

An Integrative Review of the Effects of Social Presence on Distance Education

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ABSTRACT

Social presence has drawn great attention in the last three decades. A large number of studies attempted to prove that social presence exerted an effect on distance learning through including more interaction. This integrative review provided a comprehensive summary of current studies on social presence, identified problems in measuring social presence, and evaluated the effects of social presence on learning. Data were collected from 189 social presence studies in the area of distance education from 1976 to 2012. Data were analyzed qualitatively followed by a quantitative meta-analysis. This study revealed that social presence was still illusive and difficult to define. Due to its ambiguity, many doubts exist related to the measurement of social presence. The results of this study suggest future researchers should be cautious when advocating the importance of social presence in distance learning.

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Chapter 1. Introduction

Social interaction, a natural human need, has been recognized as an essential factor in learning processes (Vygotsky, 1986). The interaction between learner-instructor and learner-learner is commonly observed in the traditional classroom. When individuals participate in distance learning events, their abilities to establish interpersonal contact with others can be greatly diminished. Therefore, many researchers have been interested 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.

Need for the Study

In 1976, Short, Williams, and Christie published their landmark book on social presence. They established the construct of social presence as “the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships ...” (p. 65). In the last three decades, there has been a sharp increase in studies of social presence. A large number of investigators intend to prove that social presence exerted some degree of positive effects in distance learning. A great deal of attention has been placed on how to create, maintain, and enhance social presence in order to improve distance learning environments. In an effort to infer generalizations from a group of substantive studies on this issue, and to facilitate the social presence theory development, this integrative review will be conducted to examine past empirical studies and synthesize findings from disparate studies (Jackson, 1980).

The integrative review is the broadest type of research review methodology as it analyzes various types of research studies in an effort to achieve the most comprehensive understanding

about an issue of concern (Whittemore & Knafl, 2005). There are several reasons for conducting an integrative review of social presence research. First, an integrative study that 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, Harms, & Burgoon, 2003) of social presence dates back to ten years ago. Biocca et al. (2003) primarily examined various conceptualizations of social presence in different studies. They summarized some measurable variables of social presence used before the year of 2003. They mentioned a few problems in measuring social presence, such as vague conceptualizations and measurement of a medium's degree of social presence. However, other aspects of social presence studies were not explored.

Second, it is time to update the evidence on past conclusions about the effects of social presence. The dramatic change in educational environments how social presence is initiated, maintained, and felt by participants in more contemporary learning environments may also change.

Third, there lacks a consensus as to what constitutes social presence across various studies (Biocca et al., 2003; Kreijns, Kirschner, & Jochems, 2011; Lowenthal, 2010). Many studies used broad or vague definitions so that it is difficult to examine corresponding items in the measurement of social presence (Lowenthal, 2010). In addition, quite a few studies claim studying social presence. However, their conceptualizations lack theoretical foundations and reflect bias toward their particular research interests (Chen, Olfman, & Harris, 2005; Kekwaletswe, 2007; Leh, 2001). Therefore, the measurement and results of these studies are questionable.

Fourth, there is a need to determine some of the questions left unanswered that demand

further exploration. The most concerning question relates to the effects of social presence in improving distance learning. A large number of studies attempt to prove that social presence exerts an effect on learning outcomes. Unfortunately, the outcomes are inconclusive. While some of the studies did find a positive relationship (Schutt, 2007; J. A. B. Smith, 2006), others have found no relationship (Harrigan, 2010; T. E. Johnson, 2011; P. Leong, 2011; Paquette, 2009; Picciano, 2002; Wise, Chang, Duffy, & Valle, 2004). The conflicts in various studies raise doubts on the existence of a relationship between social presence and learning. It is important to understand the scope and conditions of the effects of social presence, as well as possible confounding factors in order to address the limitations in past studies.

Purpose Statement of the Study

A large number of studies have identified social presence as a major factor in facilitating teaching and learning in distance education. The importance of creating and enhancing social presence, even when sometimes not explicitly stated, is often implied in the literature (Garrison & Arbaugh, 2007; Reio & Crim, 2006; Tu, 2000a). With such an emphasis placed on social presence, the effects of this construct, defined in terms of learning outcomes and perceived learning, need detailed investigation related to its impact and limitations.

The overall goal of this integrative review is to summarize the accumulated state of knowledge concerning 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 important unresolved research issues related to this construct.

Research Questions

This study seeks to examine problems in current social presence studies both qualitatively and quantitatively (Figure 1). Emerging from the concerns stated above, this integrative review attempts to answer the following qualitative questions: 1) How is social presence defined? 2) What factors comprise social presence? 3) What problems exist in measuring social presence?

This integrative review also attempts to answer the following quantitative questions based on empirical evidence: 4) What is the impact of social presence on learners' perceived learning? 5) What is the impact of social presence on learners' actual learning outcomes?

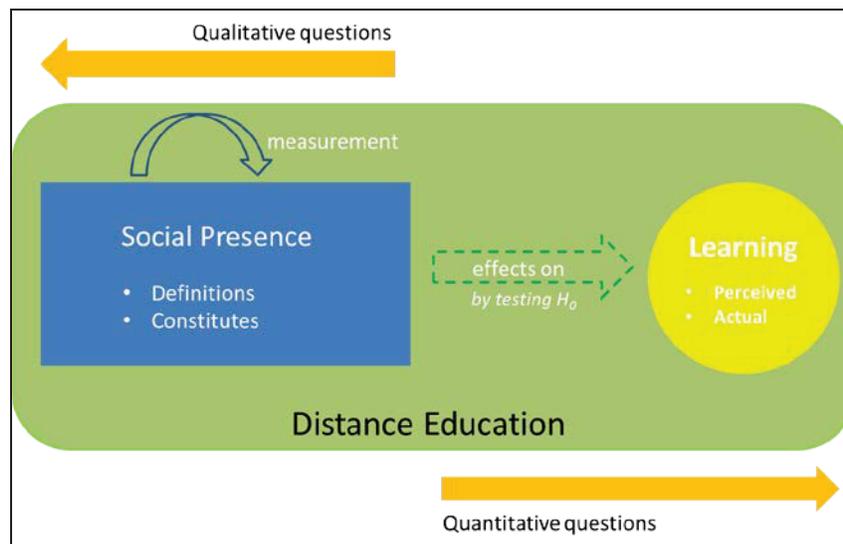


Figure 1. Illustration of the research problem

Significance of the Study

This study is intended to contribute to the body of knowledge concerning social presence in distance education. This knowledge would contribute to the theory of social presence, clarify the measure of the construct, specify the limitations of similar studies, discover unsolved issues that need further exploration, and provide guidance for future investigations.

Limitations of the Study

While this study offered a valuable opportunity to explore social presence issues in

teaching and learning practices, there are several limitations in conducting an integrative review.

First, a challenge is arriving at a consensus of conceptualizations. Until now, there is not a commonly accepted definition of social presence. Such disagreement is reflected in different theoretical interpretations and distinct instruments proposed to measure social presence. In addition, the conceptualization of social presence continues to develop in response to new instructional environments and technology. Therefore, this review is conducted on an evolving construct. Any emerging characterization is limited to that point.

Second, the most concerning limitation was that there exists significant variability for how data could be organized and categorized, although a systematic review approach was utilized. All the data were evaluated by one person. On one hand, it was good to keep consistency in the application of the approach. On the other hand, it could be argued that the single reviewer was more likely to be biased.

Third, in order to avoid overgeneralization of the review results, it is recognized that the participants, settings, and courses represented in the synthesis does not represent the entire compendium of research related to social presence. For example, there were few studies that examined the effects of social presence on elementary, middle, or high school students, nor were there studies that examined the effects of social presence in courses of engineering, sciences, or some other disciplines.

Fourth, there is no well-recognized minimum number of studies required in a meta-analysis. However, if the number of studies is small, the effect size is more likely to be affected by the selection of studies.

The last limitation is due to the inability to retrieve all the literature on social presence. Five electronic databases used in this study were unable to track documents back in the 1970s to

the early 1990s. Manual scrutiny of available reference lists was used as a complementary search strategy. In addition, although some qualified studies were shown in the electronic databases, they were not available from the retrieval system, in print, or through the inter-library system due to copyright restrictions. Furthermore, concerning the availability issue, it is also reasonable to note that studies that did not find effects were not published, thus remaining unavailable.

Organization of the Proposed Study

Chapter 1 provides the background introduction of the study topic, needs of the study, purpose statement of the study, research questions, significance of the study, and limitations of the study. Chapter 2 provides a review of the literature related to this study. This chapter is divided into four sections. The first section is a historical discussion of social presence. It includes the origins of social presence and its evolving conceptualizations. The second section synthesizes the theoretical underpinnings of social presence. The third section describes the associations of social presence with distance education, and the fourth section discusses current research trends in this area. Chapter 2 ends with a summary of the literature review and a brief discussion of the proposed research problem. Next, Chapter 3 describes the methodological approach that will be employed to answer the posited research questions. This chapter discusses strategies of conducting an integrative review, which includes six parts: problem formulation, literature search, evaluation, data analysis and interpretation, and presentation of the results. Chapter 4 presents the results of the study. Chapter 5 discusses the implications of the results obtained from this integrative review and concludes the study.

Chapter 2. Review of the Literature

Introduction

This study presents a systematic review the research related to social presence. This chapter is a review of the literature related to the study and includes three sections. In the first section, the literature reviews the theoretical underpinnings on which the social presence construct was built. In the second section, the review of literature describes how social presence was examined in distance education contexts in past empirical studies. The last section discusses the research trends in studying social presence. This chapter concludes with a discussion of the research problem.

The Theoretical Underpinnings of Social Presence

Communication is perceived as an exchange of cues via which one communicator can affect the state of the other (Cherry, 1957). It can happen in a variety of modes and it is a complex process which involves receiving, processing and sending messages in the exchange of information (Tardy, 1988). The process of communication has a looping effect— what one person does will influence the other and in turn produces a counter effect (Heath & Bryant, 1992). In mediated environments, such effects become problematic due to the absence of a real person. A common concern is that the separation of communicators hinders the development of interpersonal relationships which are perceived central to teaching and learning environments (Haythornthwaite, 2002; Holmberg, 1989; Moore, 1989; Moore & Kearsley, 1996). The construct of social presence (Short, Williams, & Christie, 1976) was established to examine a new set of interpersonal communication effects in mediated learning environments, especially the social climate of distance learning classes.

Previous studies in the field of human communication have identified three concepts

closely related to social presence (Figure 2). They are intimacy (Argyle & Dean, 1965), immediacy (Wiener & Mehrabian, 1968), and interactivity (Rafaeli, 1988, 1990). Although the first two concepts are grounded in face-to-face settings, in the field of distance education and communication, they are also greatly valued in forming interpersonal relationships (Christophel, 1990; Gunawardena, 1995; Gunawardena & Zittle, 1997; McIsaac & Gunawardena, 1996; Mehrabian, 1989; Short et al., 1976).

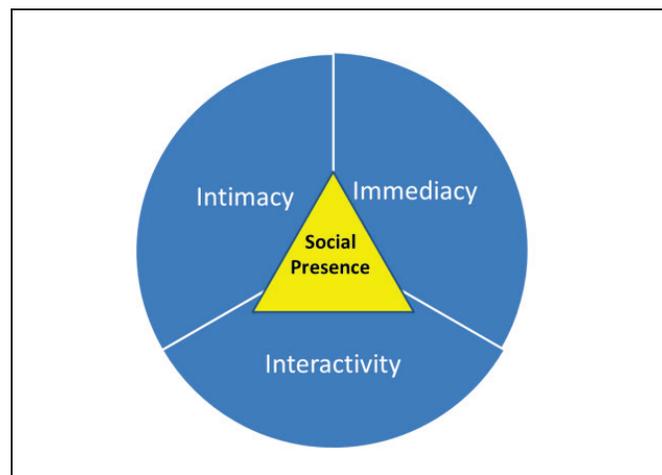


Figure 2. The theoretical axis of social presence

Intimacy

Intimacy is the sense of close connection one feels in a relationship. It is a joint function of eye-contact, physical proximity, intimacy of topics, and amount of smiling (Argyle & Dean, 1965). Subsequent studies also include physical orientation, close acquaintances, associations, familiarity, variances in voice tone, pauses and inflection of speech, and form of address as indicators of high levels of intimacy (Tardy, 1988). Of all the intimacy behaviors, eye contact is thought to be the most important nonverbal cue in interpersonal communication because it synthesizes and reflects the information about one's point in the conversation, the nature of the topic, and the relations between a pair of people. Eye contact conveys intimacy by contributing to fostering relationships and physical closeness (Argyle & Dean, 1965). Argyle and Dean (1965)

indicat that high levels of intimacy reinforce familiarity, self-disclosure, and trust, while low levels weaken them. Therefore, Heath and Bryant (1992) describe intimacy as self-confirmation from the other and the depth of an attachment between the relational partners (p. 178). They suggest that intimate relationships are cooperative and friendly rather than competitive or hostile.

The degree of intimacy varies in interpersonal relationships. The intimacy equilibrium model of Argyle and Dean (1965) describes how people adjust the degree of intimacy in face-to-face communication. For example, when there is an uncomfortable topic being discussed, one may tend to avoid eye contact, increase physical distance, and alter other behaviors to adjust the degree of intimacy to an optimal comfortable level. Changes in one factor of intimacy will bring about compensatory shift in other factors to reserve the equilibrium. A more familiar and comfortable discussion topic is more likely to contribute to a greater degree of intimacy (Argyle & Cook, 1976).

Argyle and Dean (1965) indicate that intimacy enables interaction to start and continue. Tardy (1988) also claims that a certain degree of intimacy was required for individuals to establish a rapport to conduct communication. A positive relationship was found between the sense of intimacy and the tendency of self-disclosure, perception of partner's disclosure, as well as partner's responsiveness (Reis & Shaver, 1988). In the distance education environment, almost all of the nonverbal cues are absent, resulting in a loss of intimacy. Short et al. (1976) suggest that social presence is dependent on the level of intimacy of the communication medium. For example, they contend that a greater level of intimacy exists in using televised communication rather than audio-only communication because television allows multiple channels and visual cues. They maintain that the capacity of media to transmit cues, such as facial expression, direction of looking, and posture contributes to the social presence of a

medium. Social presence is one of the factors that contributes to intimacy (Short et al., 1976, p. 72).

Short et al. (1976) perceive communications media that lack nonverbal cues as extremely low in social presence compared to face-to-face communication. Social presence was “a quality of the medium itself” (Short et al., 1976, p. 65). Similarly, Sproull and Kiesler (1986) point out that the essential difference between computer-mediated and face-to-face communication lies in the absence or presence of various social context cues. In addition, the media richness theory implies that communication differs across media because of their different capabilities to support bandwidth and cues (Daft & Lengel, 1984; Trevino, Lengel, & Daft, 1987). These lines of studies were merged in a “cues filtered out” perspective (Culnan & Markus, 1987), which was challenged by Walther (1992) who called for a shift to a relational perspective. The perspective of “cues filtered out” assumes that a medium itself is the only influence on interpersonal communications. Media characteristics (e.g., fewer channels, low bandwidth) make computer-mediated contexts less suitable for some communication (Rice, 1993; Short et al., 1976; Trevino et al., 1987). In contrast, a relational perspective suggests that computer mediation should have very limited effects on relational communication and researchers should examine the real functional social factors.

It was found that in mediated communication, users tend to express missing nonverbal cues in written or other alternative forms. Short et al. (1976) posit that participants need to modify their behaviors in some reduced-cue situations. For example, nodding of the head can be replaced by verbal expressions, such as “I agree.” Emoticons and other symbolic displays were developed to add affective elements of computer-mediated communication (Gunawardena & Zittle, 1997; Kuehn, 1993; Walther, 1994a). This adjustment is supported by Argyle and Dean’s

(1965) equilibrium model because a communicator needs to turn to other alternative channels to convey affective messages in order to reserve a level of comfort. Moreover, it should be noted that the equilibrium theory may be different when it is applied in online learning environments, where learners make all the decisions on what and how to communicate. Walther (1992) and Argyle and Cook (1976) maintain that intimacy behaviors are derived partly from social norms to form a need for affiliation. Thus, it is possible that the physical absence of participants and learners' arbitrary controls in distance communication result in some extreme behaviors (such as embarrassing, flaming, dropout, or lurking) in online intimacy (Tu, 2001). It has also been suggested that increased social presence might cause confusion and conflicts in cultural norms when diverse learners participate in the virtual learning environment (McKerlich & Anderson, 2007).

Immediacy

Immediacy is a construct conceptualized by Wiener and Mehrabian (1968) to measure the psychological distance that a communicator places between people. It is associated with the closeness one feels with another (Mehrabian, 1969b). Generally speaking, immediate behaviors communicate liking (and closeness) while non-immediate behaviors communicate disliking (and distance) (Mehrabian, 1971). According to Mehrabian (1971), human behavior patterns can be interpreted as a principle of "approach-avoidance" (p. 1): People approach persons and things they like and avoid what they dislike.

Verbal immediacy. The concept of immediacy was initially applied to the understanding of speech and written communication patterns (Wiener & Mehrabian, 1968). According to their research, variances in using pronouns, addresses, and tense verbs convey a degree of attachment or detachment. For example, using "you" and "I" as opposed to the use of "we" indicates the

separation of one from another and therefore conveys non-immediacy. Other examples include syntactic expressions of probability (will vs. may) and ownership (my vs. our) (Rubin, Palmgreen, & Sypher, 1994). Verbal immediacy refers to stylistic verbal expressions that affect a degree of like or dislike.

Nonverbal immediacy. Mehrabian and his colleague (Wiener & Mehrabian, 1968) extend immediacy from speech itself. One can convey immediacy both verbally and non-verbally. Nonverbal immediacy is rooted in the idea that people often convey implicitly (nonverbally) complex information about feeling instead of using words (Mehrabian, 1989). For instance, touching, forward leaning, eye contact, and directness of body orientation are able to promote feelings of liking, pleasure, arousal, and thus enhance immediacy (Mehrabian, 1969b, 1971).

Teacher immediacy. Andersen (1979) explored immediacy behaviors specifically in the educational context, and proposed the concept of teacher immediacy as “those nonverbal behaviors that reduce physical and/or psychological distance between teachers and students” (p. 544). She revealed a significant relationship between teacher nonverbal immediacy and students’ affective learning. The following studies conducted in an educational setting identified a variety of teacher behaviors contributing to a sense of immediacy, which in turn led to more affective and intense interaction. Examples of verbal immediacy behaviors used by classroom teachers include praising students, addressing students by their first name (Gorham, 1988; Hackman & Walker, 1990), referring to personal examples/experiences, providing feedback (Gorham, 1988), and using humor (Christenson & Menzel, 1998; Christophel, 1990; Gorham, 1988; Gorham & Zakahi, 1990; Sanders & Wiseman, 1990). Examples of non-verbal immediacy behaviors used by classroom teachers include smiling and maintaining eye contact when talking to students (Andersen, Andersen, & Jensen, 1979; Gorham, 1988; Hackman & Walker, 1990), using vocal

expressiveness, smiling at the class, having a relaxed body position and direct body orientation (Andersen, 1979; Gorham, 1988; Richmond, Gorham, & McCrosky, 1987), touching students in the class, and moving around (Gorham, 1988). Some behaviors were also identified to lower the sense of immediacy, such as raising voice in anger or frustration (Bradac, Bowers, & Courtright, 1979; Heath & Bryant, 1992; Short et al., 1976). Immediacy behaviors suggest a more positive attitude involved in a conversation and reduce distance between the sender and the receiver (Mehrabian, 1969a; Wiener & Mehrabian, 1968). Accordingly, results of these studies suggest that students prefer teachers who demonstrated more immediacy behaviors.

Immediacy and social presence. Immediacy is suggested to be a contributing factor to social presence (Christophel, 1990; Gorham, 1988; Hackman & Walker, 1990; Walker & Hackman, 1991, November). Short et al. (1976) indicate that social presence and immediacy are likely to vary together with different media, but they are different. Immediacy could vary in the same medium according to its usages in different communication contexts. However, social presence (the degree one is perceived as “a real person”) stays the same within a particular medium regardless of specific contexts.

As Mehrabian (1989) claimed, language plays an important role in conveying immediacy (inclusion) or non-immediacy (individuals). In distance education contexts where most of the communication relies on written text, verbal immediacy behaviors are able to influence interpersonal relationships and mediated communication. But immediacy has become more difficult to convey, and some researchers contend that participants need to adjust their linguistic and textual behaviors for the new format of social relationships (Gunawardena, Lowe, & Anderson, 1998; Walther, 1992).

Interactivity

Interactivity (Rafaeli, 1988) is a variable characteristic of communication settings. It reflects the extent that in a series of communication, the later transmission is dependent on earlier (previous) transmissions (Rafaeli, 1988). The definition indicates its subjectivity, and thus interactivity is a parameter of a communication setting, not of a medium (Rafaeli, 1990). Moreover, interactivity exists on a continuum of three levels (Rafaeli, 1988). The lowest level is two-way communication. It simply suggests the bi-directional flow of information, which could be non-interactive. The highest level is full interactivity (responsiveness). It differs from quasi-interactivity (reaction, e.g., a machine reacts to a procedure) by acknowledging the content, nature, form or presence of earlier responses. The full state of interactivity requires the constantly interchangeable roles of the sender and receiver (Rafaeli, 1988).

Wagner (1997) proposes interactivity as “real time exchanges of audio, video, text, and graphical information” (p. 19), and she views interactivity as an attribute of the technology system. The exchange of information can happen among learners, between learner and instructor, and also between human and the technology used to deliver the instruction (Wagner, 1997). Wagner (1994) distinguishes interactivity from interaction, the term that is often used interchangeably. Interaction is mutually-influencing behaviors/events between interactants, while interactivity represents the attributes of a communication system via which connections could be established.

Since the communication process was generally perceived as an exchange of “cues” via which one communicator can influence the state of the other (Cherry, 1957), Short et al. (1976) point out that one significant issue is whether these cues are used by the other communicator. They separate “indicative cues” (cues that signal a state of the sender) from “communicative

cues” (cues that require the receiver to respond). The indicative cues only guarantee that some information is derived from the sender, but do not necessarily associate with communicative worth. Therefore, Short et al. (1976) describe interactivity as media attributes that are capable of transmitting communicative cues. To realize interactivity in mediated communication, it should allow treatment of media channels as “real people” (Rafaeli, 1988). Social presence is dependent upon the degree a communicator is perceived as a real person through a medium (Short et al., 1976, p. 73).

Although Short et al. (1976) maintain that social presence is “a quality of a medium itself” (p. 65), they measure it via subjects’ ratings of several media “on a series of seven-point, bipolar scales” (p. 66). Social presence is treated as media’s sensitivity, sociability, and familiarity. It is not clear whether the actual media attributes or users’ perceptions of media affect communication (Walther, 1992). Therefore, Rafaeli (1988, 1990) argues that social presence is a subjective measure of the presence of others in Short et al. (1976)’s study, while “interactivity” is the actual quality of a communication context. Social presence is said to be realized only when participants are engaged in a full state of interactivity in which a reciprocal exchange of information occurs (Rafaeli, 1988).

Similarly, Gunawardena (1995) differentiates interactivity from social presence as a one-step gap. While interactivity is a quality of a communication sequence or context (Rafaeli, 1988), it has the potential to be fulfilled by someone or some actions, hence the realization of social presence. He claims that social presence requires users to notice and appreciate the awareness of interactivity.

Social Presence and Distance Education

When individuals participate in distance learning events, their abilities to establish

interpersonal contact with others is often diminished. In past studies, social presence has been identified as an important element to enable and promote social interaction in distance learning environments. Social presence indicates a level of comfort, which is required in both traditional and technology-mediated learning environments (Gunawardena, 1995). A lack of social presence may lead to more frustration in the learning processes, a more critical attitude toward the instructor, a lower level of perceived learning effectiveness, a stronger feel of dissatisfaction, and less participation (Reio & Crim, 2006; Rifkind, 1992). An environment lacking social cues can be viewed as impersonal, and therefore, the amount of information shared with others may decrease (Leh, 2001). According to Sherry (1996), when there is a lack of dialogue among distance learners, “the quality and integrity of the educational process” (p. 5) will be negatively impacted.

The dramatic change in education environments leads to a need for new instructional design approach. As some investigators claimed, it is critical that distance educators are aware of a number of principles that can facilitate learning in the mediated settings. Social presence appears to be one variable that matters and has been studied a lot. Earlier researchers (Short et al., 1976; Sproull & Kiesler, 1986) maintain that a computer-mediated learning environment is not ideal for social interaction. However, this point of view has been argued extensively and increasing studies have shown that appropriate instructional strategies can help maintain social presence for effective educational outcomes in distance education contexts.

Aragon (2003) believes that three groups of individuals are involved in shaping online learning environments. They are course designers, instructors, and participants. Firstly, a well-designed distance course starts with proper “course design and presentation mechanisms” (Collison, Elbaum, Haavind, & Tinker, 2000, p. 1). Before the class starts, part of social presence

has already been planned in the course design and organization (Arbaugh & Hwang, 2006). It can be inferred from the syllabus, guidelines, learning activities, selection of readings and representation modes. Structural components such as goals, deadlines, rules and guidelines are extremely important in online classes because the element of face-to-face management in traditional classrooms is absent in online learning environments (Palloff & Pratt, 1999). In addition, the media interface can be designed to accommodate interactive activities more easily (Palmer, 1995), fostering social presence.

Secondly, in the progress of a course, social presence can be maintained and enhanced through carefully designed activities that encourage interaction (Vrasidas & MaIsaac, 1999), such as group-based work, discussion forums, and problem solving tasks (Wagner, 1997). Past empirical studies indicate that different types of discussion questions have different effects on the development of social presence. The more task-oriented the conversation is, the lower degree the social sense would be (Tu, 2000b; Tu & McIsaac, 2002). In contrast, discussion activities designed to share personal experience would enhance social presence (Swan & Shih, 2005). In addition, class size also has an effect on social presence. Social presence is found to develop faster (Akyol, Garrison, & Ozden, 2009), at higher levels (Driver, 2002), and produce higher communication quality (Lowry, Roberts, Romano Jr., Cheney, & Hightower, 2006) in small classes than in large classes. The ideal size of successful online classes is 25 to 30 students (Arbaugh & Benbunan-Finch, 2005). Therefore, in large classes, it is suggested to have additional tutors or teaching assistants to ensure enough interaction (Heppner, 2007; Messineo, Gaither, Bott, & Ritchley, 2007).

Thirdly, it is challenging for online instructors to remain active and responsible in manipulating social presence because it is much more timeconsuming compared to traditional

classroom-based instruction. Online courses require more highly interactive one-on-one approaches in addition to a group approach common in the face-to-face classroom, resulting in high workloads of the instructor (Kearsley, 2000; Ryan, Carlton, & Ali). It is common to see that faculty delay feedback, which may result in students' feelings of disconnectedness (Stephen, O'Connell, & Hall, 2008). Instructors' awareness of a number of efficient strategies that facilitate the development of social presence may help alleviate their stress in online teaching (Swan & Shih, 2005). Therefore, it is suggested that institutions include such issues in the faculty professional training. Institutions can also provide increasing design and organization support to instructors through the use of consistent instructional design formats, shared guidelines of using technology, and common instructor techniques across courses (Dziuban, Shea, & Arbaugh, 2005).

Fourthly, the advanced development in communication technologies and learning management systems provides more opportunities for easy and extensive communication and interaction. They embody much potential for educational usage. For example, the innovative use of learning management systems could save instructor time in some administrative tasks. Therefore, they can dedicate more time and effort to quality interaction with students (Feldstein & Masson, 2006). For another example, the instructor can add new information from diverse resources in a variety of presentation modes, such as including video/audio files (Homer, Plass, & Blake, 2008). Furthermore, there is a growing interest in studying how to use social software such as Facebook, MySpace, Twitter, Blogs, and Ning to enhance social presence in collaborative learning environments (Brady, Holcomb, & Smith, 2010; Dunlap & Lowenthal, 2009; Joyce, 2009; Leslie & Murphy, 2008). Social software, known as Web 2.0, is a collection of software by which users can communicate as a group and also contribute content (Kesim &

Agaoglu, 2007). They do not merely function as a photo album or message board, but also allow more opportunities for interaction. In addition, the use of emerging multiuser virtual environments, such as Second Life, can also be perceived as nurturing and collaborative learning environments that encourage social presence development (Burgess, Slate, Rojas-LeBouef, & LaPrairie, 2010). The use of cell phones has also been explored to improve social presence in mobile learning environments (Arminen & Weilenmann, 2009; DuVall, Powell, Hodge, & Ellis, 2007; Kekwaletswe, 2007). Instructional designers are called to seek the maximum effectiveness of employing a variety of tools and strategies to enhance social presence.

Research in Social Presence

Current research on social presence has two major trends. One trend examines the relationship between social presence and a variety of factors in distance education, such as satisfaction (Arbaugh, 2001; Gunawardena & Zittle, 1997), motivation (Baker, 2010; T. Russo & Beson, 2005; Weaver & Albion, 2005; Wise et al., 2004), attrition rates (Boston et al., 2010), course design features (Akyol et al., 2009; Ke, 2010), feedback strategies (McCollum, Calder, Ashby, & Morgan, 1995), discussion topics (Swan & Shih, 2005; Tu, 2000b), perceived learning (Akyol & Garrison, 2008; Christophel, 1990; Swan & Shih, 2005), and other factors associated with distance education. The investigators attempt to quantitatively discover new relationships, as well as confirm hypothetical relationships between social presence and factors in distance education in order to improve the learning experience.

This trend of studies faces the challenges of conflicting results. For example, although there is some evidence to show the positive relationship between social presence and student satisfaction/perceived learning achievement, other studies find that social presence has no effect on perceived learning, satisfaction, or final course outcomes. Such confliction suggests that

social presence is not a direct influencing variable on distance learning (Wise et al., 2004). The idea of social presence is primarily originated from the concept of “immediacy” and “intimacy” which are associated with the psychological perception of closeness in an interpersonal relationship. In the education context, its main responsibility is sustaining a comfortable learning environment where participants are able to conduct social interaction freely and collaboratively. Social presence primarily contributes to the social emotion of participants. However, a strong positive link to cognitive learning outcomes has not been found. While high social presence is more likely to result in more social interaction, it does not necessarily lead to higher learning achievements because the quality of interaction is more important than the quantity of interaction (Swan, 2002).

On the other hand, another focus of social presence research looks at the fluctuating features of the construct in order to explore its nature, development patterns, and the distribution. Challenges of this trend of studies relate to their complex analysis processes and the limitation of generalizability. First, there is no consensus regarding indicators of social presence. Some studies utilize broad indicators that may not capture the accuracy of social presence, while other studies use too specific indicators that run the risk of being extremely context specific (Garrison & Arbaugh, 2007). Secondly, each study has been restricted to a few types of learning activities (e.g., online discussion), one or two communication media (e.g. asynchronous discussion board), and in a particular course or discipline. The transferability of these results may be extremely low.

With the exponential increase in social presence studies in the past three decades, a comprehensive review is greatly needed to integrate and evaluate current studies. The results of this review will provide more insights for solving existing problems related to the two trends of social presence studies.

Overall Summary of the Review of Literature

The theoretical foundation of communication theories provides a lens through which interpersonal communication in mediated environments can be examined and understood in terms of intimacy—the sense of close connection one feels in a relationship (Argyle & Dean, 1965), immediacy—the psychological distance between communicators and recipients (Wiener & Mehrabian, 1968), and interactivity—the characteristic of a communication sequence/setting (Rafaeli, 1988, 1990). These three concepts jointly contribute to the formation of the social presence construct (Short et al., 1976).

As can be concluded from this review of literature, many problems are inherent in past studies of social presence. First, various conceptualizations of social presence exist in different studies. The lack of consensus in what constitutes social presence implies the complexity of the nature of this construct and its resulting imprecision in the measurement and interpretation in different studies. It is because of such indefinite features in social presence that an integrative review of past studies could be beneficial.

Second, social presence was identified as a significant construct in the field of social science and communication. It is possible that the importance of social presence has been advocated widely for its potential academic benefits in the field of education. Although some positive effects have been seen, social presence still faces skepticism for its direct influence on perceived learning and actual learning outcomes. It is because of such ambiguous relationships between social presence and learning that further examination of research is needed to determine the overall effects of social presence by combining the disparate results from different studies.

Chapter 3. Methodology

This chapter presents the methodology that was used in this integrative review of social presence. The overall goal of this review was to summarize the accumulated state of knowledge concerning social presence in distance teaching and learning practices. The study will generate a more comprehensive understanding about social presence, highlight important unresolved research issues, and provide guidance for future research. More specifically, five research questions were answered by their corresponding data and types of analysis (Table 1). The responses to these questions will contribute to a more robust understanding of the role of social presence in distance education.

Integrative Review

The methodology that guided this study was the integrative review approach as outlined by Cooper (1998). He suggested that this integrative approach was necessary to build a comprehensive understanding of an issue of interest and is particularly helpful for informing future studies, practices, as well as policy.

The integrative review is the broadest type of research review methodology because it allows the inclusion of various types of research studies in order to obtain a more comprehensive understanding about an issue of concern (Whittemore & Knafl, 2005). It seeks to summarize past studies by drawing overall conclusions about a particular issue from many disparate investigations that address related issues (Cooper, 1998). A well-done integrative review is able to make crucial contributions to theory development and generate direct influences in informing future applicable practice (Broom, 1993).

Table 1.

Research Questions, Collected Data, and Types of Analysis

Research questions	Collected data	Types of analysis
1. How is social presence defined?	189 empirical studies on social presence	An iterative comparison of similarities and differences among all the studies.
2. What factors comprise social presence?		
3. What problems exist in measuring social presence		
4. What is the impact of social presence on learners' perceived learning?	24 studies quantitatively examined the relationship between social presence and perceived learning	Meta-analysis – calculating the effect size of social presence on learners' perceived learning.
5. What is the impact of social presence on learners' actual learning outcomes?	9 studies quantitatively examined the relationship between social presence and actual learning	Meta-analysis – calculating the effect size of social presence on learners' actual learning outcomes.

An integrative review is more comprehensive than either a qualitative literature review or a quantitative meta-analysis (Whittemore & Knafl, 2005). It is able to use both qualitative and quantitative approaches to synthesize past studies, resulting in more robust conclusions. A qualitative synthesis runs the risk of being biased, while a quantitative synthesis requires a standardization of theoretical conceptualizations, measurements, and analytical procedures before the variables of interest can be statistically calculated (Borenstein, Hedges, Higgins, & Rothstein, 2009). Such standardization will greatly diminish the number of qualified studies, leading to the loss of data, which in turn limits the scope and breadth of a review.

Cooper (1998) identified five stages as comprised of the integrative review methodological framework: 1) problem formulation, 2) data collection, 3) evaluation of data, 4) data analysis and interpretation, and 5) presentation of results (Figure 3). The first stage involves outlining the issue of interest and identifying the research focus and boundaries. The second stage is a crucial one; search strategies must be well-defined to strengthen the rigor of a review and minimize researcher bias. The third stage makes judgments on the quality of available data to see whether they are qualified for further analysis. The fourth stage involves the reduction, display, and comparison of the data. The last stage is to present a culmination of the comprehensive understanding about a particular topic.

More than 300 studies spanning from the 1970s to 2010s were located and reviewed. In doing so, 112 empirical studies published in peer-reviewed journals and 77 dissertations/thesis were selected for in-depth integrative review. Existing theoretical perspectives were summarized and critically evaluated in this review.

Application of the Integrative Review Stages

This section delineates the process of conducting an integrative review in detail as encompassing five stages. The rigor of doing this study is highlighted.

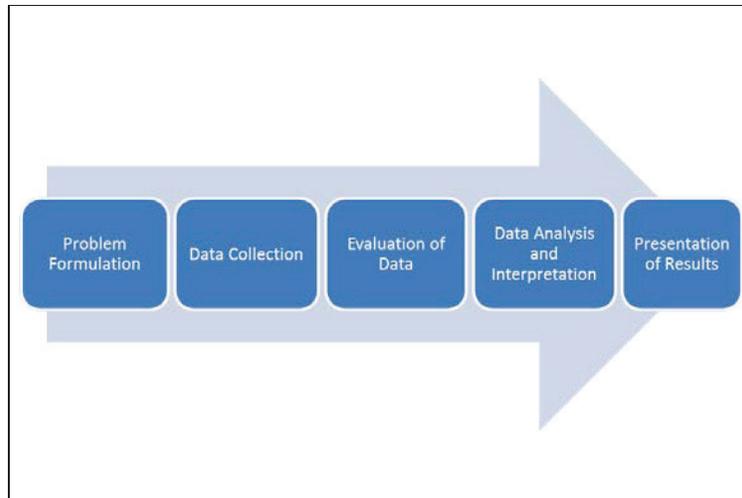


Figure 3. Diagram of the research methodology

Stage 1: Problem Formulation

This study intends to develop a better understanding of social presence, in order to contribute to the development of social presence theory, inform teaching and learning practices, and direct future studies in the same area.

First, the researcher became intrinsically interested in the nature of social presence. This construct had been bearing a range of different meanings in previous studies (Biocca et al., 2003). However, the different dimensions proposed by different empirical studies ran the risk of being data-driven within a very specific context. For example, three dimensions proposed by Rourke and his colleagues (Rourke, Anderson, Garrison, & Archer, 1999) were generated when students interacted with each via text-based conferencing system. Jin (2011) conceptualized social presence in a virtual world where students were asked to collaborate with each other. In addition, when subsequent studies used various conceptualizations of social presence, they might have examined different targets, though under the same name “social presence.” Therefore, a conceptually grounded definition with rigorous boundaries was needed (Garrison & Arbaugh, 2007).

Second, social presence is an abstract construct. It is still unclear what factors comprise this construct (Biocca et al., 2003). Although many empirical studies have attempted to establish the multidimensional structure of social presence (Biocca, Harms, & Gregg, 2001; Kreijns et al., 2011; Rourke et al., 1999; Tu, 2002), there lacks an agreement of these factors across all different studies.

Third, the researcher attempted to evaluate existing weak spots in measuring social presence, including the aspects of instruments, measurable variables, and research designs. A variety of instruments have been developed to examine a range of social presence variables from different perspectives. There was no consensus in what is/are the most appropriate instrument(s)/variable(s), because there was no consensus in what constitutes social presence. The research designs in past studies were reviewed. Related to this, it was also not clear what factors existed in limiting the generalization of the social presence effects across all situations.

Fourth, the researcher was curious about the actual effects of social presence in improving learning. Although many empirical studies conclude that various benefits could be obtained from a high level of social presence, they are not explicit for what extent social presence contributed to these benefits. In addition, there are many circumstances that researchers found that social presence has no effect on perceived learning (Ferguson, 2010; E. Kim, 2005; Wise et al., 2004). Studies that prove that social presence enhances actual learning outcomes (grades or performances) are rare. It is ambiguous as to what is the overall relationship between social presence and learning, as well as what is the strength of the relationship.

Stage 2: Data Collection

Data collection at this stage involves an extensive search of the literature. A comprehensive search with at least two complementary search strategies is of importance to

reduce a review's bias to minimum (Whittemore & Knafl, 2005). A specific description of search criteria and strategies enhanced a review's rigor (Cooper, 1998). An initial reading of the studies during the search process helped the researcher to develop a codebook used in the next stage to document all relevant study characteristics (Swider, 2002).

Literature search criteria

First, the researcher searched for findings from all previous empirical studies on social presence in distance education. The literature search only included the articles published in English.

Literature search strategy

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. The strategies were (a) computerized searches of reference databases and (b) scrutiny of citation lists for relevant data.

Database search (Appendix A). Six scholarly databases were searched for studies related to social presence. 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 & Theses database. The researcher 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 framework named "community of inquiry" (Rourke et al., 1999), a large number of investigators did not study social presence alone. Therefore, 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.

The “ancestry approach” (Polit & Beck, 2008, p. 109) was used as a complementary strategy to obtain additional relevant articles from the review of citations in the literature already located. The scrutiny of references located 34 studies of interest. When the data were delimited as empirical studies, 29 documents remained.

Literature search findings

In total, 231 studies were located for further evaluation. Three studies were unable to be obtained due to copyright restrictions. A significant number of articles were excluded as they were not conducted as empirical studies. Unpublished manuscripts were excluded, too. Multiple database channels with different entry combinations were applied during the literature search in order to obtain the most exhaustive number of qualified studies.

Stage 3: Evaluation of Data

After data collection, the researcher determined the appropriateness of studies for inclusion in this review. A study had to meet several criteria to be included. First, the data was screened for peer-reviewed empirical studies, excluding reviews, critiques, manuals, and incomplete reports. 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. Third, the study must include a specific measure of social presence and this measure was tested for its influence on issues relevant to improving learning and or learning environment. 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.

Furthermore, numerous characteristics of each study were recorded. They encompassed five broad groups, including study characteristics, study targets, study design, treatment characteristics, and results of the study.

Publication characteristics

In regard to the publication of a study, the following information was retrieved: (a) the year of publication, (b) the author, (c) the name of publish journal/organization/conference, and (d) the information channel from which the study was discovered.

Study targets

In regard to the study targets, the retrieved data were: (e) the number of participants, (f) the educational status of the participants (e.g., graduated, undergraduate, high school, or elementary school), (g) the subject matter of targeted courses, and (h) the institutional information (e.g., public vs. private; urban vs. rural).

Study design

Data gleaned from retrieved studies were: (i) the setting in which the study took place (e.g., web, videoconferencing, audio-conferencing, and etc.), (j) the instrument used to measure social presence, and the instrument's reliability, (k) the variables standing for social presence, (l) the methodological design of the study, and (m) analysis approaches. Generally speaking, each study was categorized into experimental, quasi-experimental, or non-experimental design. More specifically, there are three types of research design: quantitative, qualitative, and mixed-methods (Creswell, 2009). Within each type, the study can be further categorized into correlational design, one-group pretest-posttest design, randomized posttest-only control group design, randomized pretest-posttest control group design, nonequivalent control group design (namely, static group comparison), or case study design. Various analysis approaches in each

study were also recorded. In studies of quantitative design and mixed-methods design, the analysis approaches (e.g., correlation test, t-test and ANOVA). In studies of qualitative design and mixed-methods design, the analysis strategies (e.g., collaborative coding, sequential explanatory strategy and concurrent triangulation strategy) were recorded.

Treatment characteristics

In this section, details recorded from the design of each study were: (n) use of a treatment, (o) the intensity and duration of the treatment, and (p) how different groups were manipulated if such information was available.

Study results

Finally, with regard to the results of a study, the researcher retrieved (q) what dimensions of social presence were found or confirmed, (r) what factors were found associated with social presence, (s) the magnitude of social presence effects (e.g., the statistical significance of correlation coefficients, t test, F test, regression test, and etc.), and (t) whether the research hypothesis was supported or rejected.

In sum, in order to code each study as objectively as possible, the methods-description approach (Cooper, 1998) was adopted. The categories listed above were low-inference codings, which only require the coder to locate desired information and record it in the coding sheet. The advantage of this approach is that it does not involve many processes of integration and interpretation of the original information, lowering the possibilities of ambiguous meanings. In the end of this stage, each primary article was reduced to a set of characteristics on a coding sheet, serving as a starting point of analysis in the next stage.

Stage 4: Data Analysis and Interpretation

The data from primary sources was compiled, analyzed, and summarized in this stage.

The researcher used both narrative and quantitative procedures to systematically review these studies. At the analysis stage, Cooper's (1998) framework was primarily aligned with the meta-analysis method which was specifically targeted on the review of quantitative studies. Issues of analyzing diverse data sources (e.g., both quantitative and qualitative) were not specifically included. Therefore, Cooper's (1998) framework was modified in this part to address the qualitative analysis (Figure 4).

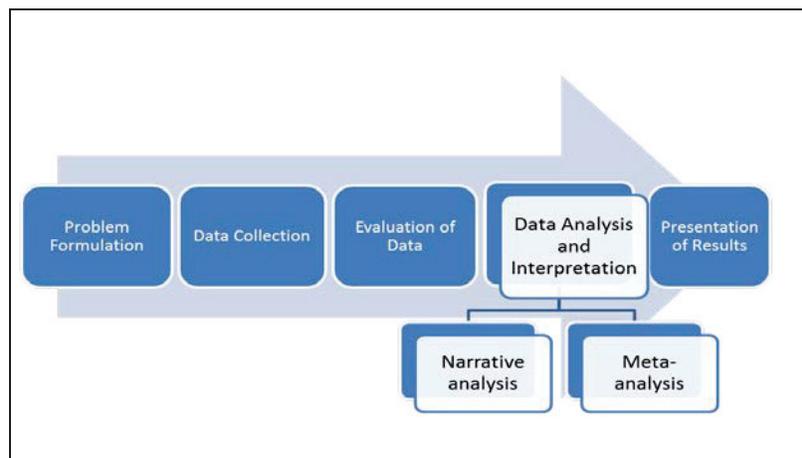


Figure 4. The revised diagram of the research methodology

Narrative (Qualitative) analysis

Generally speaking, narrative analysis in the integrative review is a process of constant comparison of primary sources. It is similar as primary research methods of qualitative analysis employed in qualitative and mixed-method studies (Patton, 2002). Data from primary sources were coded, categorized, integrated, interpreted, and summarized into conclusions to answer the research questions at this stage.

According to Whitemore and Knafl (2005), the process of narrative analysis could be divided into four steps: 1) data reduction, 2) data display, 3) data comparison, and 4) conclusion drawing and verification.

The first round, data reduction, involved organizing the data from primary sources into an

overall classification system. The overall classification system could be determined by chronology, settings, sample characteristics, and etc. (Whittemore & Knafl, 2005). In this study, primary articles were chronologically entered into the table as each article was reviewed.

The second round was data display, which involved extracting primary data and displaying them in the form of tables, matrices, charts, or graphs for comparisons (Whittemore & Knafl, 2005). In this study, various characteristics corresponding to each study as mentioned in the Stage 3 were put into a table. The use of tables enhanced the visualization for analysis in the next step.

The third round was data comparison, an iterative examination process which involved a constant comparison to identify categories, patterns, themes, and relationships (Whittemore & Knafl, 2005). Based on Glaser (1978) and Patton's (2002) recommendation, a constant comparison method is applicable in the qualitative analysis to convert primary data into systematic categories. In this research, studies using similar research designs and instruments were grouped together. Studies that drew similar conclusions were also organized together. The author made constant comparisons on other characteristics in order to discover clusters of data, discern themes, and subsuming particulars (Miles & Huberman, 1994; Patton, 2002). Data were converted into more than 10 emerging categories through several iterative comparisons across primary data sources. As a result of the analysis, social presence issues were eventually categorized into five main categories: (a) conceptualization of social presence, (b) variables used to measure social presence, (c) instruments, (d) research designs of social presence, and (e) effects of social presence. The use of tables facilitated the synthesis and comparison by compiling varied information into an organized display. Patterns and relationships were easier to distinguish through such visualization. During the identification and finalization of

categorizations, a decision tracking document was maintained to record analysis decisions, puzzles, thoughts, supporting rationales, and any ideas that might affect the interpretation of data (Miles & Huberman, 1994).

There was conflicting evidence about the effects of social presence on some factors in distance education, such as learner's satisfaction, learners' perceived learning, and actual learning outcomes. To analyze these conflicts qualitatively, explicit efforts were taken to explore the confounding variables contributing to the variability in different findings (Whittemore & Knafl, 2005). Furthermore, the conflicts suggest that further research with more rigorous design and explicit boundaries may be required.

The last round of qualitatively analyzing data was conclusion drawing and verification which involved subsuming the patterns from interpretive description into summary (Whittemore & Knafl, 2005). At this stage, data on the coding sheet were further extracted to higher levels of abstractions. Commonalities and differences were identified and elaborated into patterns, themes, and relationships. Conflicting evidence was addressed by analyzing the confounding variables (Whittemore & Knafl, 2005). Conclusions and proposed conceptual models were developed, revised, and verified in an iterative process to be as inclusive and accurate as possible (Miles & Huberman, 1994). Extra attention was paid to avoid premature conclusions or exclusion of unexpected evidence (Sandelowski, 1995).

Meta-analysis

A meta-analysis was used in this study for synthesizing quantitative data on social presence to determine its overall effects on learners' perceived learning and actual learning outcomes. It also enhanced the generalizability of the data about this particular issue. Quantitative results from individual studies were used as the units of measurement in this

method. The procedure used to statistically combine the quantitative results of social presence was the calculation of average effect sizes. Quantitative results were summarized by indices of the effect size that “may then be averaged to obtain an overall estimate of effect magnitude” (Hedges & Becker, 1986, p.15).

The most significant strength of the meta-analysis is that calculating the index of the effect size is scale-free (Hedges & Olkin, 1985). This feature particularly fits the cases of social sciences. As can be seen in Appendix B, a variety of scales were employed to measure social presence in previous studies. The use of a scale-free index makes it possible to integrate the results from different studies on the same constructs. Perceived learning measured what participants believed that they had learned from the course. It was also measured by various instruments and items constructed by Alavi (1994), Arbaugh (2000), Eom, Wen, and Ashill (2006), Richmond et al. (1987), Wise et al. (2004), Wu and Hiltz (2003, 2004) and some other specific scales in single studies. Actual learning outcomes were indicated by assignment grades and/or final course grades.

The retrieval of studies for inclusion in a meta-analysis is critical, because the choice of data can directly exert some control over the results (Cooper, Robinson, & Patall, 2006). According to Hedges and Becker (1986), certain criteria must be met before the effect size could be calculated. The studies included for meta-analysis were screened from qualified ones that have been identified in the data evaluation in Stage 3. First, they must quantitatively measure the same construct. Second, the selected studies must be independent. Third, the studies must estimate the same statistical parameters. In this synthesis, the search for factors that associated with social presence focused on two outcome variables: learners’ perceived learning and actual learning outcomes. Based on the above criteria, 141 studies were excluded, leaving 40 studies for

the analysis of this section.

In addition to these broad criterion, included studies had to be detailed enough to describe adequate statistical information that allow for calculating the effect size. For studies that examined correlational relationship, the correlation coefficient and sample size must have been reported (Borenstein et al., 2009). For studies that employed a factorial design, the ANOVA table must have included the all of the cell means (B. Johnson, 1989). For studies that utilized inferential analysis, proper transformation must have been applied based on reported zero-order correlations (Hedges & Olkin, 1985; Rosenthal, 1984). For studies that only included descriptive data, means and standard deviation must have been identified for the transformations in order to calculate the effect size (Hedges & Olkin, 1985). During further analysis of the selected documents in detail, seven studies (Caspi & Blau, 2008; Galbraith, 2007; Hostetter & Busch, 2006; H.-Y. Huang, 2003; J. Kim, Kwona, & Cho, 2011; Liu, Gomez, & Yen, 2009; Ubon, 2005) were excluded because the lack of specifics in reporting data. Finally, 33 studies were identified for meta-analysis (Appendix D).

Average effect sizes. The average effect size was calculated by weighing each study's correlation number according to its sample size (Cooper & Hazelrigg, 1988).

Before calculating the effect size, several steps were conducted to integrate data. First, the median and range of the estimated relationship in each study were recorded (Cooper et al., 2006). Second, the distribution of the effect size was examined to exclude statistical outliers using $p < .05$ for two-tailed as the significance level (Barnett & Lewis, 1994; Cooper et al., 2006).

The calculation of the effect size was based on (a) the conversion of r for most of the correlational studies, (b) t and F index for studies that reported mean differences among between

two groups, and (c) means and standard deviation for the rest of the descriptive studies. For studies that employed more than one analysis approach, a separate effect size was calculated for each approach. In the area of social presence, the dominant majority of past quantitative survey studies belong to the case (a) because they merely involved a cross-sectional one-time measure in naturalistic settings but not statistically equating participants on any other variables.

Calculating effect size. According to Hedges and Olkins (1985), the standardized mean difference could be considered as being comparable among different studies. In this research, the researcher used bias-correlated standardized mean difference, i.e. Hedges' g index, as the final effect size index in data synthesis. Hedges' g is based on Cohen's d , the sample estimate of the standardized mean difference. According to (Hedges, 1981), the Cohen's d is slightly biased, tending to over-estimate the population standardized mean difference in small sample size cases. Therefore, Hedges (1981) proposed an adjustment for such bias and thus developed the conversion from Cohen's d to Hedges' g .

The effect size calculation scheme is shown in Figure 5 as follows. Step 1 was to convert the different statistics index in different studies into Cohen's d . Step 2 was to convert Cohen's d into the bias-corrected standardized mean difference (Hedges' g) for the final effect size index. Step 3 was calculating the effect size. The formulas for conversions (Borenstein et al., 2009) are listed in Appendix E. Step 4 was to determine whether social presence had an effect on perceived (or actual) learning by calculating the confidence interval. The null hypothesis was tested by the effect size. Specific calculations of the meta-analysis are presented in the Appendix E.

H₀: Social presence has no effect on learners' perceived (or actual) learning.

H₁: Social presence has effects on learners' perceived (or actual) learning.

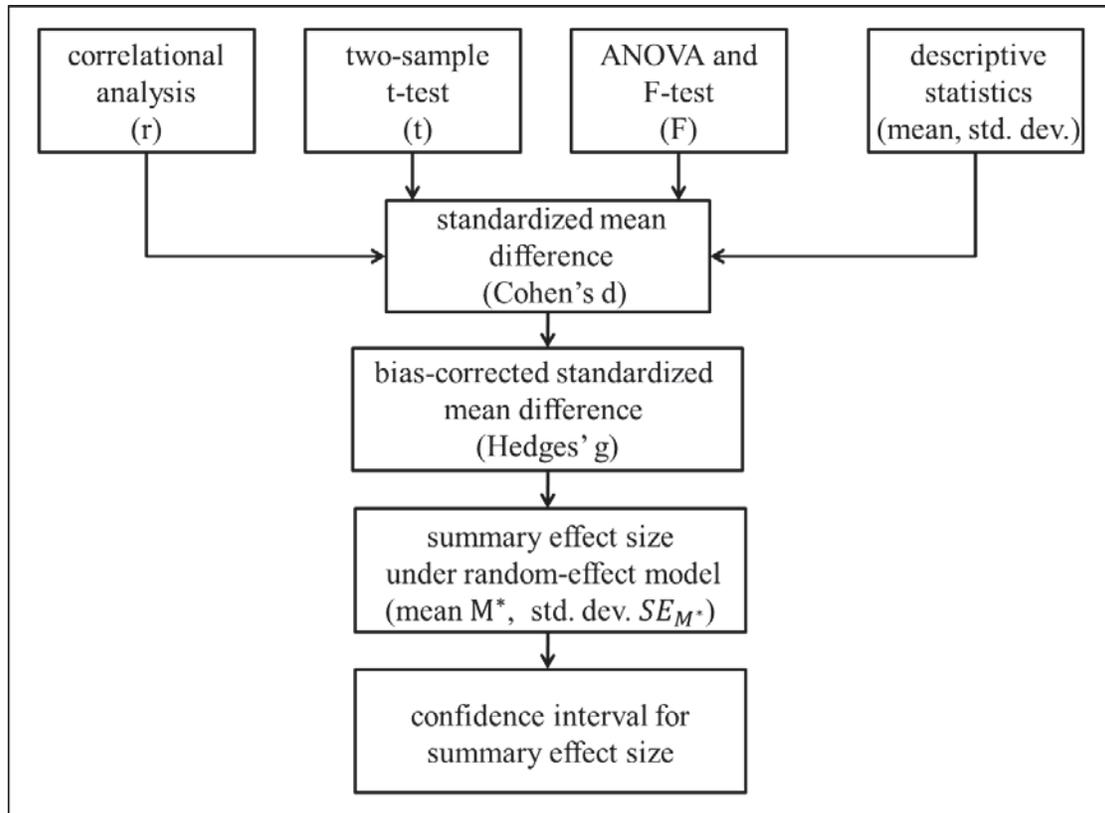


Figure 5. The conversions of different types of effect size.

Stage 5: Presentation of Results

The final step of the integrative review is to translate what the researcher reviewed and found into a public document (Cooper, 1998). The importance of findings and implications for the research are highlighted in order to reflect both the depth and breadth of the topic.

Limitations of the methodology and results are also explicitly stated.

Validity of the Study

Validity of a study reflects the extent to which the findings accurately reflect what really happened in the setting being studied (Creswell, 2009). In an integrative review, threats to validity mainly lie in 1) narrow, superficial or unclear definitions and concepts; 2) inability to retrieve all studies of interest and biases in selecting resources for reviewing; 3) biased criteria in data evaluation; and 4) misinterpretation in data analysis (Cooper, 1982).

To minimize these threats and protect validity, several strategies were employed in correspondence to each group of threats. First, to minimize narrow, superficial or unclear definitions and concepts, the author began with some broadly recognized conceptualizations of social presence, and remained open to other conceptualizations that might be discovered during the review. Second, to obtain the most exhaustive data sources and minimize biases in selecting data, the author accessed the most extensive databases to gather as much information as possible. In addition, the author was explicit in describing the data collection process and indicated retrieval bias when there was any. Third, to minimize biased criteria in data evaluation, the author stated the criteria used to select or exclude studies in the methodology clearly and explicitly. Fourth, to minimize misinterpretation in data analysis, the author paid particular attention to distinguish direct study-based evidence from indirect references drawn from these evidences (Cooper, 1982). Moreover, the author kept a decision document to record analysis decisions, puzzles, thoughts, supporting rationales, and any ideas that might affect the interpretation of data (Miles & Huberman, 1994).

Limitations of Integrative Review

While this study offered a valuable opportunity to explore social presence issues in teaching and learning practices, there were several limitations. The most concerning limitation was that there was a significant variability for how data could be categorized, although a systematic review approach had been utilized. All the data were evaluated by one person. On one hand, it was good to keep consistency in the application of the approach. On the other hand, it could be argued that the single reviewer was more likely to be biased.

In addition, to avoid overgeneralization of review results, it was recognized that the participants, settings, and courses represented in the synthesis did not represent the entire

population. For example, there were few or no studies that examined the effects of social presence on elementary, middle, or high school students, nor were there studies that examined the effects of social presence in courses of engineering, medicines, or some other disciplines.

Moreover, there was no specific standard for the minimum number of studies required in a meta-analysis. However, if the number of studies was small, the effect size was more likely to be affected by the selection of studies, resulting in less credible review.

Reliability of the Study

Reliability in an integrative review is mainly concerned with the consistency of coding approaches. Many review studies evaluated the inter-rater correlation of coding if the study involved more than one coder. For this study, there was only one coder who was the principle investigator. It had the advantage of stability over multiple coders in coding activities while at the same time ran the risk of subjectivity, uncertainty, and inconsistency. Threats to reliability mainly come from transcription errors of the researcher, the predispositions of the researcher, inconsistent meanings of codes applied by the researcher, and ambiguous meanings of codes (Cooper, 1982). In an effort to reduce these threats, three strategies were applied. First, the investigator employed and integrated methodological procedures recommended by a variety of professionals (e.g., Cooper, 1982, 1998; Hedges & Olkin, 1985; Rosenthal, 1984). The second strategy was to consult with research experts at Virginia Tech and also contact original investigators (if necessary) to resolve uncertainty. Third, the author double-checked the ambiguous items in an iterative way as the coding process involved.

Chapter 4. Results

This chapter presents the results of integrative review empirically related to social presence in distance education. As stated in the Chapter 1, this study seeks to answer the following five research questions qualitatively and quantitatively:

1. How is social presence defined?
2. What factors comprise social presence?
3. What problems exist in measuring social presence?
4. What is the impact of social presence on learners' perceived learning?
5. What is the impact of social presence on learners' actual learning outcomes?

In presenting the results, the tables of categorical characteristics of data are presented and discussed. In addition, in the meta-analysis section, the homogeneity/heterogeneity, random/fixed model, and the confidence intervals are described in calculating the effect sizes.

Characteristics of Studies

In total, 189 empirical studies were selected for the 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 dissertations were Master's theses. This study reviewed empirical studies spanning the years from 1976 to 2012. The majority of the studies (89.44%) took place between the year of 2000 and 2012 (Figure 6). Half of the studies were conducted after 2008 (median=2008) and the number of studies peaked in 2011 (mode=2011).

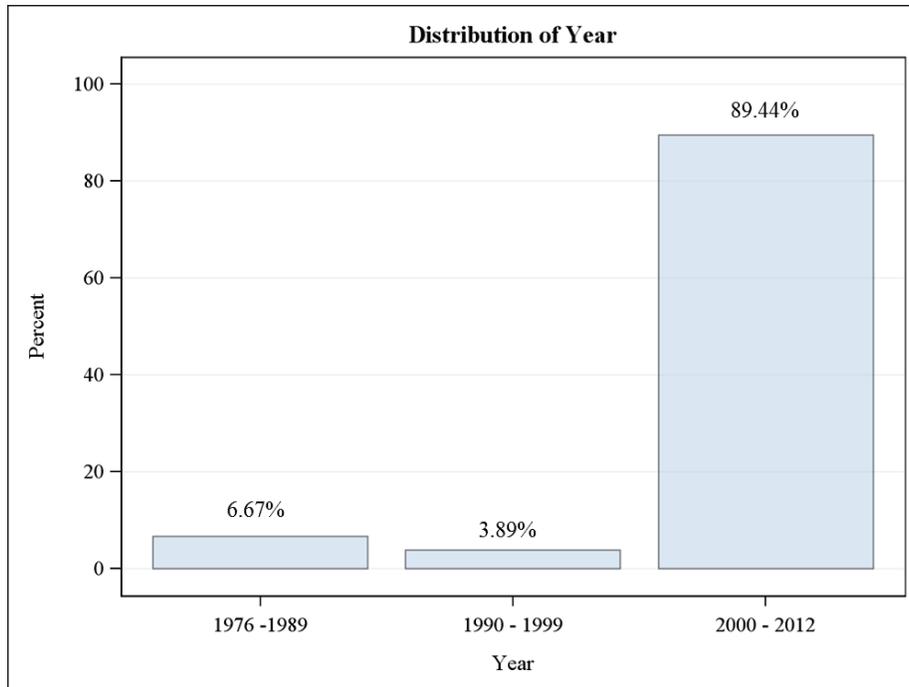


Figure 6. Distribution of studies by years

Social presence studies have been conducted on four continents in over 10 countries, including Canada, Turkey, Italian, Spain, United of King, Sweden, Austria, Japan, Korean, and China. The majority of them (83.98%) were conducted in the United States (Figure 7).

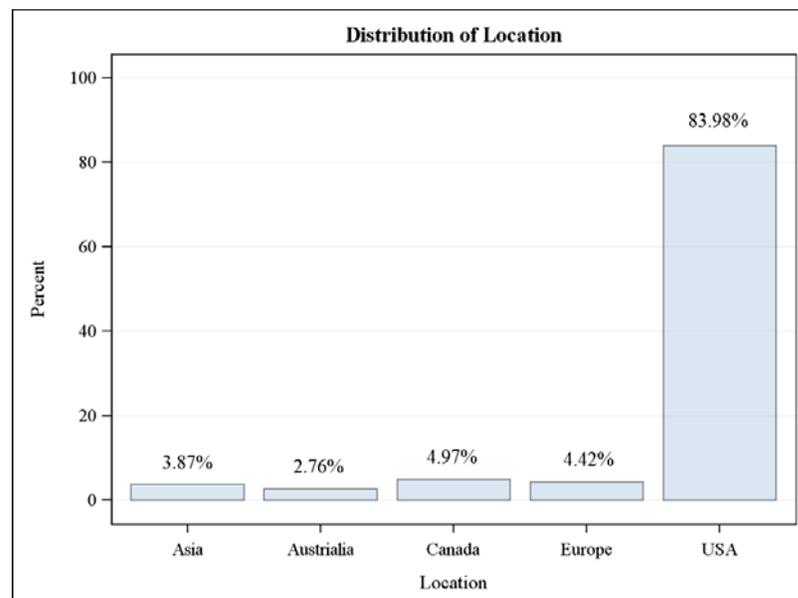


Figure 7. Distribution of location

As showed by the reported frequencies of the characteristics in Table 2, 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.

Table 2.

Summary of subject and education setting characteristics

	Percentage
Subjects	
Instructors	8.84
Students	88.95
Web Users	2.21
Education Setting	
Higher Education	88.70
Non-Higher Education	11.30

To investigate social presence, 86.36% of the studies were conducted within distance courses, 7.39% of the studies were from blended distance courses, and the rest of 6.25% were conducted in face-to-face classrooms (Figure 8).

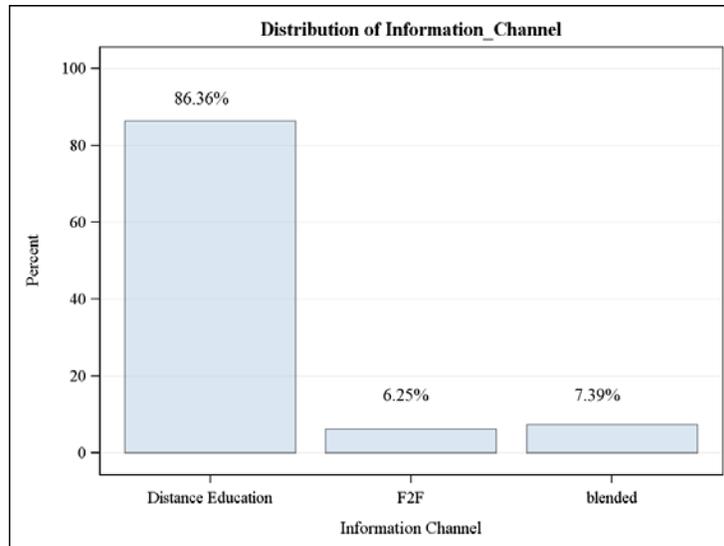


Figure 8. Distribution of information channel

Previous studies investigated social presence with various types of media in technology-mediated environments (Figure 9). 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 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.

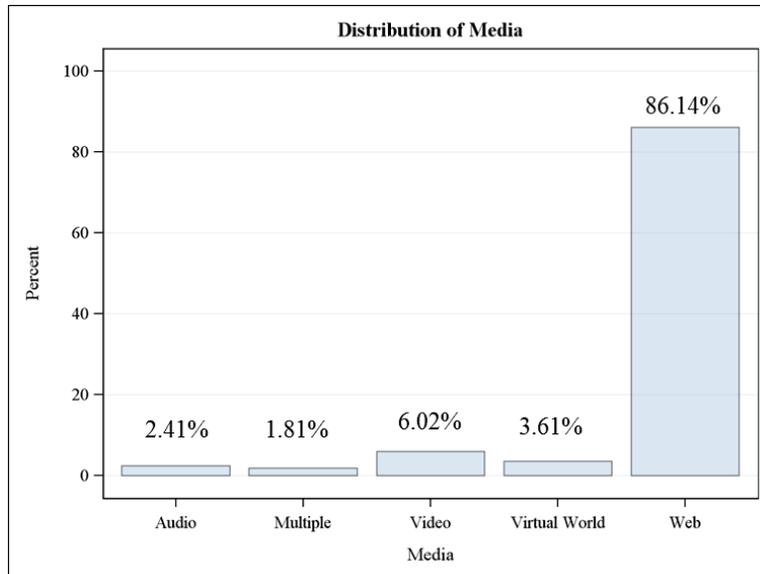


Figure 9. Distribution of media

As reported in Figure 10, 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.

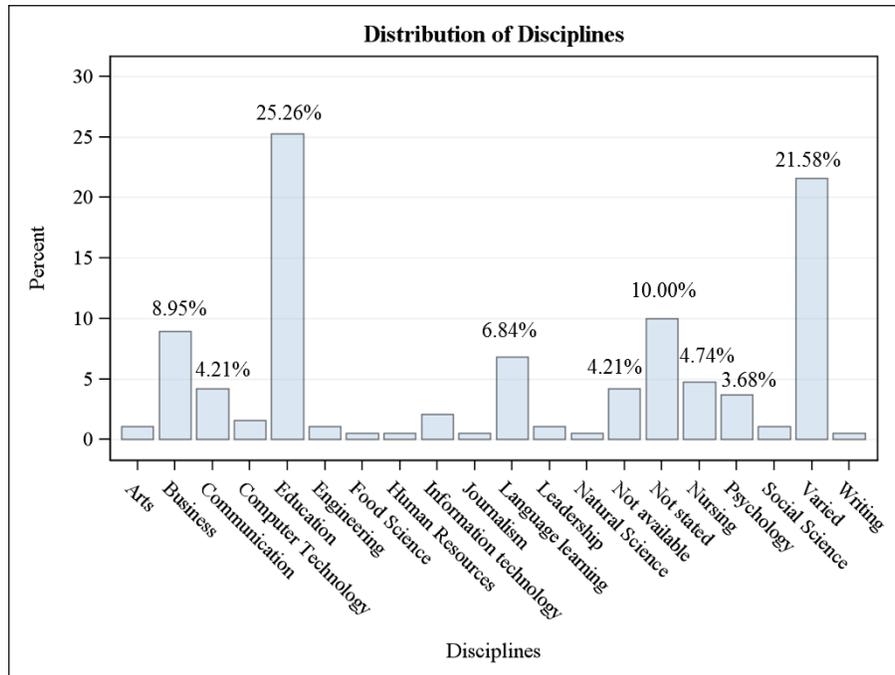


Figure 10. Distribution of disciplines

Results of the Research Question 1

Research Question One “How is social presence defined?” was qualitatively reviewed in this section. The concept of social presence has evolved since it was established. Generally speaking, its conceptualization went through four main stages, including 1) a quality of medium, 2) telepresence and copresence, 3) psychological involvement, 4) intelligence involvement, and 5) performable conceptualizations.

A quality of medium

The concept of social presence was first established by Short et al. (1976) in the field of social psychology in telecommunication. After examining a variety of media including facsimile machines, voice mail, and audio-teleconferencing, they postulated that the inability of some communication media to project non-verbal cues would hinder the interpersonal communication via such media. Based on the evaluation and comparison of participants’ affective attitudes towards different types of communication media, Short et al. (1976) introduced social presence

as “the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships ...” (p. 65). They implied that different types of communication media varied in their degrees of social presence, and therefore social presence was perceived “as a quality of the medium itself” (Short et al., p.65)

Short et al. (1976) suggested that the quality of a medium in communication was dependent on its capabilities to convey verbal and nonverbal cues. Media potentially high in the degree of social presence were described as warm, personal, sensitive and sociable. Media potentially low in the degree of social presence were described as cold, impersonal, insensitive and unsociable (Short et al., 1976). Such statements were in concert with some other researchers (Daft & Lengel, 1984; Sproull & Kiesler, 1986; Trevino et al., 1987) who also implied that the qualities of the medium might have a direct effect on social presence. Therefore, in early social presence studies, social presence was used to compare the capabilities of different media and students’ affective attitudes towards a specific medium. Face-to-face communication was rated as the most sociable medium, followed by video and audio media as the next most sociable, and the letter as the least sociable medium (Short et al., 1976). Influenced by Short and his colleagues, many researchers identified the quality of media as social presence, or at least as one significant dimension of social presence (Bigley, 2012; Caspi & Blau, 2008; Doran, 2010; Newberry, 2001). The common point for such conceptualization is that social presence was defined as a fixed attribute depending on which communication media was used.

However, some other researchers in the field of communication (Eastmond, 1993; Johansen, Vallee, & Spangler, 1988; Rafaeli, 1988; Walther, 1992) argued that treating social presence as a quality of the medium in Short et al. (1976)’s definition was too vague to explain how the qualities of the medium embodied social presence. Rafaeli (1988) pointed out it was still

unknown whether it was the quality of a medium, a channel, learning content, or students' characteristics that affected social presence. Johansen et al. (1988) also argued that people were able to have different degrees of social presence even when they were using the same medium. Walker and Hackman (1991, November) implied that social presence should be interpreted as both the ability of the media and the participants' sense of resembling face-to-face interaction.

Telepresence and Copresence

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 the dynamics of users' experiences and perceptions. 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 & Murphy, 1997; Lombard & Ditton, 1997, September). Telepresence originated within the industry area to describe the importance of a control of the distant machine (Martin, 1981). It was elaborated to describe a sense of shared space among physically separated participants (Buxton, 1993; Lombard & Ditton, 1997, September). Copresence described the awareness of the other living organisms across the physical distance (Biocca & Nowak, 2001; Goffman, 1959), which in turn would lead to the feeling of co-location. Accordingly, social presence was regarded as a feeling of socially present at a remote location (Mason, 1994; McLeod, Baron, Marti, & Yoon, 1997; Sallnäs, Rasmus-Gröhn, & Sjöström, 2000; Steinman, 2010), as being together (Hwang, 2007), and as a sense of proximity (McLeod et al., 1997). Social presence enabled opportunities for social activity in the mediated environment (Nowak & Biocca, 2001).

In line with the idea of telepresence and copresence, Heeter (1992) defined social presence as the existence of other people and the extent to which they are reactable. McLeod et

al. (1997) interpreted social presence as the degree of “tangibility and proximity” (p. 708) of other people within a communication situation. McLellan (1999) further stated it as “the sense of being present in a social encounter with another person” (p. 40). Tu (2000b) 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). Although there were various ways to describe social presence, these statements were merged in focusing on the extent to which communication users had a sense of being together in a shared space. They also pointed out an important characteristic of social presence– it exists in degrees (Biocca et al., 2003) and along a continuum (Liang, 2006). The lower level could be a simple awareness of existence of others embodied by symbolic representations such as an avatar, while the higher level could be a mutual awareness indicating that one is able to react to the other (Biocca et al., 2001). Based on the idea of telepresence and copresence, social presence was used to study users’ awareness 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 (e.g., Mason, 1994; Sallnas et al., 2000).

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). It is even possible that two people may sit face-to-face, however, they do not set any interpersonal relationships or interaction. Therefore, Blocher (1997) described social presence as the degree 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, Anderson, & Archer, 2000; Rourke et al., 1999; Whiteman, 2002)

Immediacy (Wiener & Mehrabian, 1968), intimacy (Argyle & Dean, 1965), and interactivity (Rafaeli, 1988) were three determinant factors to initiate social interaction and set up interpersonal relationships. Therefore, a large number of studies defined social presence by associating it to these three concepts with an emphasis on the salience of interpersonal relationships. For example, in the face-to-face setting, social presence was defined as “those nonverbal behaviors that reduce physical and/or psychological distance between teachers and students” (Anderson, 1979, p. 544). In computer-mediated communication, Menzie (1991) defined social presence as a number of immediacy behaviors, including “uses personal examples, uses first names, asks questions, uses humor, uses personal pronouns, discloses personal information, and use ... emoticons or punctuation marks...” (p.38). At the same time, researchers became more and more interested in studying the comfortable levels of these interpersonal relationships (Andersen, 1979; Andersen et al., 1979; Gorham, 1988; Hackman & Walker, 1990; Kearney, Plax, & Wendt-Wasco, 1985; Plax, Kearney, McCroskey, & Richmond, 1986). Accordingly, 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 & Blau, 2008), the capabilities of “express themselves personally” (Salloum, 2011, p.44),

a facilitator of salient interpersonal relationships (Gunawardena & 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, it was argued that social presence was not created for the sake of socializing, but more importantly for the facilitation of cognitive development. Therefore, social presence is not simply a function of interpersonal relationships, but “the cognitive representation of the group by group members” (Rogers & Lea, 2005, p. 1). In addition, Biocca et al. (2003) stated that the changes in psychological states could be promoted to the changes in the intelligent states by accessing and understanding others’ mind. 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 & Kelley, 2000). Tu and McIsaac (2002) referred social presence as the degree of feeling and reaction 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).

The psychological and intelligence involvement types of statements take a dominant part

in recent social presence studies. 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 & Zittle, 1997; Hackman & Walker, 1990; Tu & McIsaac, 2002). In brief, 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.

Performable Conceptualizations

Biocca et al. (2003) pointed out that there was a trend to use implicit or explicit behavioral indicators in defining social presence. There were two main reasons. Firstly, 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, some researchers regarded social presence as a performable construct. For example, social presence is 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 a subjective concept, involving the subjective projections of self into a technology mediated environment, the subjective assessments of others' presence, and the assessments of the subject's

relations with others (Kehrwald, 2010). The most recent definition of social presence (Garrison, Cleveland-Innes, & Fung, 2010) emphasized participants' ability to identify with the community, conduct communication, and develop interpersonal relationships via projection of their personal characteristics. One critical difference in these definitions from previous ones was that it emphasized the responsibilities of creating and sustaining social presence on the learners' part. Social presence is perceived as the ability of the learners to socially and affectively make themselves salient in communities of inquiry.

The second reason for adopting a performable conceptualization was due to the development of emerging social medium systems (Biocca et al., 2003). Previous definitions of social presence were mostly derived from studies employing low-bandwidth media that were mostly text-based, where nonverbal behavior communications were very limited. Recent studies in immersive virtual environments defined social presence involving more behavioral engagement. For example, in the virtual environment, such as 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 & Anderson, 2007).

Performable statements of social presence are often accompanied by a list of behavior indicators. Therefore, the performable type of definitions allows 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 & Garrison, 2008; Swan, 2002, 2003; Vaughan, 2004)

In sum, the idea of social presence was originated in the field of interpersonal communication. The conceptualization of the construct went through five main stages: 1) a quality of media, 2) telepresence and copresence, 3) psychological involvement, 4) intelligence involvement, and 5) performable conceptualizations. Social presence is such a complicated construct that its conceptualization is never consistent across different studies (Table 3).

Table 3.

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 & Straub, 1997; E. Kim, 2005; Tung & 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, 2000b)
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 & Blau, 2008; Cobb, 2009; Gorham, 1988; Gunawardena & Zittle, 1997; Kehrwald, 2008; Nowak & 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, Rüggenberg, Krämer, & Eschenburg, 2008; Cortese & Seo, 2012; Shen & 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	(Conceicao & Schmidt, 2010; Garrison et al., 2010; Kehrwald, 2010; Wanstreet & Stein, 2011)

Results of Research Question 2

As one can see from the results of Question 1, social presence is not a single concept but a complicated construct which is comprised of multiple elements. The researcher in this study reviewed and summarized factors that had been proven to be constitutes of social presence in previous empirical studies. Generally speaking, seven groups of elements were identified as closely associated with the formation of social presence. They are 1) media richness, 2) copresence, 3) humanizing, 4) intimacy, 5) immediacy, 6) interactivity, and 7) connection.

Media richness

In Short et al. (1976)’s study from which the concept of social presence was extracted, participants evaluated and compared the feeling about three types of media via five-point bipolar scales. Instead of measuring users’ experiences in using these media, Short et al. directly asked participants to value the capabilities of media. The variables they used were characteristics of media richness, including personal/impersonal, sensitive/insensitive, warm/cold, passive/reactive, immediate/non-immediate, meaningful/meaningless, and public/private. The different scores each medium gained were interpreted as various levels of social presence they were able to display.

Short et al. (1976) interpreted social presence as stable properties of the medium and this tradition was followed by a number of studies to differentiate and compare various media (Bente et al., 2008; Bigley, 2012; Caspi & Blau, 2008; de Greef & IJsselsteijn, 2001; Doran, 2010; Kumar & Benbasat, 2002b; Sallnäs et al., 2000). Similarly, Lee and Nass (2001) measured social presence as the degree to which a computer could resemble human voices. The variables were whether the computer voice was vivid and attractive.

The findings derived from media richness scales viewed social presence as a “quality of the medium” (Short et al., p. 65), suggesting that different types of media steadily embodied different levels of social presence (Short et al., 1976; Weinel & Hu, 2007, July). Results were often interpreted to describe that the unmediated face-to-face communication was the highest in social presence (Rice, 1993; Short et al., 1976) while text-based communication was the lowest in social presence (Bente et al., 2008). Other types of media, such as audio, video, or avatar had the potential to produce as much social presence as the face-to-face communication (Bente et al., 2008).

Copresence

Copresence or telepresence was perceived as a factor of social presence (Biocca et al., 2001; McLeod et al., 1997). It was measured through two main variables, awareness and attention. They were indicated by the awareness of presence in the same room, noticing or being noticed by others, paying attention to or being attended by others, or feeling isolated/lonely (Biocca et al., 2001). However, researchers in later studies suggested that these variables were unable to be fully representative of social presence because being together does not necessarily lead to social interaction (Biocca et al., 2003; Gunawardena, 1995). Certain changes in the complex psychological state are required to trigger the social communication. Therefore, it is more appropriate to treat these variables as prerequisites of social presence or a part of indicators that contribute to the formation of social presence.

Humanizing

Humanizing was perceived as one component central to social presence because social presence was often defined as the perception of others as real people (Cox-Davenport, 2010; Doran, 2010; Greyling & Wentzel, 2007; T. C. Russo, 2000; Tourangeau, Couper, & Steiger,

2003). Actual human being with individual personalities which can emerge from text and voice via the communication media, so that participants could detect others' personality and even transient moods behind the medium (Doran, 2010).

Intimacy

Social presence is theoretically rooted in one concept of communication theory called "intimacy" (Argyle & Dean, 1965). A large number of variables were generated from these three concepts to measure social presence.

A stream of studies believed that intimacy elements represented social presence. Previous communication theorists (Argyle & Dean, 1965; Heath & Bryant, 1992; Rubin et al., 1994; Tardy, 1988) identified familiarity, closeness, informality, self-discourse, privacy, trust, topic orientation (task/social) as factors of intimacy. They were measured to indicate participants' feeling of social presence (Alruhaimi, 2011; Bigley, 2012; Burgoon & Hale, 1987; Harrigan, 2010; P. W. K. Leong, 2006; Liu et al., 2009; Mykota & Randy, 2007; So & Brush, 2008; Tu & McIsaac, 2002).

Immediacy

Immediacy (Wiener & Mehrabian, 1968) is another foundational concept underlying social presence.

Perceptions of immediacy

Early immediacy studies identified immediacy as subjective sensations: closeness and liking conveyed by verbal and nonverbal behaviors (Mehrabian, 1968, 1971). Therefore, variables of participants' feeling and attitudes towards the medium, other participants, learning activities, attributes of language, perceived emotional connections, as well as a sense of collaboration and learning community were used to assess social presence (Arbaugh & Hwang,

2006; Chongwony, 2008; Cobb, 2008; Garrison et al., 2010; Gunawardena & Zittle, 1997; Hostetter & Busch, 2006; Jones, 2007; Shen & Khalifa, 2008; Short et al., 1976; Swan, 2003; Tao, 2009; Tu & Yen, 2006).

Behavioral indicators of immediacy

In addition to subjective feelings, a number of studies investigated immediacy behaviors as indicators of social presence. The assumption underlying it is if one shows certain behaviors, he/she must be socially present (Biocca et al., 2003). Behavioral components were common in previous studies of face-to-face classrooms where social presence was treated as students' sense of teacher's immediacy (Andersen, 1979; Gorham, 1988; Richmond et al., 1987). Andersen (1979) explored Mehrabian's idea of immediacy specifically in the context of postsecondary education, and he proposed the concept of teacher immediacy as "those nonverbal behaviors that reduce physical and/or psychological distance between teachers and students" (p. 544).

Accordingly, Richmond et al. (1987) identified 14 nonverbal immediate and non-immediate behaviors. Immediate behaviors included using gestures when talking to the class, looking at the class when teaching, smiling at the class as whole in addition to at individual students, touching students, moving around the classroom, using a relaxed body position, and using a variety of vocal expressions. Non-immediate behaviors included using monotone voice, having a tense body position, and sitting behind the desk or in a chair or standing behind podium when teaching.

Correspondingly, Gorham (1988) identified a list of 20 verbal immediate behaviors used by classroom teachers, which encompassed using personal examples, encouraging students to talk, using humor, addressing students by name/first name, having conversations with students before, after and outside of class, using vocatives such as "my, I, our, we", providing feedback, asking students' feeling about class topic/assignments/due dates, soliciting students' opinions,

praising and criticizing faults in their work. All of these non-verbal and verbal immediacy behaviors were perceived as social presence indicators.

Immediacy behaviors in the face-to-face setting

Some early social presence studies were conducted in the face-to-face classrooms (Andersen, 1979; Christophel, 1990; Gorham, 1988; Gorham & Zakahi, 1990; Kearney et al., 1985; Plax et al., 1986; Richmond et al., 1987). Researchers in these studies discovered and confirmed non-verbal immediacy behaviors as reflections of social presence. Social presence was almost exclusively conveyed by the instructor.

Immediacy behaviors in the online setting

A variety of immediacy behaviors in the online setting were identified and summarized by Garrison et al. (2000) and Rourke et al. (1999) in their establishment of the CoI framework. They proposed affective responses and cohesive responses as representative of social presence. Affective responses include participants' expression of emotion (e.g., silly, sad, like), use of humor and emoticons. Cohesive response is indicated by the use of phatics and vocatives. According to Wiener and Mehrabian (1968), variances in using pronouns, addresses, and tense verbs convey a degree of attachment or detachment which further contribute to the sense of social presence. Phatics are used to share feelings and build a social mood, but not to communicate educational information (Rourke et al., 1999). For example, greetings and salutations can be used to establish or confirm ties between communication interactants. Vocatives refer to addressing other participants by their names. In addition, vocatives reflect the inclusion or exclusion of participants in the group level by using "we, our, us, or group" or "you, I" (Wiener & Mehrabian, 1968), syntactic expressions of probability (will vs. may), and ownership (my vs. our) (Rubin et al., 1994). In addition, Swan and Shih (2005) included

reflection on the course as another emerging indicator in this category because the asynchronous feature of verbal communication affords more opportunities and greater time to reflect on their own and others' postings.

Interactivity

Social presence is also theoretically rooted in the concept of interactivity (Rafaeli, 1988, 1990) which was also believed as one significant component. Interactivity was characteristic of a communication setting (Rafaeli, 1988). It varies from two-way communication, quasi-interactivity to full interactivity (Rafaeli, 1988). The high level of interactivity indicates high level of social presence.

Perceptions of interactivity

A number of social presence studies found that social presence was indicated by participants' perception of the interaction with the instructor and peers as purposeful, appropriate, clear, responsive, in-time, reinforced, supportive and acknowledged (Abdullah, 1999; Alruhaimi, 2011; Gunawardena & Zittle, 1997; Joyner, 2009; Kehrwald, 2010; Khan, 2011; Oldenburg, 2008; Pugsley, 2010; Shen & Khalifa, 2008; Tu & McIsaac, 2002; Whiteside, 2007; Yen & Tu, 2008). In addition, a sense of interactivity was also determined by the frequency of interactions (Doran, 2010), the instructor involvement (Joyner, 2009; Whiteside, 2007) and instructional interventions (Whiteside, 2007).

Behavioral indicators of interactivity

A number of social presence behaviors were identified by Garrison et al. (2000) and Rourke et al. (1999) into a category called "interactive responses". Elements in this category include behaviors of continuing or replying a thread, quoting or referring others' messages, raising questions, complementing participants, and expressing agreement. Swan and Shih (2005)

added in the offering advice to classmates and the inviting responses as two more indicators in this category.

Connection

Connection is another related conception of social presence which is indicated by feeling connected with others (Henninger & Viswanathan, 2004; Joyner, 2009; Picciano, 2002; Swan & Shih, 2005), sharing individual experiences and personal information with others (Oldenburg, 2008; Rogers & Lea, 2005), sharing resources and information with group members (Whiteside, 2007), self-disclosure (Delfino & Manca, 2007; S., D., Katzarska-Miller, Lemker, & Foss, 2010), a level of involvement in the participation (Kumar & Benbasat, 2002a; Lee & Nass, 2005), being accessible to other (Biocca & Harms, 2002), and a sense of belonging to a group (Glisan, 2008; Rogers & Lea, 2005; Rovai, 2002; D. R. Smith, 2008). In addition, a depth of trust and safety (Joyner, 2009; Pugsley, 2010; Whiteside, 2007) and a feeling of openness (Ke, 2010) were also needed for participants to express ideas.

In sum, from the evidence of previous empirical studies, social presence was seen as a multi-dimensional construct. It was composed of various elements embodying media richness, copresence, humanizing, intimacy, immediacy, interactivity, and connection (Table 4).

Table 4.

Constitutes of social presence

Categories	Examples
Media richness	Participants' feeling towards to a specific medium (Short et al., 1976)
Copresence	Awareness of others (Biocca & Nowak, 2001)
Humanizing	Perception of others as real people (Doran, 2010)
Intimacy	A sense of familiarity (Tu & McIsaac, 2002)
Immediacy	Feeling of closeness (Gunawardena & Zittle, 1997) Expressing emotions (Rourke et al., 1999)
Interactivity	Feeling of the interaction with others (Yen & Tu, 2008) Replying a thread (Rourke et al., 1999) (Rourke et al., 1999)
Connection	A sense of belonging to a group (Rogers & Lea, 2005)

Results of Research Question 3

Social presence is an abstract construct. In order to measure it, a variety of methodological approaches have been used. Generally speaking, there are two kinds of measures: objective measures and subjective measures.

Objective measures evaluate an experiment subject's automatic responses via certain psychophysiological indicators and behavioral indicators (Van Baren & IJsselsteijn, 2004). Psychophysiological indicators include a change in heart rate, blood pressure, muscular responses, skin temperature, skin conductance, and facial electromyography. (Van Baren & IJsselsteijn, 2004). Behavioral indicators include facial expressions, pointing, postures, and use of certain language (Gorham, 1988; Richmond et al., 1987). Objective measures were more frequently found in the studies of spatial presence (Laarni, Ravaja & Saari, 2003), physical presence (Mania, Troscianko, Hawkes, & Chalmers, 2003), behavioral presence (Witmer & Singer, 1998), and mental models (Frith & Frith, 2001).

The majority of previous studies used subjective measures to evaluate social presence. It means social presence was assessed via participants' conscious judgment (Van Baren & IJsselsteijn, 2004). Thus, to answer Research Question 3, various instruments in subjective measures were examined in detail. There were two main types of instruments to measure social presence: quantitative instruments and qualitative instruments.

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). Social presence was measured in terms of quantification of participants' subjective feelings towards a variety of elements, including media richness, copresence, humanizing, intimacy, immediacy, interactivity, and connection, which were identified as important indicators associated with social presence. A small number of studies assessed other factors such as self-identity and self-categorization, as representative of social presence. The existence and degree of social presence was quantified as a range from 0 (non-existent) to 5 or 7 (very high degrees) of the subjective senses of these elements.

For studies that employed survey scales, more than 90% of the studies employed one of five instruments that were widely recognized and validated. The first well-recognized scale, the Social Presence Scale, was constructed by Short and her colleagues (Short et al., 1976). They maintained that social presence could be determined through measuring 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 a computer-conferencing environment only.

Another widely used scale, the 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 were combined into the Immediacy Behavior Scale to measure social presence.

Fourthly, as the understanding of social presence developed from a single 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. 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 five 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 presented in Appendix B.

Among these quantitative studies, a Pearson correlation was most commonly used to explore potential associations between one variable versus another variables. Simple and multiple linear regression analyses were employed, for example, in Arbaugh (2001), Gorham (1988) and Tu, Yen, Blocher, and Chan's (2012) study to further predict the casual effects of one independent variable on the dependent one. Moreover, if participants were grouped with certain

traits (for example, high/low motivation, nature of communication, age, learning levels), t-test or one way analysis of variance were used to examine group difference, and two-way analysis of variance could be used to explore the interacting effects of various participant traits and social presence dimensions (Biocca et al., 2001; Christophel, 1990; Richmond et al., 1987).

Furthermore, when there was more than one dependent variable with several groups, multivariate analysis of variance was used (Lowry et al., 2006). In more complicated situations where multiple independent variables were potentially correlated and thus were able to jointly affect a number of dependent variables, structural equation modeling and factor analysis were used to examine their various relationships in multiple levels (Garrison et al., 2010; Shen, Yu, & Khalifa, 2010). At the same time, such analysis was used to generate, understand or confirm the multidimensional structures of social presence (Arbaugh, 2008; Shen & Khalifa, 2008; Tu, 2000a; Witmer, Jerome, & Singer, 2005). See Table 5 for a summary of quantitative designs.

Table 5.

Quantitative research design in social presence studies

Variables			Quantitative methodology design					
# IV	# DV	# Group	Correlation	Linear Regression	T-test	ANOVA	MANOVA	SEM (Factor Analysis)
1	1	1	√	√ simple				
2 or more	1	1		√ multiple				
N/A	1	2			√	√ one-way		
N/A	1	3 or more				√ one-way		
N/A	2	2 or more				√ two-way		
N/A	2 or more	2 or more					√	
2 or more	2 or more	N/A						√

Note. IV = independent variable; DV = dependent variable; N/A = not available; ANOVA = analysis of variance; MANOVA = multivariate analysis of variance; SEM = structural equation modeling.

Many problems exist in current social presence quantitative measurements. The most concerning problem lies in the validities of various scales. Generally speaking, quantitative validity had two important aspects: content validity and construct validity (Creswell, 2009). Content validity indicates whether the survey items measure the content that they are intended to measure (Creswell, 2009). In other words, the first problem was whether the items in previous

studies really measured representatives of social presence.

As a result of the complexity and ambiguity of social presence conceptualizations, it is difficult to find a sound multifaceted instrument to measure social presence. As apparent from Appendix C, not a single questionnaire successfully covered all dimensions of social presence inclusively and exclusively. It seems that the existing instruments measure varying aspects of an amorphous set of variables encompassing media attributes, intimacy, immediacy, and others, depending on the varying conceptualizations of social presence assumed by authors. Some studies measure 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 assesses elements of media attributes and immediacy while the Networked Minds Scale constructed by (Biocca et al., 2001) focuses on dimensions of co-presence and interactivity. Moreover, several studies (Chen et al., 2005; Giesbers, Rienties, Gijsselaers, Segers, & Tempelaar, 2009; Hernandez, 2008; Lyons, Reysen, & Pierce, 2012; Tourangeau et al., 2003; Weinel, Bannert, Zumbach, Hoppe, & Malzahn, 2011) claim to investigate social presence, however what they actually measured were features or characteristics not associated with the construct. 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.

In addition, each questionnaire was constructed in a certain situation tailored for a specific technology tool such as computer conferencing system (Gunawardena & Zittle, 1997; Rourke et al., 1999), computer-supported collaborative environments (Kreijns et al., 2011), video (Homer et al., 2008), email (Richardson & Swan, 2003), mobile learning environments (Arminen & Weilenmann, 2009; DuVall et al., 2007; Kekwaletswe, 2007), virtual environments (Burgess et

al., 2010; Hodge, Tabrizi, Farwell, & Wuensch, 2008; Jin, 2011; McKerlich & Anderson, 2007; Shen et al., 2010), and general online learning experience (Tu & Yen, 2006). It is unknown whether the measurement items will become problematic when social presence is studied under different contexts.

Construct validity indicates whether all of the items in one instrument measure the same hypothetical construct (Creswell, 2009). For every new scale, it was important to use factor analysis to evaluate whether the items were valid measures of latent constructs and these items should not be overlapped (Suhr, 2006, May). However, a process of validation was missing in the following scales: Social Presence Scale (Saenz, 2002), Social Presence Scale (Wise et al., 2004), Social Presence Behaviors Scale (Weaver & Albion, 2005), Communication Survey Scale (Lowry et al., 2006), and Social Presence Scale (Yamada & Akahori, 2007).

Qualitative instruments

In addition to quantitative instruments by which subjective attitudes towards social presence were measured, 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 observations and interviews 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). Therefore, the quantity of behavior indicators manifests the intensity of social presence.

The most concerning problem in qualitative measurement relates to issues of qualitative reliability, especially the reliability of content analysis. 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 exclusion of codes that were close, but not exactly the same (De Wever, Schellens, Valcke, & Van Keer, 2006) and inclusion of agreement codes by chance (Lombard, Snyder-Duch, & Bracken, 2002). Krippendorff's alpha is a more flexible and accurate indicator of reliability because it is able to account for chance agreement, and calculate nominal, ordinal, interval, and ratio variables (Lombard et al., 2002). Different indexes could also be used to ensure reliability. However, only a few studies (De Wever et al., 2006) met this requirement.

Research Context

Besides the measurement problems in both quantitative and qualitative instruments, there were also some measurement problems associated with the selection of research context. Firstly, as Figure 10 shows, the majority of social presence studies were clustered in certain disciplines, such as Education (25.26%), Business (8.95%) and Language Learning (6.84%). Scarce studies were found in Engineering (1%), Natural Science (0.5%) and other disciplines. Whether the formation and development of social presence is discipline-sensitive is unknown.

Secondly, as reported in Figure 8, not all studies were conducted in pure distance environments. Some were from blended distance courses (7.39%) and some were in the face-to-face classrooms (6.25%). The development of social presence in different environments could be very different (Akyol et al., 2009; Shea et al., 2010). The variances in the selection of instructional media, class activities, and other course-related factors also added many uncertainties to different studies. Therefore, the social presence frameworks or conclusions established as such run the risk of being context-driven, and thus could be problematic.

Thirdly, in most social presence survey studies, there was a lack of evidence that the investigators statistically equated participants on other variables that might be confounded with

social presence. Such confounding may influence the reliability and validity of such studies.

Results of the Research Question 4

The fourth question examined the effects of social presence on students' perceived learning. After a careful screening, 24 studies met this question's requirements and were selected for meta-analysis. These studies spanned the years 1988-2012. Approximately 58% of the studies were from published peer-reviewed articles and the rest of them were from unpublished dissertations. Nearly 92% of the studies used correlation analysis to explore the relationship between social presence and perceived learning. About 4% of the studies used a t-test analysis and 4% of the studies used a regression analysis.

In some of the selected studies, more than one investigation of social presence on perceived learning was conducted. These investigations were independent to each other even they were conducted in the same study. For example, in Gorham (1988) and Gorham and Zakahi (1990)'s studies, one investigation was conducted to explore the relationship between verbal immediacy (verbal social presence) and perceived learning while the other investigation was conducted to explore the relationship between nonverbal immediacy (nonverbal social presence) and perceived learning. In E. Kim's (2005) study, one investigation was conducted with a group of active users while the other with a group of passive users. In Teng (2005)'s study, the sample of one investigation was native English speakers while the sample of the other investigation was non-native English speakers. To increase the power of meta-analysis, these multiple investigations were included in the meta-analysis, and they were treated as if they were from different individual studies.

Random effect meta-analysis was performed in determining the effect of social presence on perceived learning, using the Comprehensive Meta Analysis 2.0 software. The following null

hypothesis was tested. The results for this hypothesis were present in Table 6 and Figure 11.

H_0 : The intervening variable, social presence, will have no effect on the outcome variable, perceived learning.

Table 6.

Hypothesis test for random effect model (Social Presence vs. Perceived Learning)

Summary Effect Size (r)						Heterogeneity Test			
Model	N	r	95% LCL	95% UCL	P-value	Q-value	df	P-value	T
Fixed	30	0.51	0.49	0.53	<0.001	253.63	29	<0.001	0.038
Random	30	0.54	0.48	0.59	<0.001				

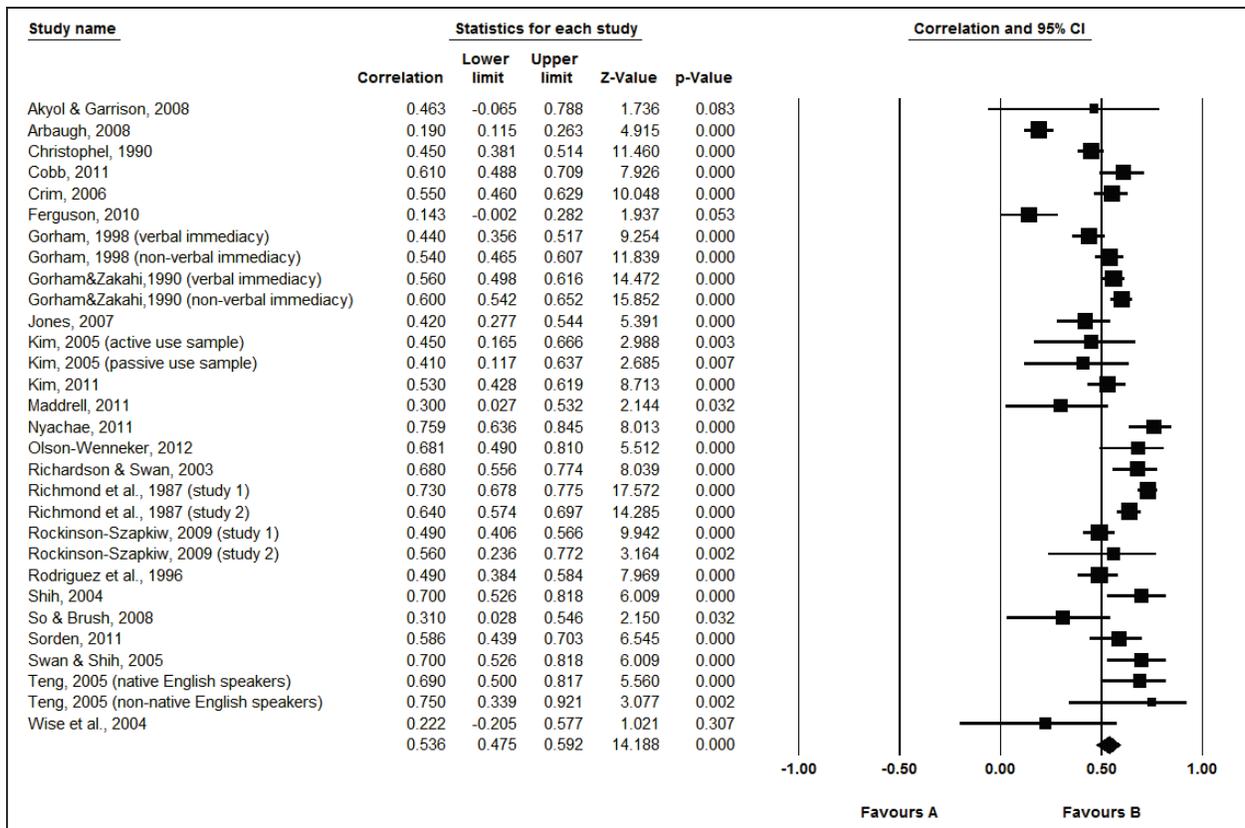


Figure 11. Random effect meta-analysis summary (Social Presence vs. Perceived Learning)

As one can see in the Figure 11, the heterogeneity test (Q-value=253.63, df=29, P-value

<0.001) indicated that the effect sizes in each of 30 individual studies are not homogeneous. This result aligns with the initial judgment of adopting a random effect model: the individual studies did not follow the same rigorous protocols and therefore did not share necessary features in common in order to be considered as a fixed model.

The effect sizes of individual studies and the summary effect size (bottom row) were showed in Figure 11. The effect sizes displayed were correlation, because the majority (29 out of 30) of the studies used correlation as the effect size. The forest plot displays the point estimate and confidence interval of individual studies and the summary effect. For individual studies, the area squared sign was proportional to the weight of the study in the random effect model; in general, the larger sample size was related to a larger weight. The summary effect, shown in the diamond sign, had much narrower confidence interval. This implied that meta-analysis had the advantages in evidence synthesis based on individual studies with relatively small sample sizes. The summary effect size had a mean=0.536 and 95% confidence interval of (0.475, 0.592). The 95% confidence interval was strictly larger than 0, and the hypothesis test had a p-value <0.001. Therefore, there was evidence that social presence was positively associated with perceived learning.

Results of the Research Question 5

One of the purposes of this study was to determine the relationship between social presence and actual learning. Actual learning can be assessed through grades and/or performance on a test, assignment or a product. After a careful screening, nine studies met this question's requirements and were selected for meta-analysis. These studies spanned the years 1979-2011. Approximately 33% of the studies were from published peer-reviewed articles and the rest of them were from unpublished dissertations. Nearly 78% of the studies used correlation analysis to

explore the relationship between social presence and perceived learning. About 11% of the studies used t-test analysis and 11% of the studies used regression analysis.

As also mentioned in the results of Research Question 4, some studies conducted more than one investigation of social presence on actual learning in a single study. For example, in Andersen's (1979) study, one investigation was about nonverbal immediacy (nonverbal social presence) and actual learning while another investigation was about general immediacy (general social presence) and actual learning. In Harrigan (2010)'s study, the effect of social presence was tested on three types of actual learning outcomes respectively. They were discussion grades, project grades, and overall performance. Similarly, in Picciano's (2002) study, the effect of social presence was tested respectively on a written assignment and a final exam. In Schutt (2007)'s study, the effect of social presence was tested respectively through an immediate posttest score and a delayed posttest score. To increase the power of meta-analysis, these multiple investigations were included in the meta-analysis, and they were treated as if they were from different individual studies.

Random effect meta-analysis was performed in determining the effect of social presence on actual learning, using the Comprehensive Meta Analysis 2.0 software. The following null hypothesis was tested. The results for this hypothesis were present in Table 7 and Figure 12.

H_0 : The intervening variable, social presence, will have no effect on the outcome variable, actual learning.

Table 7.

Hypothesis test for random effect model (Social Presence vs. Actual Learning)

Summary Effect Size (r)						Heterogeneity Test			
Model	N	r	95% LCL	95% UCL	P-value	Q-value	df	P-value	τ^2
Fixed	16	0.02	-0.025	0.057	0.441	17.789	15	0.274	0.038
Random	16	0.02	-0.029	0.068	0.428				

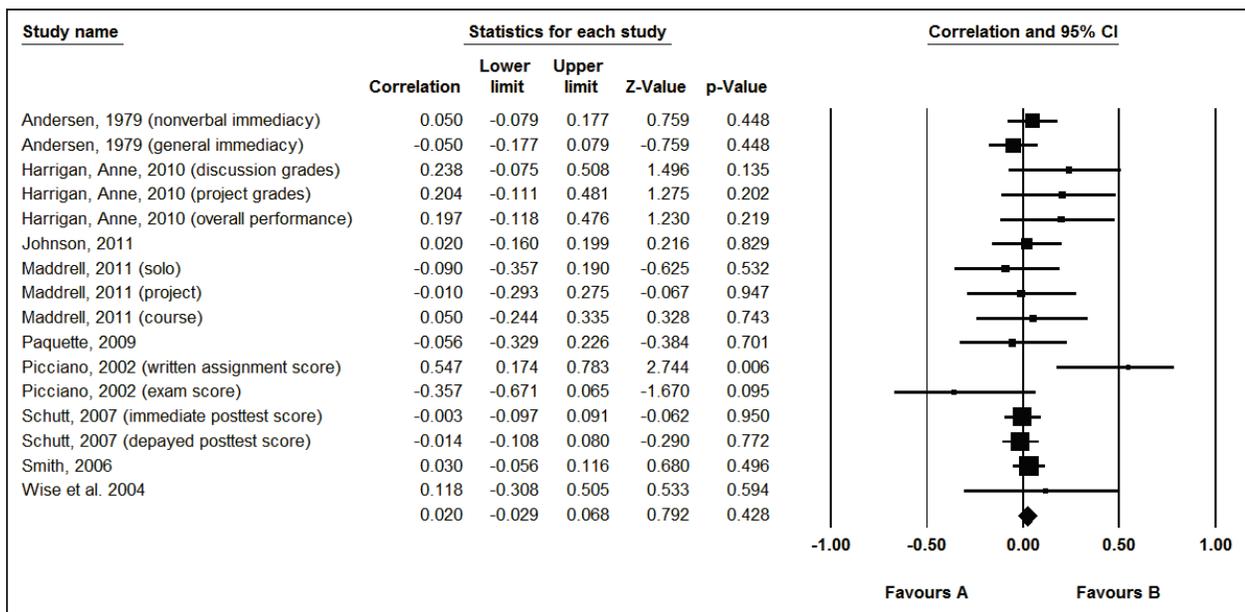


Figure 12. Random effect meta-analysis summary (Social Presence vs. Actual Learning)

As showed in Figure 12, the heterogeneity test (Q-value=17.789, df=15, P-value =0.274) indicated that the effect sizes in sixteen individual studies are relatively homogeneous. The main reason for the homogeneity was that there were actually only nine individual studies, but five of them contained multiple investigations. The investigations within an individual study were much more homogeneous than across different studies. Even the heterogeneity test was not significant, the researcher still used random effect model for meta-analysis, because the choice between

fixed and random effect model should be primarily based on the nature of the studies (i.e. whether individual studies followed the same rigorous protocols and had enough features in common), rather than the heterogeneity test. In fact, when the individual studies were homogeneous, the random effect model would be converged to fixed effect model automatically, and therefore the model estimation and inference would not significantly change.

The effect size of individual studies and the summarized effect size (bottom row) is shown in Figure 12. The effect sizes displayed are correlation because the majority (15 out of 16) of the studies used correlation. In the forest plot, the summary effect (in the diamond sign) had a much narrower confidence interval, but it covers the zero value, indicating a non-significant effect. The summary effect size had a mean=0.020 and 95% confidence interval (-0.029, 0.068). The 95% confidence interval covers 0, and the hypothesis test has p-value =0.428>0.05. Therefore, the researcher failed to reject the null hypothesis. There was not enough evidence that social presence was associated with actual learning.

Chapter 5 Discussion and Conclusion

The purpose of this study was to synthesize the research issues associated with conceptualizations, constitutes, and measure of social presence. Based on the results of the study, this chapter discusses the potential implications, provides suggestions for subsequent studies, and presents the conclusions. In addition, an attempt was made to elicit the direct effects of social presence on learning.

Research Question 1

The first research question examined how social presence was conceptualized since it was established. The idea of social presence originated in the field of communication to understand interpersonal relationships. Its conceptualization has been evolving from a quality of media to a psychology and/or intelligence state, and to various social presence behaviors triggered by changes in the state.

The evolution of definitions reflects two essential features of the social presence construct (Figure 13). The first notable characteristic of social presence is that it is not simply existent or nonexistent. Instead, it exists in degrees (Biocca et al., 2003; Kehrwald, 2008; Lowenthal, 2010; Tu & McIsaac, 2002) and varies on a continuum from absent, to low degrees embodying psychological involvement, to high degrees including certain levels of behaviors (Biocca et al., 2003). Social presence is 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, their 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 & McIsaac, 2002).

The second prominent characteristic of social presence is that it evolved from a unitary concept to a multidimensional construct. Social presence is so broad and complex that it embodies many sub-elements (Biocca et al., 2001; Garrison et al., 2000; Rourke et al., 1999; Tu & McIsaac, 2002; Wulff, Hanor, & Bulik, 2000). For example, Tu and McIsaac (2002) defined social presence to have three dimensions: social context, online communication, and interactivity. Social context refers to online users' perception of the computer-mediated communication environment, as well as online users' characteristics. Online communication is about the attributes and application of the language used online. Interactivity is concerned with activities and communication styles that engage online learners. Garrison et al. (2000) recognized social presence as participants projecting themselves through expressing emotion and exchanging information with a community of learners. Rourke et al. (1999) suggested that social presence is indicated by the affective responses, the interactive responses, and the cohesive responses. Affective responses are participants' expression of emotion, feelings, and moods. Interactive responses embody reciprocal and respectful exchanges of information. Cohesive responses involve the use of phatic words and vocatives that build and sustain a sense of group commitment. Biocca et al. (2001) defined and identified three dimensions of social presence as copresence, involvement, and behavioral engagement. This multidimensional structure was further refined into awareness, affective social presence, and cognitive social presence (Shen & Khalifa, 2008). The multidimensional definitions of social presence encompass and elaborate several elements across previous unitary definitions, and thus allow a more comprehensive examination and understanding (Figure 13).

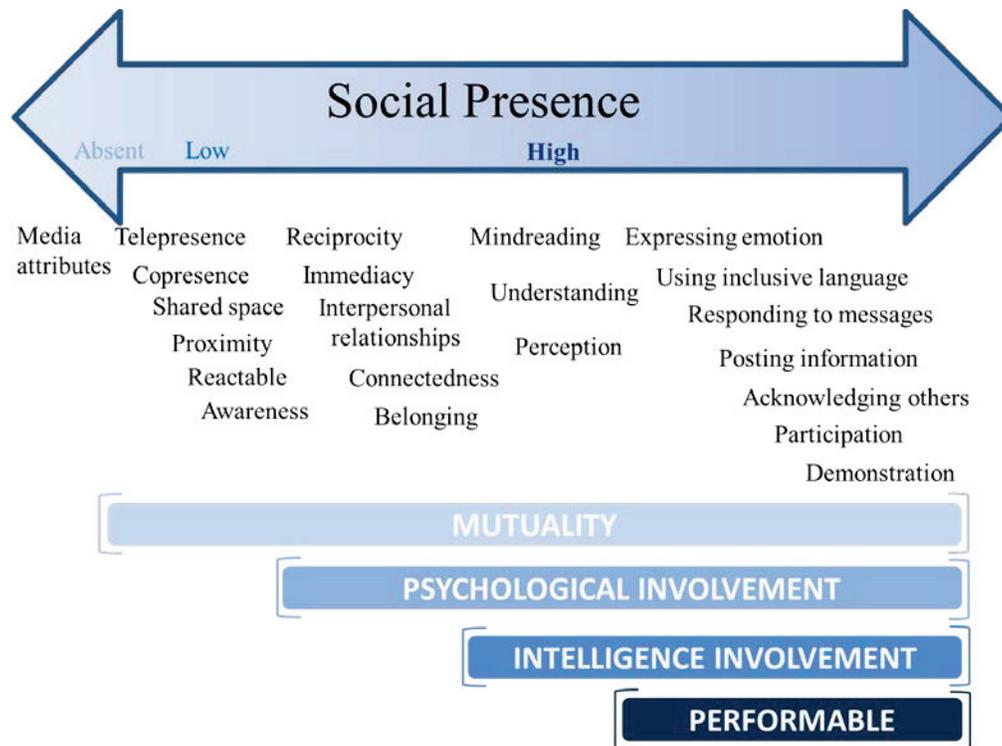


Figure 13. The illustration of social presence evolution. Adapted from “Being online: Social presence as subjectivity in online learning” by B. A. Kehrwald, 2010, *London Review of Education*, 8, p.41.

As apparent from Figure 13, social presence is still a complex construct lacking a universal definition. The construct is vaguely conceptualized, has ambiguity boundaries, and blurs with confounding factors.

Research Question 2

The second research question examined constitutes of social presence identified by previous studies. As suggested by empirical evidence, seven groups of elements were believed to be social presence components. They are media richness, copresence, humanizing, intimacy, immediacy, interactivity, and connection.

Media richness was identified as a component of social presence in Short et al. (1976)’s study when this construct was established. Short et al. (1976) suggested that media potentially

high in the degree of social presence were described as warm, personal, sensitive and sociable. Media potentially low in the degree of social presence were described as cold, impersonal, insensitive and unsociable. Such statements were in concert with some other researchers (Daft & Lengel, 1984; Sproull & Kiesler, 1986; Trevino et al., 1987) who also implied that the qualities of the medium might have a direct effect on social presence.

This perspective was followed by a number of researchers who perceived social presence as a stable property of a medium, implying that different communication tools embodied different levels of social presence. Newberry (2001) evaluated and ranked the relative richness of seven media types according to their capabilities of supporting feedback, multiple cues, message tailoring and emotions. Similarly, Salloum (2011) evaluated participants' perceptions of social presence on various computer-mediated communication tools, such as email, discussion forums, web-conferencing, and text chat. Caspi and Blau (2008) measured whether online platform is a personal or impersonal medium. In Doran (2010)'s study, media attributes were considered as one factor of social presence. Bente et al. (2008) reported that, compared to audio, video, or virtual world, social presence was significantly low in text-based communications. Similarly, Rockinson-Szapkiw, Baker, Neukrug, and Hanes (2010) claimed that different communication tools used in their study accounted for the difference in the intensity of social presence. Results of such studies were often interpreted to describe that the unmediated face-to-face communication was the highest in social presence (Rice, 1993) while computer-mediated and virtual communication is low in social presence (Burke & Chidambaram, 1999), suggesting that different types of media steadily embodied different levels of social presence. However, results from these variables should only be inferred as users' existing perceptions of media and media characteristics, rather than the psychological communication effects (e.g., social presence)

conveyed through using different types of media.

As what has been described in the literature review, interactivity (Rafaeli, 1988, 1990) is one of the foundational factors associated with social presence. However, this factor was often confused with the idea of “interaction” in a number of studies. Tu and his colleagues defined interactivity as a component of social presence in a series of studies (Tu, 2002; Tu & McIsaac, 2002; Tu & Yen, 2006; Yen & Tu, 2008). Interactivity was perceived equally as interaction and they described interactivity as “activities in which CMC users engage and the communication styles they use” (Tu & McIsaac, 2002, p.135). Instead of describing concrete interactive activities, interactivity a variable characteristic of communication settings (Rafaeli, 1988). It reflects the extent that in a series of communication, the later transmission is dependent on earlier (previous) transmissions (Rafaeli, 1988).

Research Question 3

The third research question examined the issues associated with social presence measurement. Self-administrated questionnaires, content analysis, and interviews are three most widely used measures in assessing social presence. All such measures can be generally categorized as subjective measures because experiment participants’ psychological states are evaluated via their conscious judgment (Van Baren & IJsselsteijn, 2004). Since social presence is a subjective construct describing a subjective feeling, it is appropriate to assess it by subjective methods (Sheridan, 1992).

Objective measures evaluate an experiment subject’ automatic responses via certain psychophysiological indicators and behavioral indicators (Van Baren & IJsselsteijn, 2004). Studies employed objective measures were rare in the social presence field, especially in the distance education context. Though these indicators are not influenced by subjects’ interpretation

(Van Baren & IJsselsteijn, 2004), they are easily confounded by other stimulus that produce the same psychophysiological responses (Blascovich, 2000; Insko, 2003). It is still unknown which psychophysiological response is definitely caused by social presence, or vice versa (Biocca et al., 2003). Social presence must be defined more concretely to use physiological measures (Biocca et al., 2003).

Due to the ambiguity of social presence definitions and the complexity of social presence indicators, not a single social presence measure is universal. The development of questionnaires 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.

In addition, as mentioned in the results, most of social presence scales were constructed in a specific context under which students were using a/some specific technology tool(s) for communication. Therefore, these scales cannot be generalized to contexts with other media (Biocca et al., 2003). Not all the instruments tested their scale validity nor do they report internal reliability.

Moreover, as learned from Research Question 2 and 3, social presence is not a static construct. It fluctuates with the progress of communication. Survey studies used a cross-sectional design which was unable to examine the dynamic pattern of social presence. In addition, using 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 a low degree of social presence or were not satisfied with their online experience (J. Kim et al., 2011; P. Leong, 2011).

In sum, vague definitions, unclear dimensions, technology-oriented instruments, and inadequate test validity and reliability present challenges for developing a sound social presence

measure.

Research Question 4

Research Question Four quantitatively examined the effects of social presence on students' perceived learning. Twenty-four empirical studies met the requirements for meta-analysis and were used for effect size calculation. The meta-analysis results revealed significant variance in perceived learning, indicating that social presence was positively associated with perceived learning.

Perceived learning was assessed based on a single self-reported item, such as "I learned much in this course" (Akyol & Garrison, 2008, p.22), "On a scale of 0-9, how much did you learn in the class, with 0 meaning you learned nothing and 9 meaning you learned more than in any other class you've had" (Richmond et al., 1987, p.581), and a choice of perceived learning from "more than expected, as much as expected, less than expected, or nothing" (Swan, 2002, p.28). Concerns were raised in the validity of such findings since the construct "perceived learning" is ill defined ambiguous (Rourke & Kanuka, 2009). Many researchers also questioned the use of perceived learning as the only measure of learning achievement (Arbaugh, 2008; Gonyea, 2005; Maddrell, 2011). Self-reports of learning should be interpreted as students' attitudes toward the course, rather than as a reflection of actual learning outcomes (Maddrell, 2011).

Research Question 5

Research Question Five quantitatively examined the effects of social presence on students' actual learning. Nine empirical studies met the requirements for meta-analysis and produced mixed results. Three studies reported significant positive relationship while six studies found the opposite results. The overall results from meta-analysis revealed no significant

variance in actual learning and failed to lend support to the hypothesis that a sense of social presence improved actual learning.

First, there is a lack of studies that explored the relevancy of social presence to actual learning. It has been stressed by many researchers that social presence is a critical factor for successful online learning. However, despite its intuitive appeal, there is a lack of direct evidence showing that social presence contributes to learning. The number of studies that tested its direct relationship with actual learning is quite limited.

Second, the contradictory results from these studies may indicate that in different situations, various factors functioned differently that could account for learning gain. For example, the instructor-student interactions in (Schutt, 2007)'s study and the learning style preference in D. R. Smith (2008)'s study could account for the learning improvement. However, it is still unclear whether these factors are indicators of social presence. Many empirical studies employed Tu and his colleagues' (Tu, 2001, 2002; Tu & McIsaac, 2002; Tu & Yen, 2006; Tu et al., 2012; Yen & Tu, 2008) Computer Mediated Communication Questionnaire (CMCQ). In their measurements, interaction was treated as one of social presence's dimensions. While other social presence dimensions failed to exert a positive influence on learning performance, the interaction dimension's effect was significant (Harrigan, 2010; M.-S. Huang, Hsiao, Chang, & Hu, 2012). However, it cannot be assumed that interaction functioned as a constitution of social presence since it has been studied for a long time as a separate variable in relation to learning.

Third, the contradictory results from these studies suggest that social presence probably is just one factor among many other factors that account for successful online learning (McKerlich & Anderson, 2007). However, its particular influence is still unclear.

A synthesis of the Research Questions Four and Five produces the following picture:

Students believe that they have improved their learning, but evidence does not support this claim. The idea of social presence originated from the concept of “immediacy” and “intimacy” which are associated with the psychological perception of closeness in an interpersonal relationship. Therefore, social presence focuses on “psycho-emotional aspects” (Henninger & Viswanathan, 2004, p.365), in other words, “dialogue type of social interaction” (Tu et al., 2012, p.59). In the distance learning environment, its main responsibility is sustaining a comfortable learning environment where participants are able to conduct social interaction freely and collaboratively. The results of the meta-analysis made it clear that social presence is not a determinant factor for learning outcomes. However, social presence may be important for social interaction and it has been found to exert influence on psycho-emotional aspects, such as satisfaction (Arbaugh, 2001; Gunawardena & Zittle, 1997; Richardson & Swan, 2003), liking (Rourke et al., 1999), a sense of belonging (Ke, 2010; Shen & Khalifa, 2008), and positive attitudes towards the course, students, and the instructor (T. Russo & Beson, 2005). Although these aspects may or may not produce a direct effect on learning gains, they could make distance learning more enjoyable for learners (Mackey & Freyberg, 2010).

Discussion of Future Research

Social presence has been studied for three decades. Considering the potential benefits that social presence brings into distance education, scholars are tempted to promote social presence as an important variable. Facilitating social presence in an online learning environment can also be very time consuming (Ubon & Kimble, 2003). In order to achieve desired social presence, challenges are created for instructional designers, course developers, teachers and online students.

Putting these large expenses aside, a highly social climate is far from an ideal learning

environment, but is more likely to result in disappointing outcomes (Biocca et al., 2003). For a few studies that reported a positive relationship between social presence and actual learning gains, one possible explanation is related to the definition and indicators of social presence. Social presence is a complicated construct that contains many dimensions. Therefore, social presence is normally measured from a broad perspective. For example, according to the three-dimensional structure proposed by Tu (2002), the social context and online communication dimensions had no difference on students' learning, but the interactivity dimension was found to have significant difference (M.-S. Huang et al., 2012). In Tu (2002)'s social presence framework, interactivity was perceived equal as interaction. It is apparent from previous empirical evidence that interactions have significant correlations with learning (Harrigan, 2010; Picciano, 2002). If interactivity was not presumed by the researchers as one component of social presence, the success of online learning depended not so much on social presence as on interactivity.

Compared to a learning environment with high levels of social presence, a learning environment with low levels of social presence could also work (Hassanein & Head, 2006) sometimes even better (Burke & Chidambaram, 1999). Moreover, in many studies, researchers found, contrary to what was expected, that high social presence is not always good. For example, students felt "little value" for creating bonds with peers (Borup et al., 2013, p.58). While fostering the closeness between students, too much social presence may simultaneously generate other side-effects, such as spending a large amount of time on off-task socialization (So & Brush, 2008), waste of effort in technical issues (Borup et al., 2013), distracting students from cognitive tasks (Burke & Chidambaram, 1999), and raising cultural conflicts when participants are from diverse areas (McKerlich & Anderson, 2007). All of these challenges could be "detrimental to learning" (Rourke et al., 1999, p.67).

Besides learning, many empirical studies have concluded other benefits obtained from a high level of social presence. However, they were not explicit in how and to what extent social presence contributed to these benefits. It made their benefits hard to be replicated in other studies under other contexts. This kind of situation is also due to the ambiguity and complexity of social presence. Every individual is situated in different social networks, has different social experiences, and thus develops various perceptions and holds different values of social presence even when interacting within the same community (Dika & Singh, 2002; Hodgson & Reynolds, 2005; Wang & Chen, 2013). The idea of social presence varies from individual to individual even if they are in the same mediated communication event (Walther, 1994b). Moreover, the effects of social presence on these people also vary according to different individual traits. For example, social presence exhibited greater benefits on low self-regulated students (Borup et al., 2013; Puzziferro, 2008; Shea & Bidjerano, 2010) and extrovert students (Borup et al., 2013). Since little is known about how social presence acts, it would be erroneous to assume that different types of social relations are established, valued or desired equally. Such uncertainty beseeches an embarrassing situation: the subsequent studies could hardly duplicate the benefits of social presence.

While the high level of social presence is more likely to result in more interactions, it contradicts the assertion that these interactions are meaningful. Recently, researchers found that social presence failed to be a predictor for meaningful interactions in online learning (Tu et al., 2012), suggesting that social presence is not a causal factor of learning. As regards to improve learning, Swan (2002) implied that the quality of interaction is more important than the quantity of interaction. Interactions need to be purposefully designed toward a specific learning outcome (Aragon, 2003; Kreijns, Kirschner, & Jochems, 2003; Shea & Bidjerano, 2009).

In sum, the idea of social presence is still illusive, though it has been examined for decades. The construct itself proves difficult to define. The results of this study suggest that future researchers should be cautious when advocating the importance of social presence on learning. Caution should also be taken when studying this popular construct in future.

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Appendix A

Databases Searched for Social Presence Studies

Database and Vendor	Description	Subject
Education Research Complete from EBSCOhost	Journal articles and documents on all aspects of education, including administration, policy, funding, and related social issues.	Education
Academic Search Complete from Ebscohost	Journal articles spanning a broad range of important academic areas.	Education Psychology Law Anthropology Many other subjects
ERIC from CSA	Extensive educational-related literature in learning, teaching, educational decision-making, and research.	Education
PsycINFO from APA PsycNET	More than 3 million documents covering all aspects of psychology, and related disciplines, including behavioral sciences, mental health, social work, and more.	Education Human Development Sociology
Education from Jstor	A non-profit service that collects comprehensive literature on all aspects of education.	Education
ProQuest Dissertations and Theses	The most comprehensive records of graduate research that collects both doctoral dissertations and master's thesis.	All subjects included

Appendix B

Survey Instruments Used to Measure Social Presence

Instrument Name	Establisher	Year	Measure at a Glance	Validated by Other Studies
Social Presence Scale	Short et al.	1976	Bipolar mental sets towards media	Yes
Immediacy Behavior Scale	Richmond et al.	1987	Observable nonverbal classroom social presence behaviors and how students value these behaviors	Yes
	Gorham	1988	Observable verbal immediacy behaviors and how students value these behaviors	Yes
Spres Scale	Gunawardena & Zittle	1997	Attitudes towards the media, communication environment, and the sense of intimacy	Yes
Networked Minds Social Presence Questionnaire	Biocca et al.	2001	Copresence, psychological involvement, and behavioral engagement	Yes
Social Identify Scale	Lee et al.	2001	Perception of self-categorization and self-identity in computer-mediated group activities.	Yes
Para-Social Presence Scale	Kumar & Benbasat	2002	Immediacy, empathy, affective attitudes, and the involvement of participants	Yes
Classroom Community Scale	Rovai	2002	Connectedness, group cohesion, passion, trust and interdependence with a learning community	Yes
Social Presence Scale	Saenz	2002	Items were constructed based on a literature review on three concepts: intimacy, immediacy, and	No

			interactivity.	
Computer Mediated Communication Questionnaire	Tu	2002	Social context, online communication, and interactivity	Yes
SP scale	Richardson & Swan	2003	Perception of others, the learning environment, and the online experience	Yes
	Swan & Shih	(2005)	As the same above, but add more peer interaction elements and separate social presence of students from the instructor	Yes
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.	Yes
Social Presence Scale	Wise et al.	2004	Perceived friendliness of instructor's messages, perceived familiarity with the instructor, and perceived enjoyment of interacting with the instructor.	No
Social Presence Scale	Lee & Nass	2005	Participants' feeling of others' voices as real people and the consequent involvement with what's being heard.	Yes
Social Presence Behaviors Scale	Weaver & Albion	2005	Perception of interactions with others.	No
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.	No
Social Presence Scale	Yamada & Akahori	2007	The perception of others, the perception of ease of	No

			communication, and the perceived consciousness of the second language communication	
Social Presence Scale	Kim	2010	Perceived social proximity and affiliation of others	Yes
Social Presence Scale	Kreijns et al.	2011	Participants' feeling of being transported to a shared space.	Yes

Appendix C

Decomposition of social presence scales' measurements

	Item	Social Presence Scale (Short et al., 1976)	Immediacy Behavior Scale (Gorham, 1988; Richmond et al., 1987)	Spres Scale (Gunawarden a & Zittle, 1997)	Networked Minds Scale (Biocca et al., 2001)
Media	warm/cold	√		√	
	colorful/colorless	√			
	personal/impersonal	√	√	√	
	sociable/unsociable	√		√	
	sensitive/insensitive	√			
Co-Presence	Inclusion/isolation				√
	mutuality/individual				√
Humanize	people/machine	√			√
	vivid/not vivid	√			
Intimate	familiar/unfamiliar				
	close/distant				
	private/not private				
	trusting/suspicious				√
	open/conservative				
Immediate	comfortable/uncomfortable		√	√	
	humorous/inhumorous		√		
	supportive/hostile		√	√	
	accepting/rejecting		√	√	
	appropriate/inappropriate		√		
	satisfying/frustrating				
	helpful/hindering			√	√
	caring/icy		√		√
Interactive	friendly/unfriendly		√		
	interactive/not interactive			√	√
	active/passive				
	easy/difficult				√
	appealing/boring				
	engaging/not engaging				

	productive/non-productive				
	collaborative/conflicting				√
	positive/negative				
	accurate/inaccurate				
	frequent/scarce				
Connect	involving/detaching				√
	belonging/isolated				
	community/individual			√	
	reliable/not reliable				√
	sharing/gossip			√	

(Continued)

	Item	Social Identity Scale (Lea, Spears, & Groot, 2001)	Para-Social Presence Scale (Kumar & Benbasat, 2002b)	Classroom Community Scale (Rovai, 2002)	Social Presence Scale (Saenz, 2002)
Media	warm/cold				
	colorful/colorless				
	personal/impersonal		√		
	sociable/unsociable				
	sensitive/insensitive				
Co-Presence	Inclusion/isolation	√			
	mutuality/individual	√			
Humanize	people/machine		√		
	vivid/not vivid		√		
Intimate	familiar/unfamiliar				√
	close/distant				
	private/not private				
	trusting/suspicious				√
	open/conservative				√
Immediate	comfortable/uncomfortable		√		
	humorous/inhumorous				
	supportive/hostile		√	√	√
	accepting/rejecting		√		
	appropriate/inappropriate		√		
	satisfying/frustrating		√	√	
	helpful/hindering		√	√	
	caring/icy		√		√
friendly/unfriendly		√			
Interactive	interactive/not interactive		√	√	√
	active/passive		√	√	√
	easy/difficult		√		
	appealing/boring			√	
	engaging/not engaging		√	√	
	productive/non-productive		√	√	
	collaborative/conflicting				√

	positive/negative		√	√	√
	accurate/inaccurate				
	frequent/scarce				√
Connect	involving/detaching		√	√	
	belonging/isolated			√	
	community/individual			√	
	reliable/not reliable			√	
	sharing/gossip		√	√	

(Continued)

	Item	Computer Mediated Communication Questionnaire (Tu, 2002)	Social Presence Scale (Richardson & Swan, 2003; Swan & Shih, 2005)	Social Space Scale (Kreijns, Kirschner, Jochems, & Buuren, 2004)	Social Presence Scale (Wise et al., 2004)
Media	warm/cold				
	colorful/colorless				
	sociable/unsociable	√	√		
	sensitive/insensitive				
Co-Presence	Inclusion/isolation				
	mutuality/individual				
Humanize	people/machine				√
	vivid/not vivid				
Intimate	familiar/unfamiliar	√			
	close/distant			√	
	private/not private	√			
	trusting/suspicious	√	√	√	
	open/conservative	√		√	
Immediate	comfortable/uncomfortable	√	√		
	personal/impersonal	√			
	humorous/inhumorous	√			
	supportive/hostile		√	√	
	accepting/rejecting	√	√	√	
	appropriate/inappropriate	√			
	satisfying/frustrating				
	helpful/hindering		√	√	
	caring/icy	√	√		
	friendly/unfriendly		√	√	√
Interactive	interactive/not interactive	√			√
	active/passive	√		√	
	easy/difficult				
	appealing/boring				√
	engaging/not engaging				√
	productive/non-productive			√	

	collaborative/conflic ting		√	√	
	positive/negative		√	√	
	accurate/inaccurate	√			
	frequent/scarce			√	
Connect	involving/detaching				
	belonging/isolated		√		
	community/individu al				
	reliable/not reliable			√	
	sharing/gossip	√		√	

(Continued)

	Item	Social Presence Scale (Lee & Nass, 2005)	Social Presence Behaviors Scale (Weaver & Albion, 2005)	Communication Survey Scale (Lowry et al., 2006)	Social Presence Scale (Yamada & Akahori, 2007)
Media	warm/cold	√		√	
	colorful/colorless				
	personal/impersonal	√		√	√
	sociable/unsociable			√	√
	sensitive/insensitive			√	√
Co-Presence	Inclusion/isolation				
	mutuality/individual				
Humanize	people/machine	√			√
	vivid/not vivid	√			
Intimate	familiar/unfamiliar		√		
	close/distant		√		√
	private/not private		√		
	trusting/suspicious		√		
	open/conservative			√	
Immediate	comfortable/uncomfortable		√		√
	humorous/inhumorous				
	supportive/hostile				
	accepting/rejecting				
	appropriate/inappropriate		√	√	
	satisfying/frustrating			√	
	helpful/hindering		√		
	caring/icy		√		
	friendly/unfriendly		√		
Interactive	interactive/not interactive		√		
	active/passive		√		
	easy/difficult				
	appealing/boring				
	engaging/not engaging				
	productive/non-productive				
	collaborative/conflict				

	ting				
	positive/negative				
	accurate/inaccurate			√	√
	frequent/scarce				√
Connect	involving/detaching	√			
	belonging/isolated				
	community/individual				
	reliable/not reliable				
	sharing/gossip				

(Continued)

	Item	Social Presence Scale (J. Kim, 2010)	Social Presence Scale (Kreijns et al., 2011)
Media	warm/cold		
	colorful/colorless		
	personal/impersonal		
	sociable/unsociable		
	sensitive/insensitive		
Co-Presence	Inclusion/isolation		√
	mutuality/individual		√
Humanize	people/machine		√
	vivid/not vivid		√
Intimate	familiar/unfamiliar		
	close/distant		
	private/not private		
	trusting/suspicious		
	open/conservative	√	
Immediate	comfortable/uncomfortable		
	personal/impersonal		
	humorous/inhumorous		
	supportive/hostile	√	
	accepting/rejecting		
	appropriate/inappropriate		
	satisfying/frustrating		
	helpful/hindering		
	caring/icy		
friendly/unfriendly			
Interactive	interactive/not interactive	√	
	active/passive	√	
	easy/difficult		
	appealing/boring	√	
	engaging/not engaging	√	
	productive/non-productive		
	collaborative/conflicting		

	positive/negative		
	accurate/inaccurate		
	frequent/scarce		
Connect	involving/detaching	√	
	belonging/isolated		
	community/individual	√	
	reliable/not reliable		
	sharing/gossip		

Appendix D

Studies Selected for Meta-analysis

1) Studies with the outcome variable: Perceived learning

Title	Author	Year	Publisher/Journal	Analysis
The development of a Community of Inquiry over time in online course: Understanding the progression and integration of social, cognitive and teaching presence	Akyol, Z., & Garrison, D. R.	2008	<i>Journal of Asynchronous Learning Networks</i>	Correlation
Does the Community of Inquiry framework predict outcomes in online MBA courses?	Arbaugh, J. B.	2008	<i>International Review of Research in Open and Distance Learning</i>	Correlation
The relationship among teacher immediacy behaviors, student motivation, and learning	Christophel, D.	1990	<i>Communication Education</i>	Correlation
Social presence, satisfaction, and perceived learning of RN-to-BSN students in web-based nursing courses	Cobb, S. C.	2011	<i>Teaching with Technology</i>	Correlation
An examination of social presence in an online learning environment	Crim, Susan J	2006	Doctoral dissertation	Correlation
The effects of podcasting on student perceptions of community within the online learning environment	Ferguson, Larry A.	2010	Doctoral dissertation	Correlation
The relationship between verbal teacher immediacy behaviors and student learning	Gorham, J.	1988	<i>Communication Education</i>	Correlation
A comparison of teacher and student perceptions of immediacy and learning: Monitoring process and product	Gorham, J. & Zakahi, W.		<i>Communication Education</i>	Correlation
The relevance of social presence on cognitive and affective learning in an asynchronous distance learning environment as identified by selected students in a community college in Texas	Jones, B. J.	2007	Doctoral dissertation	Correlation
The effects of digital audio on	Kim, E.	2005	Doctoral	Correlation

social presence, motivation and perceived learning in asynchronous learning networks			dissertation	
Developing an instrument to measure social presence in distance higher education	Kim, J.	2011	<i>British Journal of Educational Technology</i>	Correlation
Community of inquiry framework and learning outcomes	Maddrell, J. A.	2011	Doctoral dissertation	Correlation
The effect of social presence on students' perceived learning and satisfaction in online courses	Nyachae, J. N.	2011	Doctoral dissertation	Correlation
The relation of social presence to online students' perceived learning and satisfaction with their instructor	Olson-Wenneker, T. R.	2012	Doctoral dissertation	Regression
Examining social presence in online courses in relation to students' perceived learning and satisfaction	Richardson, J. C. & Swan, K.	2003	<i>Journal of Asynchronous Learning Networks</i>	Correlation
The relationship between selected immediacy behaviors and cognitive learning	Richmond, V. P., Gorham, J. S., & McCrosky, J.	1987	In M. McLaughlin (Eds.) <i>Communication Yearbook 10</i> , (pp. 574-590). Beverly Hills, CA: Sage.	Correlation
The impact of asynchronous and synchronous instruction and discussion on cognitive presence, social presence, teaching presence, and learning	Rockinson-Szapkiw, A. J.	2009	Doctoral dissertation	Correlation
Clarifying the relationship between teacher nonverbal immediacy and student cognitive learning: Affective learning as the central causal mediator	Rodriguez, J. L., Plax, T. G., & Kearney, P.	1996	Communication Education	Correlation
Anatomy of asynchronous online learning: A study of factors that contribute to perceptions of social presence	Shih, Li-Fang	2004	Doctoral dissertation	Correlation
Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors	So, H. -J. & Brush, T. A.	2008	<i>Computers & Education</i>	Correlation

Relationships among collaborative learning, social presence and student satisfaction in a blended learning environment	Sorden, S. D.	2011	Doctoral dissertation	Correlation
On the nature and development of social presence in online course discussions	Swan, K., & Shih, L. F.	2005	<i>Journal of Asynchronous Learning Networks</i>	Correlation
An examination of social presence in online learning through the eyes of native and non-native English speakers	Teng, Y.	2005	Doctoral dissertation	Correlation
The effects of teacher social presence on student satisfaction, engagement, and learning	Wise, A., Chang, J., Duffy, T., & Valle, R.	2004	<i>Journal of Educational Computing Research</i>	T-test

2) Studies with the outcome variable: Actual learning

Title	Author	Year	Publisher/Journal	Analysis
Teacher immediacy as a predictor of teaching effectiveness	Andersen, J. F.	1979	In D. Nimmo (Eds.), <i>Communication Yearbook 3</i> (pp. 543-559). New Brunswick, NJ: Transaction Books	Correlation
Social presence and interactivity in online courses: Enhancing the online learning environment through discussion and writing	Harrigan, A. M.	2010	Doctoral dissertation	Correlation
The impact of teaching, social, and cognitive presence on success in online courses at a community college in South Texas	Johnson, T. E.	2011	Doctoral dissertation	Correlation
Community of inquiry framework and learning outcomes	Maddrell, J. A.	2011	Doctoral dissertation	Correlation
Virtual academic community: Online education instructors' social presence in association with freshman composition students' critical thinking and argumentation	Paquette, P. F.	2009	Doctoral dissertation	Regression
Beyond student perception: issues of interaction, presence and performance in an online course	Picciano, A. G.	2002	<i>Journal of Asynchronous Learning Networks</i>	Correlation
The effects of instructor immediacy in online learning environments	Schutt, M.	2007	Doctoral dissertation	Correlation
The effect of social presence on teacher technology acceptance, continuance intention, and performance in an online teacher professional development course	Smith, J. A. B.	2006	Doctoral dissertation	Correlation
The effects of teacher social presence on student satisfaction, engagement, and learning	Wise, A., Chang, J., Duffy, T., & Valle, R.	2004	<i>Journal of Educational Computing Research</i>	T-test

Appendix E

Meta-analysis Calculations

Step 1. Converting different statistics indices to Cohen's d

(a) For most studies that measured the correlations, the effect size was calculated by converting the Pearson coefficient r to d . The formulas that were applied are:

$$d = \frac{2r}{\sqrt{1-r^2}}$$
$$V_d = \frac{4V_r}{(1-r^2)^3}$$
$$SE_d = \sqrt{V_d}$$

where $V_r = \frac{(1-r^2)^2}{n-1}$, r is the correlation coefficient, and n is the sample size.

(b) For studies that reported a two-group independent t-statistic or used the one-way ANOVA to report a two-group F-statistics, the effect size was calculated from converting the indexes t or F to d . The formulas employed were:

$$d = t \times \sqrt{\frac{n_1+n_2}{n_1n_2}}, \text{ or } d = \sqrt{F} \times \sqrt{\frac{n_1+n_2}{n_1n_2}}$$
$$V_d = \frac{n_1+n_2}{n_1n_2} + \frac{d^2}{2(n_1+n_2)}, SE_d = \sqrt{V_d}$$

where t and F are reported statistic indices and n_i is the sample size for i^{th} group.

(c) For studies that utilized two-way ANOVA to report F-statistics with multiple groups (say k , $k \geq 3$), the effect size was calculated from converting the multi-sample F-statistic to d , if one is interested in the mean difference of two groups, as in Group 1 and Group 2. The formulas applied were:

$$d = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{MSE}}$$

$$V_d = \frac{n_1+n_2}{n_1n_2} + \frac{d^2}{2(n_1+n_2)}, SE_d = \sqrt{V_d}$$

where \bar{X}_i is the group mean for the i^{th} group

MSE is the mean squared error shown in ANOVA table with F-statistics

n_i is the sample size for the i^{th} group

(d) For the study that reported descriptive statistics, the effect size has to be calculated from converting sample mean \bar{X} and sample standard deviation S to d . The formulas used are:

$$d = \frac{\bar{X}_1 - \bar{X}_2}{S_{pooled}}$$

$$V_d = \frac{n_1+n_2}{n_1n_2} + \frac{d^2}{2(n_1+n_2)}, SE_d = \sqrt{V_d}$$

where $S_{pooled} = \sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}}$

\bar{X}_i is the sample mean for the i^{th} sample

S_i^2 is the sample variance of the i^{th} sample

n_i is the sample size for i^{th} sample

Step 2. Converting from Cohen's d to Hedges' g

Based on the results of first step, the researcher calculated g by using the following formulas:

$$J = 1 - \frac{3}{4 \times df - 1}$$

$$g = J \times d$$

$$V_g = J^2 \times V_d, SE_g = \sqrt{V_g}$$

where df is the degree of freedom to estimate pooled standard deviation for the raw sample mean difference, $\bar{X}_1 - \bar{X}_2$. In the cases of (a), (c) and (d), $df = n_1 + n_2 - 2$; in the case of (b), $df =$

n – 1.

Step 3. Calculating the overall effect size

Since this meta-analysis study is to assess the impact of an educational intervention (social presence), the magnitude of the impact may vary depending on the resources of each individual studies, such as class size, student age, subjects, and other factors. Those factors are very likely to be different in different studies. Therefore, the researcher needed to use a random-effect meta-analysis to address the variation across studies. A random-effect model not only deals with the within-study variation, but also adjusts the between-study variation (Borenstein et al., 2009).

Among k studies, the researcher derived the common effect size Hedges' g and its variance for each study in the step 2. Next, the researcher named the effect size of social presence as Y and its variance as V_Y . Then, under the random-effect model, the formulas applied were:

$$Y_i = \mu + \zeta_i + \varepsilon_i, i = 1 \dots k$$
$$\zeta_i \sim Normal(0, \tau^2), \varepsilon_i \sim Normal(0, \sigma_\varepsilon^2)$$

where Y_i is the effect size (Hedges' g) for i^{th} study

μ is the grand mean for population effect size

ζ_i is the random effect accounting for between-study variation

ε_i is the error term accounting for within-study variation

To compute the variance under a random-effect model, the researcher estimated both the within-study variance (σ_ε^2) and the between-study variance (τ^2). The study's total variance is the sum of these two values. According to the DerSimonian and Laird method (Borenstein et al., 2009), the estimate of τ^2 was computed by using the following formula:

$$\hat{\tau}^2 = T^2 = \frac{Q - df}{C}$$

where $Q = \sum_{i=1}^k W_i Y_i^2 - \frac{(\sum_{i=1}^k W_i Y_i)^2}{\sum_{i=1}^k W_i}$

$$C = \sum_{i=1}^k W_i - \frac{\sum_{i=1}^k W_i^2}{\sum_{i=1}^k W_i}$$

$$W_i = \frac{1}{V_{Y_i}}$$

V_{Y_i} is the variance of the effect size for i^{th} study

$$df = k - 1$$

k is the number of the studies

Then, the total variance was computed as:

$$V_{Y_i}^* = V_{Y_i} + T^2$$

Next, the weight was defined as:

$$W_i^* = \frac{1}{V_{Y_i}^*}$$

Then, the weight mean for the summary effect M^* was computed as:

$$M^* = \frac{\sum_{i=1}^k W_i^* Y_i}{\sum_{i=1}^k W_i^*}$$

$$V_{M^*} = \frac{1}{\sum_{i=1}^k W_i^*} SE_{M^*} = \sqrt{V_{M^*}}$$

Then, the 95% Confidence Interval of the summary effect was computed as:

$$[M^* - 1.96 \times SE_{M^*}, M^* + 1.96 \times SE_{M^*}]$$

Finally, a Z-value to test the null hypothesis, namely, the mean effect size μ is zero ($H_0: \mu = 0$)

will be:

$$Z = \frac{M^*}{SE_{M^*}}$$

The p-value for two-tailed Z-test was computed as:

$$p = 2(1 - \Phi(|Z|))$$

where $\Phi(\cdot)$ is the cumulative density function for standard normal distribution, Normal(0,1).