of the other living organisms across the physical distance (Biocca and Nowak, 2001; Goffman, 1959), which in turn would lead to the feeling of co-location.

Accordingly, social presence was regarded as a feeling of presence toward people that were physically separated (Mason, 1994; McLeod et al., 1997; Sallnäs et al., 2000; Steinman, 2010), as being together (Hwang, 2007), and as a sense of proximity (McLeod et al., 1997). Heeter (1992) defined social presence as the existence of other people and the extent to which he/she is reactable. McLeod et al. (1997) interpreted social presence as the degree of "tangibility and proximity" (p. 708) of other communicators. McLellan (1999) further stated it as "the sense of being present in a social encounter with another person" (p. 40). Tu (2000) described it as "the degree of person-to-person awareness" (p. 1662). Steinman (2010) stated it as the perception of "their classmates as real persons instead of just names on a list" (p.158).

Psychological Involvement. Nowak and Biocca (2001) claimed that social presence should be extended from the idea of telepresence and copresence (being together) to the idea of being together for interactive events. It means that the sense of social presence must involve certain changes in the psychological state (Biocca et al., 2003).

Participants do not only need the ability and opportunity to interact with each other, but they also need to be emotionally motivated to respond to the other participants (Biocca et al., 2001; Kehrwald, 2008). Therefore, Blocher (1997) described social presence as the extent to which communicators feel being present in a reciprocal social interaction via a conduit of interactive communication media (p. 33). Similarly, social presence was described as a projection of oneself into communication (Garrison, 1997; Garrison et al., 2000; Rourke et al., 1999; Whiteman, 2002).

Immediacy (Wiener and Mehrabian, 1968), intimacy (Argyle and Dean, 1965), and interactivity (Rafaeli, 1988) were three determinant factors to initiate social interaction and set up interpersonal relationships. A large number of studies defined social presence by associating it to these three concepts with an emphasis on the salience of interpersonal relationships. Social presence was defined as "those nonverbal behaviors that reduce physical and/or psychological distance between teachers and students" (Anderson, 1979, p. 544), and a number of immediacy behaviors, including "uses first names, asks questions, uses humor, uses personal pronouns, discloses personal information, and use … emoticons or punctuation marks…" (Menzie, 1991, p.38). As researchers became more and more interested in studying the comfortable levels of these interpersonal relationships (Andersen, 1979; Andersen et al., 1979; Gorham, 1988; Hackman and Walker, 1990; Kearney et al., 1985; Plax et al., 1986), social presence was defined as "the feeling that others are involved in the communication process" (Whiteman, 2002, p. 6), the feeling of connectedness with one another (Caspi and Blau, 2008), the capabilities of "express themselves personally" (Salloum, 2011, p.44), a facilitator of interpersonal relationships (Gunawardena and Zittle, 1996; Shin, 2002; Short et al., 1976) and an environment that was "comfortable, positive, supportive, necessary, encouraging, and genuine" (Liang, 2006, p.103). It was noted that Short et al. (1976) admitted social presence as a "salience of the interpersonal relationships" (p. 65) although they attributed it to "a quality of the medium itself" (p. 65). Therefore, their definition was quite vague (Walther, 1992).

Intelligence Involvement. In the distance learning environment, social presence is not simply a function of interpersonal relationships, but "the cognitive representation of the group by group members" (Rogers

and Lea, 2005, p. 1). Therefore, Biocca (1997) described social presence as "the degree to which a user feels access to the intelligence, intentions, and sensory impressions of another" (p.22). It was further interpreted as "reading a mind" (Biocca et al., 2003, p. 472). Social presence was also treated as degrees of mutual understanding (Biocca et al., 2001; Savicki and Kelley, 2000). Tu and McIsaac (2002) referred to social presence as the degree that one feels and reacts to other "intellectual entity" (p. 146). Gramling (2003) defined social presence as the capabilities of demonstrating themselves in technology-mediated communication and the connection with others in teaching and learning. Salloum (2011) described social presence as "a sense of belonging to the learning community" (p.44).

Performable Conceptualizations. Biocca et al. (2003) pointed out that there was a trend to use implicit or explicit behavioral indicators in defining social presence because there was increasing evidence from empirical studies showed that social presence could be demonstrated by a number of visible activities, such as expressing emotion, posting/replying messages, using certain language (such as "we", "our"), participating in group activities, and etc. (Garrison et al., 2000; Kehrwald, 2008; Rourke et al., 1999). Therefore, social presence was defined as participants' ability to project themselves and their availabilities for transactions (Kehrwald, 2008). As Biocca et al. cited, Palmer (1995) stated social presence as building "a relationship through an interdependent, multichannel exchange of behaviors" (p. 291). Heeter (1992) emphasized the extent to which other individuals react to the user in defining social presence. Menzie (1991) defined social presence as a number of immediacy behaviors. Social presence was also described as the subjective projections of self into a technology mediated environment, the subjective feeling of others' presence, and relations with others (Kehrwald, 2010).

The most recent definition of social presence (Garrison et al., 2010) emphasized participants' ability to identify with the community, conduct communication, and develop interpersonal relationships via projection of their personal characteristics.

Due to the development of emerging social medium systems, recent studies in immersive virtual environments defined social presence involving more behavioral engagement (Biocca et al., 2003). For example, in Second Life, the definition of social presence was extended to include communication behaviors that an avatar is able to convey, including gestures and voices (McKerlich and Anderson, 2007).

In sum, the conceptualization of the construct went through five main stages. Social presence is such a complicated construct that its conceptualization is never consistent across different studies (Table 1).

Evolution of research foci

The foci of the empirical studies were grouped into four categories (Figure 4): media comparison, users' awareness, learning experience and attitudes, and behavioral engagement. These categories gradually emerged during analyzing studies' statements of research purposes and adoption of social presence definitions in previous studies.

Short et al.'s (1976) statement of social presence led to the development of media richness research in social presence field. In early studies, social presence was used to compare the capabilities of different media and students' affective attitudes towards a specific medium. Many researchers identified the quality of media as social presence, or at least as one significant dimension of social presence (Bigley, 2012; Caspi and Blau, 2008; Doran, 2010; Newberry, 2001).

The discussion on social presence and communication media from the 1980s to 1990s pointed to a research focus shifting from comparing media characteristics to exploring users' awareness of others. Social presence enabled opportunities for social activity in the mediated environment (Nowak and Biocca, 2001). Social presence was used to study users' perceptions of others, and feelings of isolation or connectedness in mediated communication, especially in the field of distance education.

Researchers began to study the emerging associations between the social presence and other social issues, such as the motivation for communication, the attitudes towards the instructor/peers, and the sense of collaboration (Mason, 1994; Sallnäs et al., 2000).

The third group, learning experience and attitudes, was most popular. This is because social presence definitions related to psychological and intelligence involvement types of statements take a dominant part in recent studies. These studies were mainly conducted after 1997. Researchers have been interested in examining to what extent the psychology involvement of social presence triggers and influences students' positive attitudes towards the instructor and peers, the learning satisfaction, the affective learning, the mutual understanding, the sense of learning community, the willingness of collaboration, the group cohesion, the perceived learning achievement, and ultimately the actual final products (Cobb, 2009; Gorham, 1988; Gunawardena and Zittle, 1997; Hackman and Walker, 1990; Tu and McIsaac, 2002). Social presence has been used as an indicator to assess the whether an environment is socially supportive for learning from the perspective of the participants.

Nowadays, as more visible indicators were identified as evidence of social presence, the fourth research focus, behavioral engagement, gradually emerged. They mostly spread out from 2004 to now. Performable statements of social presence are often accompanied by a list of behavior indicators.

Table 1. Definitions of social presence.

| Stage	Definition	Example studies
A quality of medium	"the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships …" (Short et al., 1976, p.65)	(Gefen and Straub, 1997; Kim, 2005; Tung and Deng, 2006)
Telepresence and copresence	"to the extent which other beings (living or synthetic) also exist in the world and appear to react to you" (Heeter, 1992, p.2) "the degree of tangibility and proximity of other people that one perceives in a communication situation" (McLeod et al., 1997, p.708)	(Mason, 1994; McLellan, 1999; Sallnäs et al., 2000; Tu, 2000)
Psychological involvement	"those nonverbal behaviors that reduce physical and/or psychological distance between teachers and students" (Andersen, 1979, p.544) "the feeling that others are involved in the communication process" (Whiteman, 2002, p.6) "one feels socially present in a distance learning environment" (Blocher, 1997, p.5)	(Caspi and Blau, 2008; Cobb, 2009; Gorham, 1988; Gunawardena and Zittle, 1997; Kehrwald, 2008; Nowak and Biocca, 2001)
Intelligence involvement	"reading a mind" (Biocca et al., 2003, p.472) "the degree of feeling, perception, and reaction to another intellectual entity…" (Tu & McIsaac, 2002, p.146)	(Bente et al., 2008; Cortese and Seo, 2012; Shen and Khalifa, 2008)
Performable conceptualizations	"a relationship through an interdependent, multichannel exchange of behaviors" (Palmer, 1995, p.291) "an individual's ability to demonstrate his/her state of being in a virtual environment and so signal his/her availability for interpersonal transactions" (Kehrwald, 2008, p.94)	(Conceicao and Schmidt, 2010; Garrison et al., 2010; Kehrwald, 2010; Wanstreet and Stein, 2011)
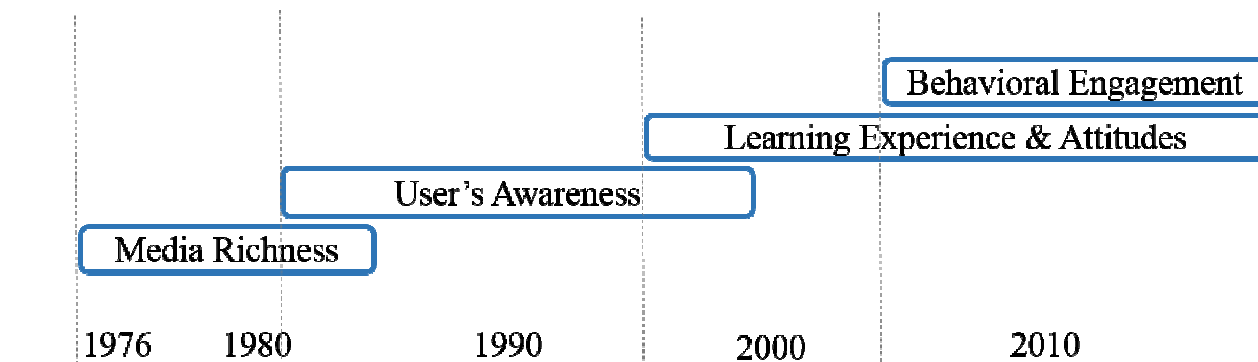
Figure 4. The illustration of the focus evolution.

They allow researchers to examine the degree to which social presence really exists. It also enables researchers to discover the development pattern of social presence as the communication progresses. Therefore, social presence studies begin to explore how and to what extent it affects diverse learning variables at different stages of a course and how it can be manipulated by instructional interventions along the passage of distance learning classes (Akyol and Garrison, 2008; Swan, 2002, 2003; Vaughan, 2004).

Measurement of social presence

The majority of previous studies used subjective measures to evaluate social presence. It means social presence was assessed via participants' conscious judgment (Van Baren and IJsselsteijn, 2004).

Quantitative instruments. Surveys are the most predominant form of quantitative instrument. Survey design uses quantitative and numeric description to represent participants' attitudes or opinions (Creswell, 2009). More than 90% of the studies employed one of five instruments that were widely recognized and validated. The first well-recognized scale, Social Presence Scale was constructed by Short and her colleagues (Short et al., 1976). They maintained that social presence was users' attitudes towards a medium. Therefore, they constructed 17 five-point bi-polar scales to evaluate and compare users' feelings towards different types of media. The second widely used scale Spres Scale was constructed by Gunawardena and Zittle (1997) which was based on the concept of "immediacy". It was extended to Social Presence Scale by Richardson and Swan (2003) as well as Swan and Shih (2005) in order to fit in a wider online learning environment instead of computer-conferencing environment only. Another widely used scale Immediacy Behavior Scale was also grounded in the concept of immediacy. Richmond et al. (1987) summarized previous immediacy studies and created a list of nonverbal immediacy behaviors used by classroom teachers that might affect students' cognitive learning. Gorham (1988) consolidated a list of verbal immediacy behaviors into a likert-scale. Items from both nonverbal and verbal immediacy scales very combined into the Immediacy Behavior Scale to measure social presence.

Fourthly, as the understanding of social presence developed from a unitary dimension construct to a multidimensional construct, Biocca et al. (2001) created the Networked Minds Social Presence Questionnaire to measure social presence from the aspect of awareness of the other, psychological states (attention, emotion, motivation), and interdependent behaviors. Arbaugh et al. developed a measure of social presence as one of the subscales in their Community of Inquiry (CoI) framework (Arbaugh et al., 2008). The CoI instrument was widely used because social presence was not examined alone, but closely related with the other two key factors (teaching presence and cognitive presence) to better evaluate the comprehensive learning experiences (Garrison, 2011). An enhanced version of CoI survey instrument was developed recently by asking respondents to rate the relative importance of each survey item (Diaz et al., 2010). The last commonly used scale Computer Mediated Communication Questionnaire was developed by (Tu, 2002). It measured social presence from four dimensions: social context, online communication,

interactivity and privacy. Besides these scales, there were also some other instruments used in a small number of studies. A summary of all the existing survey scales retrieved for this review is listed in Table 2.

By using surveys, social presence was measured in terms of quantification of participants' subjective feelings towards a variety of measurable elements, including media richness, copresence, humanizing, intimacy, immediacy, interactivity, and connection, which were identified as important elements representing social presence.

A small number of studies assessed other factors such as self-identity, self-categorization, and etc. as representatives of social presence. The existence and degree of social presence was quantified as a range of score from 0 (non-existent) to 5 or 7 (very high degrees) of the subjective senses of these elements. It seems that most of social presence scales were constructed in a specific context under which students were using a/some specific technology tool(s) for communication.

Qualitative instruments. Qualitative instruments were adopted to capture the direct experiences of social presence from participants. Observation, interview, and document content analysis were primary qualitative instruments. While observation and interview measured social presence in terms of participants' subjective feelings, document content analysis investigated the existence of behaviors indicators of social presence. The assumption of using behavior indicators is if one shows certain behaviors, he/she must be socially present (Biocca et al., 2003).

When a transcript was coded by multiple reviewers, the index of percent agreement was normally used in most studies to indicate inter-rater reliability. However, this index was easily contaminated by excluding semantically close codes (De Wever et al., 2006) and inclusion of agreement codes by chance (Lombard et al., 2002). Different indexes could be used to ensure reliability. However, only a few studies (De Wever et al., 2006) met this requirement.

DISCUSSION

Social presence is difficult to define

The evolution of definitions reflects two essential features of social presence construct (Figure 5). The first remarkable characteristic of social presence in its involvement is that it is not simply existent or nonexistent. Instead, it exists in degrees (Biocca et al., 2003; Kehrwald, 2008; Lowenthal, 2010; Tu and McIsaac, 2002) and varies on a continuum from absent degrees, to low degrees embodying psychological involvement, to high degrees including certain levels of behaviors (Biocca et

Table 2. Overview of quantitative instruments for measuring social presence.

Instrument Name	Establisher	Year	Measure at a Glance
Social Presence Scale	Short et al.	1976	Bipolar mental sets towards media
Immediacy Behavior Scale	Richmond et al.	1987	Observable nonverbal classroom social presence behaviors and how students value them
	Gorham	1988	Observable verbal immediacy behaviors and how students value them
Spres Scale	Gunawardena & Zittle	1997	Attitudes towards the media, communication environment, and the sense of intimacy
Networked Minds Social Presence	Biocca et al.	2001	Copresence, psychological involvement, and behavioral engagement
Social Identify Scale	Lee et al.	2001	Perception of self-categorization and self-identity in computer-mediated group activities.
Para-Social Presence Scale	Kumar & Benbasat	2002	Immediacy, empathy, affective attitudes, and the involvement of participants
Classroom Community Scale	Rovai	2002	Connectedness, group cohesion, passion, trust and interdependence with a learning community
Social Presence Scale	Saenz	2002	Items were constructed based on a literature review of intimacy, immediacy and interactivity.
CMCQ	Tu	2002	Social context, online communication, and interactivity
SP scale	Richardson & Swan	2003	Perception of others, the learning environment, and the online experience
	Swan & Shih	2005	As the same above, but add more peer interaction elements and separate social presence of students from the instructor
Social Space Scale	Kreijins et al.	2004	Participants' feelings of their own and others' behaviors as well as perceived frequency of certain types of others' behaviors.
Social Presence Scale	Wise et al.	2004	Perceived friendliness of instructor's messages, familiarity with the instructor, and enjoyment of interacting with the instructor.
Social Presence Scale	Lee & Nass	2005	Participants' feeling of others' voices as real people and the consequent involvement with what's being heard.
Social Presence Behaviors Scale	Weaver & Albion	2005	Perception of interactions with others.
Communication Survey Scale	Lowry et al.	2006	Participants' feelings towards communication processes, such as perceived quality of discussion, appropriateness, richness, openness, and accuracy of the communication.
Social Presence Scale	Yamada & Akahori	2007	The perception of others, ease of communication, and consciousness of the second language communication
CoI	Arbaugh et al.	2008	Open communication, group cohesion, personal/affective projection
Social Presence Scale	Kim	2010	Perceived social proximity and affiliation of others
Social Presence Scale	Kreijins et al.	2011	Participants' feeling of being transported to a shared space.

al., 2003). Social presence is dynamic. It measures the moment-by-moment judgment about the interaction with another sentient that might be limited or facilitated by a medium (Biocca et al., 2001). It develops in ongoing demonstrations (Kehrwald, 2008). At its lowest degree, social presence simply means being there, and at its highest degree, social presence represents mutual dependent behavioral interaction. The increasing degrees of social presence imply greater involvement in participants' representations of themselves, the interaction with others, and the understanding of another subject's emotions, intentions, as well as dispositions connected to oneself (Biocca et al., 2003; Kehrwald, 2008; Tu and McIsaac, 2002).

The second prominent characteristic of social presence conceptualizations is that it evolves from a unitary concept to a multidimensional construct. Social presence is so broad and complex that it embodies many sub-elements
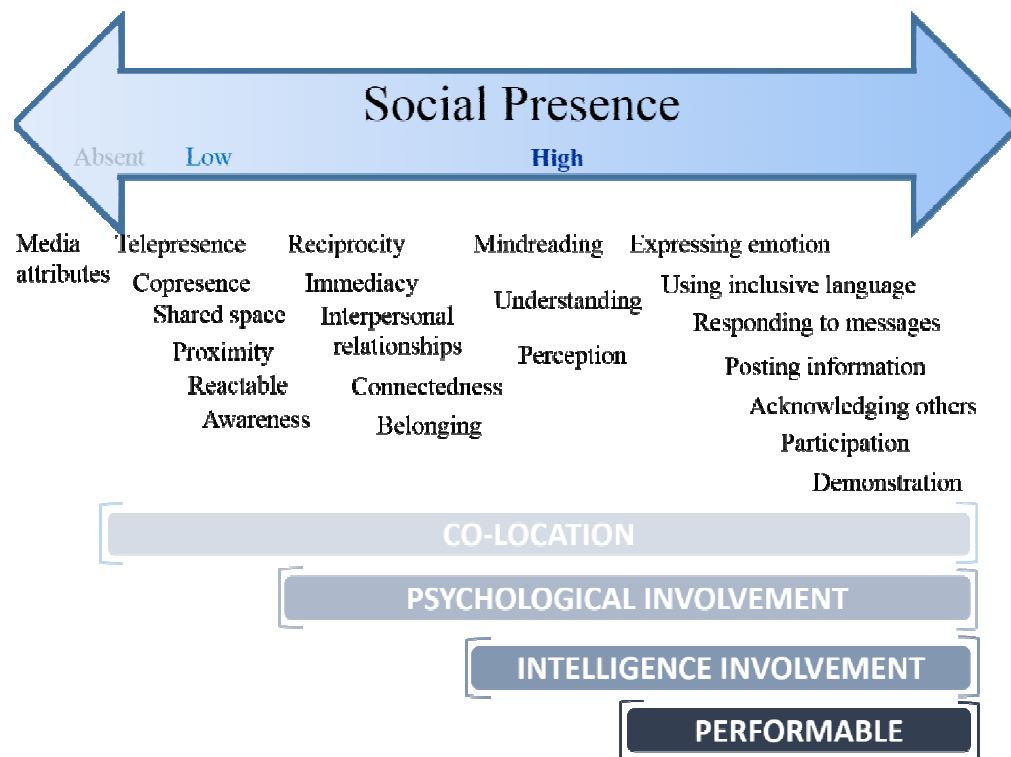
Figure 5. The illustration of social presence evolvement.

(Biocca et al., 2001; Garrison et al., 2000; Rourke et al., 1999; Tu and McIsaac, 2002; Wulff et al, 2000). There lacks a consensus as to what constitutes social presence across various studies (Biocca et al., 2003; Kreijns et al., 2011; Lowenthal, 2010). Many studies used broad or vague definitions so that it was hard to have exact corresponding items in the measurement of social presence (Lowenthal, 2010). In addition, quite a few studies claimed studying social presence. However, their conceptualizations were short of theoretical foundation and biased in their particular research interests a (Chen et al., 2005; Kekwaletswe, 2007; Leh, 2001). Therefore, the measurement and results of these studies are questionable.

Social presence is difficult to measure

Due to the complexity and ambiguity of social presence conceptualizations, not a single social presence measure is universal. It is difficult to find a multifaceted sound measuring instrument. As apparent from the Appendix, not a single questionnaire successfully covered all dimensions of social presence inclusively and exclusively. It seems that the existing instruments tend to measure varying subsets of social presence variables encompassing media attributes, intimacy, immediacy, and others, depending on the varying conceptualizations of social

presence assumed by authors. Some studies measured social presence as a broader concept, including various aspects while some studies perceive social presence as a narrower construct. For example, the Spres Scale developed by Gunawardena and Zittle (1997) primarily assessed elements of media attributes and immediacy while the Networked Minds Scale constructed by (Biocca et al., 2001) focused on dimensions of co-presence and interactivity. Moreover, there were studies (Chen et al., 2005; Giesbers et al., 2009; Hernandez, 2008; Lyons et al., 2012; Tourangeau et al., 2003; Weinel et al., 2011) claiming to investigate social presence, however what they had measured were not within the space of interest associated with social presence. It was unclear whether these instruments were measuring social interaction, social climate, the feeling towards social medium, or some other constructs that were frequently confused with social presence.

Moreover, social presence is not a static construct. It fluctuates with the progress of the communication. Survey studies used a cross-sectional design which was unable to examine the dynamic pattern of social presence. In addition, using the voluntary survey to get data is hard to control non-respondent bias. It is possible that those who did not respond to the survey felt low degree of social presence (Kim et al., 2011; Leong, 2011). In addition, each questionnaire was constructed in a

certain situation tailored for a specific technology tool such as computer conferencing system (Gunawardena and Zittle, 1997; Rourke et al., 1999), computer-supported collaborative environments (Kreijns et al., 2011), video (Homer et al., 2008), email (Richardson and Swan, 2003), mobile learning environments (Arminen and Weilenmann, 2009; DuVall et al., 2007; Kekwaletswe, 2007), virtual environments (Burgess et al., 2010; Hodge et al., 2008; Jin, 2011; McKerlich and Anderson, 2007; Shen et al., 2010), and general online learning experience (Tu and Yen, 2006). It is unknown whether the measuring items will become problematic when social presence is studies under different contexts. The development of question-naires has gone hand in hand with, and to a large extent relied on the development of social presence theories. Therefore, the doubt of items in different questionnaires could only be solved until a sound social presence theory has been developed.

Conclusion

In sum, the idea of social presence is still illusive though it has been examined for decades. The construct itself proves difficult to define. Studies varied a lot in claiming what social presence is in their own studies. Vague definitions and unclear dimensions are also seen in previous studies. Moreover, the dynamic feature and multi-facet constitutes make it hard to measure. Technology-oriented instruments, and inadequate test validity and reliability also present challenges for developing a sound social presence measure. More works are required to revalidate the construct constitutes and instruments. A more rigorous framework is the basis of the development of future social presence research. More importantly, as the development of new communication tools never stops, researchers are called to investigate the dynamics of social presence in the new technology context, such as mobile environment and 3D virtual world.

Conflict of Interests

The authors have not declared any conflict of interests.

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