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Social presence in online discussion groups: testing three conceptions and their relations to perceived learning

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Abstract The correlation between three conceptions of social presence (seen as 1. a subjective quality of a medium that determines the quality of the communication and perception of others, 2. self-projection onto the group, and 3. identification with the group) and different aspects of perceived learning in online discussion groups were tested. Six hundreds and fifty nine students completed a web-based questionnaire that was distributed via 50 course Websites. Self projection, perception of others and identification with the group correlated positively with each other. They also correlated positively with most aspects of perceived learning. The subjective quality of the medium did not correlate with these conceptions and also did not correlate with any aspects of perceived learning. Thus, social presence may afford learning by setting a convenient climate. Alternatively, it may contribute only to the socioemotional source of perceived learning while leaving cognitive source unaffected.

Keywords Social presence · Perceived learning · Online discussion group · Self projection · Group identification

In recent years, online environments have become more widely used for teaching courses and for affording interactions between learners and instructors. One important aspect of an online learning environment is the ability of the learners to establish a satisfying level of social presence. Online environments, and especially text-based environments, may challenge the process of constructing social presence, which in turn may impair learning processes. In this paper, we present three definitions of social presence, suggest a working definition for perceived learning, discuss the relations

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between social presence and perceived learning, and report the results of a study that tested the relations between the three conceptions of social presence and perceived learning.

A literature review disclosed three different conceptualizations of social presence that were studied in learning contexts: (1) as a characteristic of a *medium* that enables (or disables) transmissions of social cues that are essential to *perceive* another learner as "real"; (2) as the potential for a *learner* to project himself socially and emotionally as real people in an online community, and (3) as a characteristic of a *group*, that reflects the level of social identification with, and the sense of belongingness to an online learning group. It is noted that other conceptualizations also exist (see: Biocca et al. 2003; Lee 2004; Lombard and Ditton 1997), but in general they were not used in a learning context; hence we will not discuss them here.

1 Social presence as perception of other given the subjective quality of a medium

Rourke et al. (1999) traced the concept of "social presence" back to Mehrabian's (1969) concept of *immediacy*, which he defined as "those communication behaviors that enhance closeness to and nonverbal interaction with another" (p. 203). According to Mehrabian, nonverbal communication leads to more immediate interaction and psychological closeness, while a conversation that lacks cues such as gestures or facial expression will result in a "distant" interaction. The concept of immediacy has been tested widely in face to face classes (Witt et al. 2004), mainly as a factor that relates to teacher–student relationships.

Short et al. (1976) elaborated upon these ideas and hypothesized that the inability of a communication medium to transmit nonverbal cues has a negative effect on interpersonal communication. They defined social presence as "the salience of the other in a mediated communication and the consequent salience of their interpersonal interactions" (p. 65). In other words, if a communicator does not intimately perceive her partner as a real person while communicating via a specific medium, this medium is said to be impersonal, cold and unsociable. Short et al. argued that social presence affects the nature of an interaction, that communicators are aware of the degree of a medium's social presence, and that communicators take it into account when planning contact. Thus, the first definition of social presence that will be tested in this study is the subjective quality of a medium to convey enough social cues, so that communicators perceive their partners as real, multi-dimensional human beings.

Many studies have ranked different communication media with respect to their level of social presence as suggested by this definition (Caspi and Gorsky 2005; Daft and Lengel 1984, 1986; Daft et al. 1987; Dennis and Kinney 1998; Irmer and Bordia 2003; Rice 1992; Short et al. 1976). However, it was shown that a "lean" medium, one that lacks the potential to transmit social cues, does not necessarily restrict interaction relative to a "richer" medium.

Hackman and Walker (1990) studied the perceived learning of students in an interactive television setting. Although interactive television is a relatively rich communication medium, it still contains less social cues relative to a face-to-face setting. They found significant positive correlations between social cues given to students

(e.g. encouraging gestures, smiles, and praise) and students' perceived learning. However, in this study, social presence was conceptualized only as teacher–students' immediacy. Webster and Hackley (1997) reported that perceived medium richness (i.e., the subjective quality of a medium) correlated positively with "cognitive engagement" (defined as the subjective experience of attention focus, curiosity and intrinsic interest) of students that learned via video-conferencing systems.

In a very influential study, Gunawardena and Zittle (1997) measured the relationship between perceived social presence, defined as perception of other learners, in online courses and learners' satisfaction. They found that social presence accounted for more than half the variance of learner satisfaction. The questionnaire developed by Gunawardena and Zittle has been used widely in many other studies of social presence (for criticism of this instrument see Tu 2002a; Kreijns et al. 2004).

2 Social presence as self-projection onto the group

Alternatively, Garrison et al. (1999) and Garrison and Anderson (2003) defined social presence as the ability of learners to project themselves socially and emotionally as real people in an online learning community. This definition differs from the previous one in three senses: First, Garrison and his colleagues moved the focus from the *potential* of a medium to allow communication that affords transmission of social cues, to the *actual* communication observed. Second, while Short et al. (1976) focused on the *limitations* that a medium imposes on the interaction, Garrison and his colleagues focused on the way people *overcome* these constraints. Third, and perhaps more important, instead of focusing on how people perceived the other(s) they considered "social presence" as projection of the self. Perception of other and self projection are two independent processes. Moreover, since perception is a subjective process, it is quite possible that, despite the projection of someone's self onto an online community, the other participants do not necessarily perceive her as a "real" person. Blau and Caspi (2007) found evidence that there is a discrepancy between the way people perceive the level of social presence in a text-based discussion group and the level that is uncovered by counting textual projections of participants' self within that group. Swan and Shih (2005) found that the perception of social presence is related to its presentation: Students perceiving the greatest presence of others in online discussions also consistently projected more of their own self therein.

Garrison et al. (1999), Garrison and Anderson (2003) and Rourke et al. (1999) suggested three categories of how social presence is manifested: affective, open communication, and cohesive. The indicators for the affective category are expressing emotions, using humor, and self disclosure. The indicators for the open communication category are replying to others, referring to others' messages, expressing agreement or appreciation, and asking questions. The indicators for the cohesive category are addressing participants by name, using inclusive pronouns and greetings.

The work of Garrison et al. triggered many studies that followed their definitions. Some studies measured this kind of social presence in order to support the claim that such social presence actually exists and can be found in online learning environments (e.g., Leh 2001; Rourke and Anderson 2002; Rourke et al. 1999; Stacey

2002; Tu 2002b; Tu and McIsaac 2002). We will return to the relation between social presence as is conceptualized here and the impact it may have on perceived learning.

3 Social presence as social identification

A third conceptualization of social presence was suggested by Rogers and Lea (2005). This conceptualization stemmed from the Social Identity model of Deindividuation Effect (SIDE, Reicher et al. 1995; Spears and Lea 1992, 1994). This model suggests that an individual's self is multi-faceted, and includes both personal and social identities. Each social identity provides information about the social group, what is typical for that group and the expected norms it demands. At any time, either a particular social identity or personal identity can be salient, and guides the behavior of the individual. Spears and Lea (1992) argued that an absence of social cues in an interaction does not imply an absence of social cues per se, since the social cues always exist as cognitive representations. Therefore, according to the model, a feeling of belongingness to a group, or identification with a group, can occur even in a "lean" environment that supplies minimal social cues. Moreover, such feelings may result in a perceptual immersion within the group. Rogers and Lea (2005) conceptualized social presence as a feeling of belongingness to, and identification with, an online group that causes this sense of immersion. They reported a positive correlation between social presence and collaborative outcomes.

Group cohesiveness is common to both the conceptualization of social presence as an authentic projection of the self and the conceptualization of social presence as social identification. But the two differ to a large degree: The latter conceptualization recognizes social presence as identification with the group while for the former it is only one of three aspects that comprise social presence. It is not clear to what extent identification with a group is a crucial factor in the conceptualization of social presence as authentic projection of the self. Moreover, given the multi-faceted nature of the self, self projection may express both personal identity and shared or social identity. It is noted here, that although Short et al.'s (1976) conceptualization of social presence focuses on perception of *a partner*, their conceptualization is often extended to perception of *others* (e.g., Tu and McIssac 2002). In terms of their original definition of social presence, Short and his colleagues did not explicitly distinguish between private (one-to-one) communication and public (one- or many-to-many) communication. Nevertheless, perception of a *group* does not play any key role in their definition.

Given the differences between the conceptualizations, our first research question focuses on the relationships between the three concepts of social presence, namely: Do perception of others (as a subjective quality of the medium), self-projection, and social identification correlate in online discussion groups?

4 The relations between social presence and perceived learning

The second research question is what the relations between the three conceptualizations of social presence and perceived learning are. Before elaborating on the possible relations between social presence and perceived learning it is necessary to define what

perceived learning is, how it differs from "learning", and why we prefer this concept as a dependent measure in the current study. Perceived learning is the set of beliefs and feelings one has regarding the learning that has occurred. As such, perceived learning is a retrospective evaluation of the learning experience. "Perceived learning" may emerge from two sources: cognitive and socio-emotional (For an example of a similar division see: LaPointe and Gunawardena 2004). The cognitive source reflects the sense that new knowledge has been acquired, that some new understanding has been achieved (even if the knowledge and understanding are incorrect), and other cognitive-based processes. The socio-emotional source reflects experiences and feelings (like difficulty or enjoyment), involvement in interactions (say with other students or a teacher), or a feeling of innovation in the current studying. As such, the socio-emotional source reflects more "peripheral" aspects of the learning process. There are evidences that the subjective feeling of learning is built either on direct monitoring of memory traces (i.e., the cognitive source; Hart 1965) or on indirect monitoring of encoding fluency (i.e., the socio-emotional source; e.g., Koriat and Ma'ayan 2005).When people are asked to evaluate their learning they may rely more on one source or the other, and the weight given to any source may not be known. Even when answering a direct question such as to what extent you believe you understand the subject-matter, a student may rely on either the cognitive source or on the socio-emotional source. It was found in many studies (see Clore 1992; Clore et al. 2001; Schwartz 2004) that feelings or emotions are informative and may guide a person while making judgments, especially about complex situations.

There are evidences that learning (measured by performance) and perceived learning (measured by reported feeling or perception) are independent, and may be uncorrelated. Rovai and Barnum (2003) contended that the use of grades to operationalize learning may not always provide the best measure. First, classroom or final grades tend to have restricted ranges, which severely limited their use in correlation studies. Second, grades reflect not only "pure" learning but sometimes also class participation, work turned in late, attendance, and other "peripheral" considerations. They recommended using perceived learning instead of grades. However, it is noted that "feeling of learning" may be higher (or lower) than the actual achievement, at least in laboratory controlled experiments (Koriat and Bjork 2005, 2006). Jiang and Ting (2000) found that perceived learning and grades for written assignments are not correlated significantly. Given this evidences, and some evidence we report below, we choose "perceived learning" as our dependent measure in the current study.

Studies that examined the relationships between social presence and learning used very different operational definitions for "learning". In some studies learning was measured as "achievement" (i.e., objective, grades) in others as "perceived learning" (i.e., subjective, students' self-report), which are two uncorrelated measures. Yet, another measure of learning is the expression of critical thinking in online discussion groups (one aspect of what has been termed "cognitive presence"). Some of these relations are reviewed below.

As mentioned above, social presence is originated in the concept of immediacy. In face-to-face classes, no direct link between immediacy and learning (students' performance as measured in test scores) was found (Kelly and Gorham 1988). Witt et al. (2004), in a meta-analytic study, found meaningful correlations between teachers'

immediacy and student reports of perceived learning, but only small or weak correlations with students' performance as measured in test scores. If this is so, why should online environments differ? First, environment does matter as hundreds of studies showed (for recent review of differences between off- and on-line educational environments see: Lou et al. 2006; Tallent-Runnels et al. 2006), and an online environment may call for more social presence to allow learning relative to traditional classes. Garrison and Anderson (2003) argued that learning is intimately connected to the learning context. Thus, to enhance and sustain meaningful learning in online environments certain aspects of social presence must be established. Second, immediacy and social presence are independent concepts. Short et al. (1976) contended that sometimes social presence (as they defined it) and immediacy vary together, but sometimes not. Moreover, as discussed above, "social presence" may represent different aspects of online interaction that do not necessarily relate to each other.

Picciano (2002) found a high, positive correlation (.67) between perceived social presence and perceived learning, but no statistically significant correlation between perceived social presence and grades in the final exam. Richardson and Swan (2003) found that 42% of the variability in perceived learning was predicted by perceived social presence. Swan and Shih (2005) found a high correlation (.70) between perceived social presence and perceived learning. Hornik and Tupchiy (2006) found a positive correlation (.38) between social presence and perceived learning but only a weak correlation (.12) between social presence and actual performance. Arnold and Ducate (2006) found that social activity outweighed cognitive events and accounted for 58–67% of the total events; nevertheless most students perceived a high level of learning.

Wise et al. (2004) experimentally manipulated the level of social presence instructors projected to online learning groups. Contrary to the above reports, they found that social presence affects the learner's interactions and perception of the instructor but has no effect on perceived learning or grades (actual performance). Therefore, they contended that a high level of social presence does not cause students to learn more, feel they learned more, or feel the experience was more useful. Thus the relation between social presence and learning or perceived learning is unclear.

How might the three conceptualizations of social presence relate to perceived learning? In general, the relation between social presence and perceived learning may be of four types: (1) Social presence is a necessary condition for learning (e.g., Garrison et al. 1999; Garrison and Cleveland-Innes 2005; Rovai 2007), which may result in a high level of perceived learning. The results of Wise et al. (2004) did not confirm this suggested relation. (2) Although social presence and perceived learning may positively correlate, there is no causality because social presence is only a "by-product" of learning done in an environment that dictates social interaction. Evidences for this possible relation came from the study of Picciano (2002, see also Conrad 2002). Moreover, a positive correlation between social presence and perceived learning might reveal students' confusion between the actual learning process and its accompanying experience. (3) Social presence may interfere with perceived learning. In such a case, we would expect a negative correlation. (4) There is no relation between social presence and perceived learning, since perceived learning is built upon cognitive rather than socio-emotional aspects of learning. In some studies, despite considerable discussion,

most of it was of a social nature with low levels of cognitive exchange (Kanuka and Anderson 1998; Meyer 2003).

Because all three definitions of social presence relate to the socio-emotional aspects of learning, but not (at least not directly) to the cognitive aspect, we may argue that a positive correlation between social presence and perceived learning may result from relying more on the socio-emotional source when reporting perception of learning, while zero or even negative correlations may result from relying more on the cognitive source.

To conclude, we are looking for relationships between social presence (seen as 1. perception of other given the subjective quality of a medium, 2. self-projection onto the group, and 3. identification with the group), and between these three definitions and perceived learning (seen as perceptions students has regarding their skills or understanding as well as feelings of difficulty or enjoyment, and involvement in interactions with other students or teacher).

There is evidence that perception of others and self-projection are positively correlated (Swan and Shih 2005), therefore we predict positive correlations between all three definitions of social presence. A positive correlation between perceived learning and social presence is predicted if perceived learning emerges from a socio-emotional source and a zero or negative correlation is expected if perceived learning emerges from a cognitive source.

5 Method

5.1 Background

The Open University of Israel is a distance learning institute that in recent years has adopted a hybrid model of teaching: Students meet with instructors both face-to-face and online. Both types of meetings are non-mandatory, and attendance or online participation are generally not calculated in the final course grade. Tutorial meetings take place every two or three weeks in local centers around the country. To achieve the hybrid teaching strategy, all courses in the university have a Website that affords synchronous and asynchronous communication, and downloading course material. A major part of the courses' Websites is the discussion group, which allows instructor-students and student-students asynchronous interaction.

To assess the activity of the discussion groups of the courses in which participants in the current study used, for each discussion group we divided the number of messages published until the time we delivered the questionnaire by the number of enrolled students. Level of activity ranged from 0.36 to 16.54, with average at 2.36 (SD: 2.51).

5.2 Participants

Six hundred and fifty-nine students answered a web-based questionnaire that was distributed via 50 course Websites in the Department of Psychology and Education at the Open University of Israel. 87.7% of the participants were undergraduates and the rest (12.3%) were graduate students. Five-hundred and seventy-eight were women

Table 1 Students perception of learning from online discussion (SPLOD)

Item (The discussion. . .)	Factor		
	Skills	Sharing opinions	Contribution to learning
Improves generalization skills	**.864**	.149	.128
Improves integration skills	**.834**	.117	.242
Improves communication skills	**.708**	.332	−.123
Is a great chance to share opinions with instructors	.002	**.843**	−.027
Is a great chance to share opinions among peers	.316	**.780**	.220
Provides useful social interaction	.374	**.703**	.091
Decreases my learning quality (r)	−.053	.042	**.856**
Peers' comments are not very valuable (r)	.257	.107	**.748**
Initial eigenvalue	3.3	1.3	1.1
% variance explained	41.2	16.0	13.6
Cronbach's α	.79	.75	.51

(r)—reversed item

(78%). It is noted that women are slightly more than 50% of the department students' population, thus women are over-proportionally represented in the current study. The participants ranged in age from 17 to 65, the modal age was 24 years, and the median age was 27. The age distribution is similar to the overall age distribution in the university. For 126 participants, this semester was their first at the university.

Fourteen percent reported that they login to the course Website everyday, 72% reported that they login at least once a week, all others do so less frequently. Thirty percent of the participants reported that they posted three messages or more to the course discussion group, 45.7% reported that they posted one or two messages, and the rest reported they never posted. The finding that about 30% posted three messages or more is somehow higher than earlier findings (Caspi et al. 2006; Caspi et al. 2003) that found that only about 15% of the students posted that much.

5.3 Instruments

Students' perception of learning from online discussion. (Wu and Hiltz 2003, 2004). Twelve items from the students perception of learning from online discussion (SPLOD) were modified and used. Factor analysis with varimax rotation revealed three factors that were labeled: Skill, Sharing opinions and Contribution to learning. Items that loaded high in two or more factors were omitted, and the rest were re-entered into a second factor analysis. The results, along with the Cronbach's alphas are presented in Table 1. The factor contribution to learning has a relatively weak reliability and therefore the two items were decomposed. The modified SPLOD therefore includes both social and cognitive aspects of perceived learning. The factor "skill" relates mainly to cognitive aspects of learning while the factor "sharing opinions" relates mainly to social aspects. It is noted, however, that these two factors are highly correlated. The inter-correlations between the factors are presented in Table 2.

Table 2 Students' perception of learning from online discussion: correlations between factors

	Sharing opinions	Peers' comments are not very valuable (r)	Decreases my learning quality (r)
Skills	.49**	29**	.10*
Peers' comments are not very valuable (r)	.23**	.35**	
Decreases my learning quality (r)	.10**		

(r)—reversed item

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Social and cognitive presence. We used two parts of the Garrison et al. (2004) questionnaire to measure perceived social and cognitive presence. Factor analysis with a varimax rotation revealed three factors: Cognitive presence, social presence as open communication and cohesiveness (that in the original model are two separate aspects of social presence), and social presence as emotional expression. Cronbach's alphas for the three factors were high (Cognitive presence—.88; Open communication—.81; Emotional expression—.89). The correlations between cognitive presence and the four factors of the SPLOD were also satisfactory (ranging from .23 to .69), implying sufficient convergent validity. The correlation between the two dimensions of social presence was .43 ($p < 0.001$).

Social presence as group identification. Three items from the Group Self-Categorization Scale (Lea et al. 2001; Rogers and Lea 2005) were used to assess group identification. Cronbach's alpha for the scale was .91.

Medium and Other Perception Scale (*MOPS*). To measure social presence as the subjective quality of a medium, we constructed the Medium and Other Perception Scale (MOPS). The items aimed to cover Short, Williams and Christie's (1976) social presence concept. The initial collection of items was reviewed and revised by an expert scholar in telecommunication to increase validity. Factor analysis with a varimax rotation revealed three factors: Social presence as perception of the others, Medium's impersonality, and Medium as interaction enabling. The items, along with the factor loadings and Cronbach's alphas are presented in Table 3. Table 4 presents the inter-correlations between the three factors. Clearly, the three factors depicted different aspects of Short and his colleagues' conceptualization.

The importance of the course's discussion group. Students were asked to rank six learning resources generally available to them, from the resource they believed contributed most to their learning to the resource that contributed least. The resources were: Face-to-face tutorial sessions, textbooks, summaries and other materials available in the course's Website, the online discussion group, other students, and the instructors. For the purpose of the current study only the rank ascribed to the discussion group was used. The average rank of the discussion group was 3.2 (SD: 1.3), with modal and median being—3 (where 1 is the resource that contributed most, and 6 the least).

Table 3 Medium and other perception scale (MOPS)

	Factor		
	Perception of the others	Medium's impersonality	Medium as interaction enabling
While reading messages in the discussion group, I attribute specific character to the poster	**.786**	−.036	.048
When I read messages of other people, I imagine how they may look like	**.738**	−.080	−.124
I successfully recognize personal style of other students from their messages	**.728**	.011	.157
The discussion in the discussion group allows me to predict the behavior of other participants	**.680**	−.021	.157
I cannot characterize other students from the way they participate in the discussion group (r)	**.576**	.178	.049
The conversation in the discussion group tends to be more impersonal than an audio conference conversation (r)	.035	**.928**	−.030
The conversation in the discussion group tends to be more impersonal than a video conference conversation (r)	−.015	**.924**	−.089
The conversation in the discussion group tends to be more impersonal than a face-to-face conversation (r)	.024	**.865**	−.033
The discussion group is an excellent medium to interact with instructors.	−.012	−.020	**.811**
The discussion group is an excellent medium to interact with other students	.178	−.052	**.783**
I feel comfortable to communicate via written medium	.056	−.057	**.704**
Initial eigenvalue	2.70	2.54	1.63
% variance explained	24.57	23.11	14.84
Cronbach's α	.75	.89	.67

(r)—reversed item

Table 4 Medium and other perception scale (MOPS): correlations between factors

	Medium's impersonality	Medium as interaction enabling
Perception of the others	.17*	.01
Medium's impersonality	−.12*	

*Correlation is significant at the 0.05 level (2-tailed)

Table 5 Demographic differences

	Variable	Means (SD)
Age[a]	Self projection—Open communication and cohesiveness	Young: 3.50 (0.84)
	$F(1,643) = 6.63$, $p = 0.01$	Old: 3.22 (0.87)
	SPLOD: Sharing opinion	Young: 3.63 (0.78)
	$F(1,643) = 4.00$, $p < 0.05$	Old: 3.50 (0.88)
Gender	Medium impersonality	Women: 2.51 (0.91)
	$F(1,644) = 9.29$, $p = 0.002$	Men: 2.26 (0.77)
	SPLOD: Peers' comments are not very valuable	Women: 3.55 (0.98)
	$F(1,644) = 14.16$, $p < 0.001$	Men: 3.19 (1.05)
Degree	Group identification	Undergraduate: 2.92 (1.02)
	$F(1,645) = 6.38$, $p < 0.05$	Graduate: 3.20 (1.02)
	SPLOD: Skills	Undergraduate: 3.14 (0.80)
	$F(1,645) = 7.86$, $p = 0.005$	Graduate: 3.37 (0.79)

[a] "Young" = below median

6 Results

Given the diversity of participants, we started by examining differences in all variables as a function of demographics. We were mainly concerned with age, gender, degree, and user's activity (login to course discussion group and posting). Thus, for each of these five demographic variables, we ran a multiple analysis of variance (MANOVA) with all 11 variables, which, for these analyses, we treated as dependent variables.

As Table 5 shows, there were very few significant differences between young and old, men and women, and undergraduate and graduate students. However, users' activities—logging in or posting—significantly differentiate among students. The general pattern is that the more students login to the course's discussion group the more they perceived social presence and have a higher level of perceived learning (see Table 6). Similar pattern was found for posting: the more students posted messages, the more they perceived social presence, and the higher their level of perceived learning (see Table 7).

Our first research question asked what are the relations between the different conceptualizations of social presence. Table 8 presents the zero-order correlations between these conceptualizations. There is a significantly high correlation between self projection and group identification, and between these two concepts and the

Table 6 Effects of login to the discussion group

Variable	F(2,645) =	Frequency of logging in to course discussion group	Mean (SD)
Self projection—Open communication and cohesiveness	26.39**	Everyday	3.69 (0.89)
		At least once a week	3.46 (0.82)
		Less than once a week	2.85 (0.81)
Self projection—Emotional expression	10.48**	Everyday	2.38 (1.20)
		At least once a week	2.13 (0.87)
		Less than once a week	1.77 (0.65)
Group identification	37.47**	Everyday	3.36 (1.02)
		At least once a week	3.02 (0.98)
		Less than once a week	2.18 (0.87)
Quality of a medium: perception of others	2.31[a]	Everyday	2.91 (0.84)
		At least once a week	2.81 (0.74)
		Less than once a week	2.67 (0.73)
Quality of a medium: Medium's impersonality	0.01[a]	Everyday	2.47 (1.01)
		At least once a week	2.47 (0.85)
		Less than once a week	2.45 (0.92)
Quality of a medium: Medium as interaction enabling	14.64**	Everyday	3.81 (0.74)
		At least once a week	3.84 (0.69)
		Less than once a week	3.38 (0.92)
Cognitive Presence	21.54**	Everyday	3.88 (0.77)
		At least once a week	3.60 (0.69)
		Less than once a week	3.18 (0.83)
SPLOD: Skills	16.83**	Everyday	3.43 (0.76)
		At least once a week	3.18 (0.80)
		Less than once a week	2.77 (0.73)
SPLOD: Sharing opinion	14.27**	Everyday	3.66 (0.86)
		At least once a week	3.62 (0.80)
		Less than once a week	3.13 (0.88)
SPLOD: peers' comments are not very valuable	1.97[a]	Everyday	3.55 (1.01)
		At least once a week	3.50 (0.99)
		Less than once a week	3.28 (1.04)
SPLOD: decreases my learning quality	5.12*	Everyday	4.38 (0.77)
		At least once a week	4.21 (0.75)
		Less than once a week	4.02 (0.79)

[a] n.s.

* $p < 0.01$

** $p < 0.001$

Table 7 Effects of posting

Variable	F(2,645) =	Number of postings	Mean (SD)
Self projection—Open communication and cohesiveness	48.11**	3 posts or more	3.83 (0.75)
		1–2 posts	3.35 (0.83)
		Never posted	2.99 (0.82)
Self projection—Emotional expression	5.98*	3 posts or more	2.30 (1.03)
		1–2 posts	2.07 (0.89)
		Never posted	1.99 (0.80)
Group identification	31.21**	3 posts or more	3.37 (0.91)
		1–2 posts	2.90 (1.03)
		Never posted	2.55 (0.97)
Quality of a medium: perception of others	0.83[a]	3 posts or more	2.85 (0.76)
		1–2 posts	2.81 (0.77)
		Never posted	2.75 (0.77)
Quality of a medium: Medium's impersonality	4.17*	3 posts or more	2.55 (0.92)
		1–2 posts	2.35 (0.82)
		Never posted	2.55 (0.94)
Quality of a medium: Medium as interaction enabling	10.51**	3 posts or more	3.96 (0.71)
		1–2 posts	3.74 (0.74)
		Never posted	3.61 (0.77)
Cognitive presence	10.78**	3 posts or more	3.78 (0.69)
		1–2 posts	3.54 (0.74)
		Never posted	3.44 (0.79)
SPLOD: Skills	9.36**	3 posts or more	3.36 (0.78)
		1–2 posts	3.12 (0.81)
		Never posted	3.01 (0.79)
SPLOD: Sharing opinion	22.62**	3 posts or more	3.85 (0.77)
		1–2 posts	3.53 (0.80)
		Never posted	3.28 (0.89)
SPLOD: peers' comments are not very valuable	2.08[a]	3 posts or more	3.59 (1.04)
		1–2 posts	3.43 (1.01)
		Never posted	3.40 (0.96)
SPLOD: decreases my learning quality	0.96[a]	3 posts or more	4.25 (0.81)
		1–2 posts	4.21 (0.79)
		Never posted	4.14 (0.69)

[a] n.s.

* $p < 0.01$

** $p < 0.001$

Table 8 Zero-order correlations between the three conceptualizations of social presence

		Mean (SD)	(1)	(2)	(3)	(4)	(5)
Self projection	Open communication and cohesiveness (1)	3.42 (0.86)					
	Emotional expression (2)	2.13 (0.92)	.43*				
	Group identification (3)	2.96 (1.02)	.70*	.54*			
Quality of a medium	Perception of others (4)	2.81 (0.76)	.27*	.31*	.34*		
	Medium's impersonality (5)	2.46 (0.88)	−.13*	.01	−.06	.01*	
	Medium as interaction enabling (6)	3.77 (0.74)	.53*	.24*	.47*	.17*	−.12*

*Correlation is significant at the 0.001 level (2-tailed)

explication of social presence as interaction enabling. Perception of others was moderately correlated with self projection and group identification, and the medium's impersonality did not correlate with either concept. These results generally support our hypothesis.

Our second research question concerned the relationships between social presence and perceived learning. Table 9 presents these correlations, after controlling for age, gender, degree, the importance attributed to the discussion group, frequency of login to the discussion group, level of posting to the discussion group, and the discussion group's activity. A medium to high correlation was found between self projection and cognitive presence, as well as two aspects appeared in the Students Perception of Learning from Online Discussion questionnaire: skills and, more obvious, sharing opinions. The correlations between group identification and these three measures were very similar as well as their correlations with the factor medium as interaction enabling. The two other factors, perception of others and medium's impersonality, have weak to zero correlations with cognitive presence, skills, and sharing opinions. Two aspects of perceived learning—increasing learning quality and value of peers' comments had weak to zero correlations with all concepts of social presence.

To test the mediating effect of certain variables, we conducted several Sobel tests (Sobel 1982). A variable may be called a mediator "to the extent that it accounts for the relation between the predictor and the criterion" (Baron and Kenny 1986, p. 1176). The three conditions needed before testing for a mediation effect are: that the predictor variable is correlated with the criterion, that the predictor variable is correlated with the mediator, and that the mediator correlated with the criterion variable. The mediated variable is said to completely mediate the relationship between the predictor variable and the criterion variable, if the effect of the predictor on the criterion controlling for the mediating variable is reduced to zero. If, however this relationship is not fully reduced, what is found is a partial mediation. The conditions to test for mediation were met for three variables: the importance attributed to the discussion group, frequency of login to the discussion group, and level of posting to the discussion group. These variables significantly correlated with two social presence variables—open

Table 9 Correlations between social presence and perceived learning, after controlling for age, gender, degree, the importance attributed to the discussion group, frequency of login to the discussion group, level of posting to the discussion group, and the discussion group's activity

			Perceived learning				
				SPLOD			
			Cognitive presence	Skills	Sharing opinions	Decreases my learning quality (r)	Peers' comments are not very valuable (r)
Social presence	Self projection	Open communication and cohesiveness	.56***	.45***	.62***	.11**	.23***
		Emotional expression	.36***	.42***	.31***	−.14***	.05
		Group identification	.43***	.45***	.44***	.01	.16***
	Quality of a medium	Perception of others	.14***	.14***	.12**	−.07	−.02
		Medium's impersonality	−.09*	−.08*	−.11**	−.01	.13***
		Medium as interaction enabling	.36***	.24***	.52***	.14***	.11**

(r)—reversed item

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

***Correlation is significant at the 0.001 level (2-tailed)

Table 10 Correlations between mediated variables, predictors and criterions

Mediated variables	Predictors		Criterions	
	Open communication and cohesiveness	Group identification	Cognitive presence	Skills
The importance attributed to the discussion group	.29*	.21*	.30*	.23*
Frequency of login to the discussion group	.30*	.33*	.27*	.25*
Level of posting to the discussion group	.35*	.30*	.18*	.17*

*Correlation is significant at the 0.001 level (2-tailed)

communication and cohesiveness, and group identification, on the one hand, and with two perceived learning variables—cognitive presence, and skills on the other hand. These correlations are presented in Table 10.

A series of Sobel tests revealed partial mediations of the variables "importance attributed to the discussion group" and "frequency of login to the discussion group", but not of "level of posting to the discussion group". In all cases the significant reduction in the regression weight did not exceeded 5%. Thus, although these variables partially mediated social presence and perceived learning, we can not consider this mediation to be meaningful. The complete analysis is presented in Appendix A.

7 Discussion

In this study we tested the relations between competing, and perhaps complementary, conceptualizations of social presence, as well as the relations between these conceptualizations and perceived learning. Previous studies did not test directly relationships between self-projection, group identification and perception of other given the subjective quality of the medium; only a few studies reported the relations between one of these conceptualizations and perceived learning.

We found that the original conceptualization of "social presence", namely perception of other given the subjective quality of the medium, is composed of three unrelated factors. These factors relate differently with other conceptualizations of social presence. The impersonality of the medium, which is a closer operationalization of "quality of a medium", was not related to later concepts that focused on self projection or group identification. Moreover, we found that medium impersonality did not correlate with perception of the other, which was suggested as the main endeavor of mediated communication. This finding adds to cumulative findings that have disconfirmed Short et al.'s (1976) notion. As far as they relate to asynchronous discussion groups, people are no longer troubled by the fact that this medium is incapable of transmitting facial expression, direction of looking, posture, intonation, and other non-verbal communication cues. One possible explanation for this result is that the more people utilize this type of communication, the more they find ways to compensate for its weakness or to utilize

its strengths. Tidwell and Walther (2002) found that the restrictions of computer-mediated communication "prompt users' adaptation to the medium through modification of uncertainty reduction behaviors" (p. 338). They suggested that although communicators via computers present less interaction relative to face-to-face communicators, their communication is more personal and intimate. It is thus possible, that constraints posed by the medium force users to adopt different communication strategies, that help them build a "live" image of the person they communicate with *despite* and perhaps *because* of the limitation imposed by the medium. In the same vein, Danchak et al. (2001) suggested an "equilibrium model" in which as the capacity of particular media to transmit social cues decreases, people using such media to communicate increase their verbal (or written) immediacy behaviors to maintain the level of interaction in communications (see also Swan 2001, 2003).

Perception of other communicators and medium as interaction enabling, the two other factors that stemmed from Short et al.'s conceptualization, correlated positively with self projection. The more people are involved in presenting themselves as real people to their virtual audience, the more they perceive the presentation of others. Three alternative explanations may be derived from these correlations: First, it is possible that individuals with a high sense of self projection are also more sensitive to social communication cues transmitted by others. Second, an opposite explanation is possible: Those who are sensitive to others' manifestation of themselves, and perceive the "others", are more highly motivated to project their own self onto the group. Swan and Shih (2005) reported that messages of students with a high perception of presence of others in online discussion contained far more social presence indicators. Swan and Shih explained that students may hold quite different perceptions of the nature and purpose of online discussion (see also: Arbaugh 2000; Kirkwood and Price 2005). Therefore, the third alternative suggests that such differing perceptions may alter the ways students perceive the presence of others and present themselves therein. In other words, there is a spurious correlation between perception of others and projection of the self, where the confounded variable is the students' purposes. These three theoretical alternatives—different sensitivity to others that appeared as a function of social involvement, more self-projection due to sensitivity to others' behavior, and different perception and projection as a function of purposes—need further research. At the implicative level, such differences may influence instructional strategies: If perceiving or projecting social presence depends primarily on individual sensitivity, it is this sensitivity that may receive the instructor's focus. However, if it is the expectation from the online learning that causes the difference, then instructors may need to explicitly define the expected level and type of participation.

The conceptualization of social presence as group identification correlated positively with all other conceptualizations, except the impersonality of the medium. The Social Identity model of Deindividuation Effect (Lea and Spears 1992; Rogers and Lea 2005; Spears and Lea 1992, 1994; Spears et al. 2002) states that when the environment affords only a limited number of social cues, what remain are the social category cues. The model contends that the cognitive representation of the group determines the behavioral norms the communicators adopt. From our results it is clear that both projection of the self and perception of the others relate to identification with the group. What is left unclear is the exact process that causes these relationships. It is

noted that the online groups that the participants in the present study related to, are ad hoc groups that were established for only one semester, and for a very specific goal. As such, they may be considered a *task* group. Under the group typology suggested by Lickel et al. (2000), a task group is characterized with a high level of interactivity and similarity. Members of such groups, like those who are part of an *intimacy* group, share common goals and outcomes. Unlike an intimacy group, membership in a task group may last for a relatively short duration and for a very specific goal. Given this definition of task group, a cognitive representation of the group might be established among the students despite the fact that no attempt was explicitly made to label the students in any specific course as "a group". The fact that the average score for group identification was at intermediate level and that the distribution was slightly skewed toward higher scores (skewness: -.173) partly support this notion.

Although identification with a group or group cohesiveness were not integral parts of the original definition of social presence, these or similar concepts very often appear in later definitions, especially within the educational research. Clearly, for one-to-one communication, like telephone or Instant Messaging such concepts are irrelevant. However, for discussion groups, and other group communication media, such concepts are inevitable. Thus, as a general definition of mediated-communication, social presence indeed should not necessarily include this aspect. However, when we deal with learning, which to a large extent occurs in social settings, identification with a group or group cohesiveness may play an important role, and may define a quality of the selected medium.

Positive correlations between different conceptions of presence and perceived learning were found. The two factors that construct social presence as authentic self-presentation positively correlated with cognitive presence, and with perceived learning as skills, and as sharing opinions. The factors "open communication" and "sense of cohesiveness" also positively correlated with the value attributed to peers' comments, whereas the factor "emotional expression" did not. These results support an earlier finding that found a positive correlation between social presence as self-projection and perceived learning (e.g., Swan and Shih 2005). These relations may be interpreted as support of one of two notions: That social presence is a necessary condition for learning thereby also correlates with perceived learning, or that it is merely a by-product of learning done in such an environment. Since we found significant correlations with both cognitive and socio-emotional aspects of learning, we cannot rule out any possibility.

Similarly, we found that group identification correlated with cognitive presence, perceived learning as skills, and as sharing opinions. Rogers and Lea (2005) contended that when shared social identity is emphasized, it resulted in a high level of collaborative outcomes. Two distinctions exist between Rogers and Lea's study and the current study. First, we did not emphasize social identity, and second collaborative outcome was not our dependent measure. As we noted earlier, sometimes inclusion in an ad hoc, temporary, task-aimed group is a sufficient condition to create a sense of belongingness and to elicit social identity. Similar to the prediction made by Rogers and Lea, we found a positive correlation between social identification and level of posting to the group, as well as a positive correlation between social identification and level of login to the courses' discussion groups (see Table 10). They explained that

adhering to the group norms is a key factor that causes these effects. If the norms are of contributing (i.e., posting) or of frequent login, then the level of social presence may influence these behaviors. The measure "group activity" may serve as an indirect measure of group norms. The correlation between this variable and social identification was weak, and did not mediate the relation between the variables, thus perhaps questioning this explanation. However, there is a large variation in this measure indicating that further research is probably needed.

Regarding the relations between social presence as a subjective quality of a medium and perceived learning, we discuss three results. The positive correlations between the factor "medium as interaction enabling" and cognitive presence, perceived learning as skills, and as sharing opinions are very similar in magnitude to the positive correlations we found between self-presentation and social identification and these variables (see Table 9). Thus, this aspect of the quality of the medium is very close to the other conceptions of social presence. If a medium affords interaction, and the interaction is public rather than private, social identification or group cohesiveness may emerge. Again, it is impossible to say whether there is a support for the claim that social presence affords learning, or that it is merely a by-product. Gorsky et al. (2008) claimed that interpersonal interaction may facilitate learning. But they rigorously stated that learning is an internal mental process, hence the presence of interaction does not necessarily signify learning.

The two other factors, "perception of others" and "medium's impersonality" correlated weakly if at all with all perceived learning variables. As we previously maintained, these conceptualizations may not be valid anymore. Nevertheless, the fact that perception of others did not relate to perceived learning is interesting. It might have stemmed from the educational setting in which this research was done. Distance learners often do not need other students (see e.g., Gorsky et al. 2007), and they need assistance which may be very specific and task-focused (Caspi and Gorsky 2006; Gorsky et al. 2008). Building three-dimensional representations of the other students might seem irrelevant to their goals and learning. Participation in face-to-face tutorial sessions may change the students' "conceptions of learning" and change this relation. We have no information regarding the level of participation in face-to-face classes among this study's participants.

Overall, we can reject the prediction that social presence interferes with perceived learning. All concepts correlated weakly if at all with the statement "the discussion decreased the quality of my learning". Nonetheless, we remind the reader that while there is only weak correlation between social presence and perceived interference, we did not measure *actual* achievement or performance. Thus, while participants may feel they were not impaired by social activities of any kind, it still possible that these activities do compete for mental resources, which otherwise were allocated to increase understanding and gaining more knowledge.

8 Summary

The definitions tested in this study conceptualized social presence in different, although to some extent related, ways. Empirically, self-projection and group identification are close to each other, although theoretically this relation cannot be easily

justified. At the same time, perception of others and group identification related theoretically and empirically to each other. However, quality of the medium, operationalized as the impersonality of the medium, although theoretically should relate to perception of the others (Short et al. 1976) and even to self-projection and social identification, in reality did not.

We found positive relations between some of these concepts and perceived learning. Perceived learning positively correlated with self-projection and with social identification, but not with perception of others. The relations found replicated the observed structure of the three conceptions. We may conclude, therefore, that instructors should encourage social participation and emphasize shared group identity in order to increase perceived learning. The relation to actual performance is yet to be studied.

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Appendix A: Testing mediating effects

The regression weight of social presence as open communication and cohesiveness on cognitive presence was reduced from $\beta = .621$ to $\beta = .581$ by including the importance attributed to the discussion group ($\beta = -0.129$) into the regression, Sobel test $z = 3.597$, $p < 0.001$. The variable frequency of login to the discussion group ($\beta = -.079$), reduced the β to .596, Sobel test $z = 2.331$, $p < 0.05$. The third variable, level of posting to the discussion group did not significantly mediate these two variables, as Sobel's test was not significant.

The regression weight of social presence as group identification on cognitive presence was reduced from $\beta = .523$ to $\beta = .477$ by including the importance attributed to the discussion group ($\beta = -.199$) into the regression, Sobel test $z = 4.018$, $p < 0.001$. The variable frequency of login to the discussion group ($\beta = -.098$), reduced the β to .490, Sobel test $z = 2.687$, $p < 0.01$. Here again, the third variable, level of posting to the discussion group did not significantly mediate the two variables, since the Sobel test was not significant.

The same pattern of results was found when the criterion was skills. The regression weight of social presence as interaction and cohesiveness on skills was reduced from $\beta = .524$ to $\beta = .497$ by including the importance attributed to the discussion group ($\beta = -.089$) into the regression, Sobel test $z = 2.44$, $p < 0.05$. The variable frequency of login to the discussion group ($\beta = -.086$), reduced the β about the same, to .495, Sobel test $z = 2.39$, $p < 0.05$. Level of posting to the discussion group did not significantly mediate social presence as interaction and skills, since the Sobel test was not significant.

The regression weight of social presence as group identification on skills was reduced from $\beta = .532$ to $\beta = .500$ by including the importance attributed to the discussion group ($\beta = -.130$) into the regression (Sobel test $z = 3.09$, $p < 0.005$). The variable frequency of login to the discussion group ($\beta = -.071$), reduced the β to .506 (Sobel test $z = 1.95$, $p = 0.05$). As before, level of posting to the discussion group did not significantly mediate these two variables, since the Sobel test was not significant. It is noted that, at maximum, the mediated variables changed the variability accounted by the predictors by only about 4–5%.

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