What Psychological Factors Enhance a Language Learning Community? Toward Effective CSCL Design for Language Learning Based on a CoI Framework

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Abstract. The current study investigated the relationship between psychological factors and learning behaviors related to the application of a community of inquiry (CoI) framework for learning English as a foreign language (EFL). An online asynchronous discussion was examined, and data included questionnaires assessing perceived psychological factors and communication logs related to the efficacy of the CoI. Results of a path analysis showed that perceived social presence plays an important role in enhancing perceived cognitive presence, which indirectly increases social interaction and deeper discussions.

Keywords: Collaborative learning, Community of Inquiry, Social Interaction

Introduction

As the importance of practical knowledge and skills, particularly 21st century skills [1] such as way of thinking, citizenship, and communication and collaboration, is addressed by educational organizations worldwide, community-based learning environments are gaining popularity. Computer-Supported Collaborative Learning (CSCL) has been examined for years and is often applied to several educational settings. For instance, several researchers have shown effects of collaboration on language learning through active interaction [12]. Furthermore, the effects of the communication medium on language learning in a CSCL have been revealed, particularly in the context of developing self-awareness during video-mediated communication [15].

One key component to designing a CSCL for language learning is to promote active social interaction. Long (1989) indicated that social interaction promotes communication and language acquisition through the active negotiation of meaning and semantics [10]. Practical communication skills are acquired through this negotiation, which is important for learners when faced with communication problems due to a lack of language knowledge. Gass and Torres (2005) suggested the importance of active interaction between learners to obtain effective and comprehensive input to aid

performance [5]. In assessing the role of social media on language learning, several studies have revealed the importance of social interaction on learning, especially the relationship between the use of social cues and active interaction [13], as well as the relationship between social interaction and learning performance [16]. Overall, it appears that social interaction has a positive effect on language learning.

However, in addition to language proficiency, a learner's communication style factors into the enhancing role of social interaction in a CSCL for language learning. In order to design effective collaborative language learning in a CSCL, various psychological factors should be investigated.

The goal of the present study was to investigate the elements contributing to the enhancement of collaborative learning in an English learning community. This was accomplished through the design, development, and evaluation of a CSCL system for language learning that used a "Community of Inquiry" (CoI) framework developed by Garrison and Anderson (2003)[3].

Community of Inquiry (CoI) Framework

A CoI framework consists of three elements: social presence, cognitive presence, and teaching presence. Social presence is defined as "the ability of participants to identify with the community, communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting their individual personalities" [3]. Cognitive presence is enhanced by integrating ideas, exploring relevant information, and so on [3]. Teaching presence is defined as the design, facilitation and direction of cognition and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes [3]. A CoI is "an environment where participants collaboratively construct knowledge through sustained dialogue, which makes possible personal meaning making through opportunities to negotiate understanding [2]. Finally, a CoI provides viewpoints for evaluating the learning environment and learning community, which leads to assessing the design used for collaborative learning.

Goda and Yamada (2012) investigated the relationship between these three CoI components in a Bulletin Board System (BBS), which is part of Asynchronous Computer-Mediated Communications (ACMC) [6]. Their findings revealed that the teaching and cognitive presence were significantly correlated with discussion satisfaction, and social presence was positively associated with the number of utterances.

However, their findings did not mention the relationship between perceived psychological factors and learning behaviors such as the promotion of social interaction and idea integration during online communication using ACMC. Furthermore, they did not suggest a design direction for an effective CSCL based on a CoI framework. The present study addressed these limitations with the following goals:

1:investigate the relationship between perceived factors and learning behaviors for effective CSCL design

2:consider designing collaborative learning support system based on results of the present study and previous research

3: evaluate the present system based on a CoI framework

In the present study, we focused on a learner-centered learning environment. Therefore, we examined social and cognitive presence in the current study.

Experiment 1

Experiment 1 investigated the relationship between perceived CoI factors focused on social and cognitive presence, and expressive social and cognitive presence during an English class using ACMC. This was done to determine an effective CSCL design.

Subjects and Procedure

Seventy-five freshmen at a University participated in Experiment 1 (Male: 38, Female: 37). These students had minimal computer skills and knowledge (such as keyboard typing) required to participate. The online discussion activities gave students additional opportunities to practice their English communication skills out of class. Online news material, "Voice of America (VoA; www.voiceofamerica.com)" was used to create authentic listening and reading materials for students. Increasing comprehensive input, such as reading or audio materials in the target language, promotes quality interaction through negotiation of meaning [9] during second language acquisition (SLA).

The discussion topic, "Three items to carry during an earthquake," was selected, considering students' interest in enhancing motivation, being engaged, and relating previous knowledge and/or experiences to the topic [8]. The online discussion was conducted in the bulletin board system (BBS) of the learning management system (LMS). All students were required to participate in all activities. Each group consisted of four to six students. Students were randomly assigned to each group. Each discussion lasted two weeks, and after one week, a face-to-face instruction was inserted to provide intervention and facilitation from the instructor.

Data Collection

The CoI questionnaire was conducted at the end of the semester. Students' CoI level and learning behavior were measured. The CoI survey, according to Swan et al. (2008) displayed in Appendix A, consists of 34 five-point Likert scale items, and internal consistencies, reported with Cronbach's alpha, were 0.91 for Social Presence (SP: e.g., "Getting to know other course participants gave me a sense of belonging in the course") and 0.95 for Cognitive Presence (CP: e.g., "Combining new information helped me answer questions raised during course activities") [11].

The CoI relationship was evaluated, and students' comments regarding the learner's utterances in discussion activities were encoded with CoI indicators (expressive social and cognitive presences) [2], displayed in Appendix.B in order to determine learning behaviors. The instructor provided most of the feedback and intervention when meeting with students in the classroom. The SP and CP of the CoI provided the focus for asynchronous communication during this study. There were three categories with 12 indicators for SP, and four indicators for CP were adopted for encoding. To increase credibility, they discussed inconsistent encodings and came to agreement for all comments. Garrison et al (2006) highlighted the importance of the unit of analysis for CoI coding [4]. For several years during the 20th century, researchers used the sentence as the unit of analysis [7]. Sentences were employed as a unit of analysis because comments indicated more information. However, the level of detail made encoding procedures more complicated and interpretation much more difficult.

Results

Perception and Utterances of Social and Cognitive Presence.

Fifty-six learners completed the questionnaire and were engaged in the online discussion. Table 1 shows the average CoI questionnaire score for each presence subscale. In order to confirm reliability of each presence in this instrument, Cronbach's alphas were calculated. Table 2 shows the scores related to social and cognitive presence.

Table 1. Average of total scores and Cronbach's alphas for the CoI questionnaire (social and cognitive presence) in Experiment 1

Items	Average Total Score (S.D.)	Cronbach's alpha
Social Presence (9 items)	31.25 (4.85)	0.74
Cognitive Presence (12 items)	41.96 (5.85)	0.86

Path Analysis.

We conducted a path analysis using STATA 12 in order to investigate the relationship between perceived sense of, and behaviors concerned with CoI. We used the total SP scores, CP questionnaire items, which consisted of the CoI scale mentioned above, and the total number of SP and CP utterances as observation variables for this analysis. Fig. 1 shows results of the path analysis. Perceived social presence affects both perceived cognitive presence and utterances of social presence. On the other hand, perceived cognitive presence reduces the number of utterances concerned with social presence. These results suggest that through social interaction, participants were engaged in active discussion as part of a cognitive learning process.

Table 2. Average number of utterances for each presence

Presence	Ave.
Social Presence	3.77
Cognitive Presence	1.55

Discussion for Experiment 1: Effectiveness of the CSCL design

Results show that perceived social presence plays an important role in active CoI, as previous research suggested that social presence is the fundamental factor in CoI [3]. Social interaction seems to promote a comfortable atmosphere to discuss the CoI, confirming significant relationships between "perceived social presence," "perceived cognitive presence," and "utterance of social presence," as well as the relationship between "utterance of social presence" and "utterance of cognitive presence." Results also indicated that perceived social presence has a positive effect on expressive social and cognitive presence directly and indirectly. In order to design an effective CSCL, the establishment of social presence is one key factor that can include the use of emoticons and reply functions. We confirmed several significant relationships between each presence; however, the number of utterances related to social and cognitive presence seem to be small, especially the utterances for cognitive presence (such as information integration and promotion of deep discussion). Cognitive learning sup-

port tools, such as a concept map, might be an important means for enhancing active discussion [14].

Experiment 2

One goal of the present study was to evaluate the effects of CSCL functions on the establishment of social and cognitive interaction, which are based on our CoI findings. The purpose of Experiment 2 was to investigate the causal relationship between CSCL functions, perceived social and cognitive presence, and expressive social and cognitive presence. To accomplish this, we used a CSCL system for language learning [17].

Subjects and Procedure

One hundred and sixty-six freshmen at a University participated in Experiment 2. This experiment was conducted as a class activity. These participants also had the minimal computer skills (e.g., word-processing and email proficiency) required for participation. Subjects were required to participate in an online discussion during the class and discuss a topic provided by an instructor in English for forty minutes. Each group consisted of four or five subjects. Group members were randomly assigned to each group. The discussion topic was, "What do you think about the best ways to select better candidates as future university students?" which considered the subjects' background knowledge.

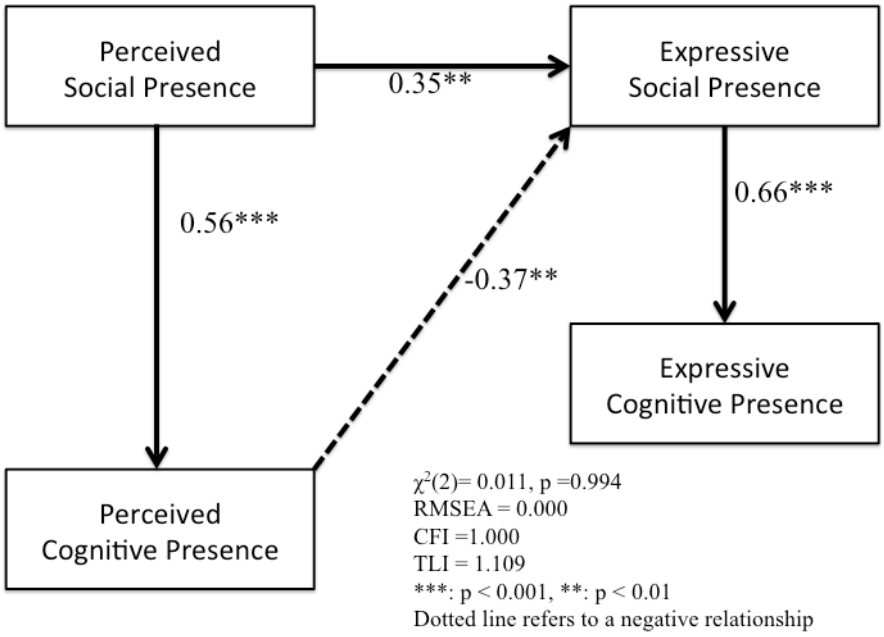

Fig. 1. Path model of the relationship between perceived and expressive presence

The CSCL system, which was used in this study, consisted of a chatbot and a concept map tool "CD-map." The chatbot asks subjects to answer questions regarding the discussion topic, using the Socratic method, before having a discussion with group members. This seems to promote cognitive learning. The "CD-map" allows a subject

to chat with group members while creating a concept map. This function consists of two parts: a communication part in the left pane and idea construction concept map in the right pane. This function allows learners to post their ideas and opinions, register postings as “favorites” (similar to the “like” button in Facebook), use emoticons, and create relationships (such as cause-and-result relationships between postings). In order to create relationships, learners click and drag a posting object in the left pane to the right pane, and then learners create relationships between postings using arrow lines in a concept map. Fig. 2 shows the interface of this system.

Subjects were divided into four groups: with or without a chatbot and with or without concept map tool in “CD-map.” Subjects in the group, which has the system without a concept map, ware allowed to use chat area for communication with other subjects (a concept map was not displayed). Subjects did not use the other system; in other words, subjects used one system/type. Subject numbers in each group were as follows: 39 subjects who had a chatbot and a concept map, 19 subjects who had a chatbot without a concept map, 37 subjects who had a concept map without a chatbot, and 16 subjects who had neither the chatbot nor the concept map (only chat area was displayed).

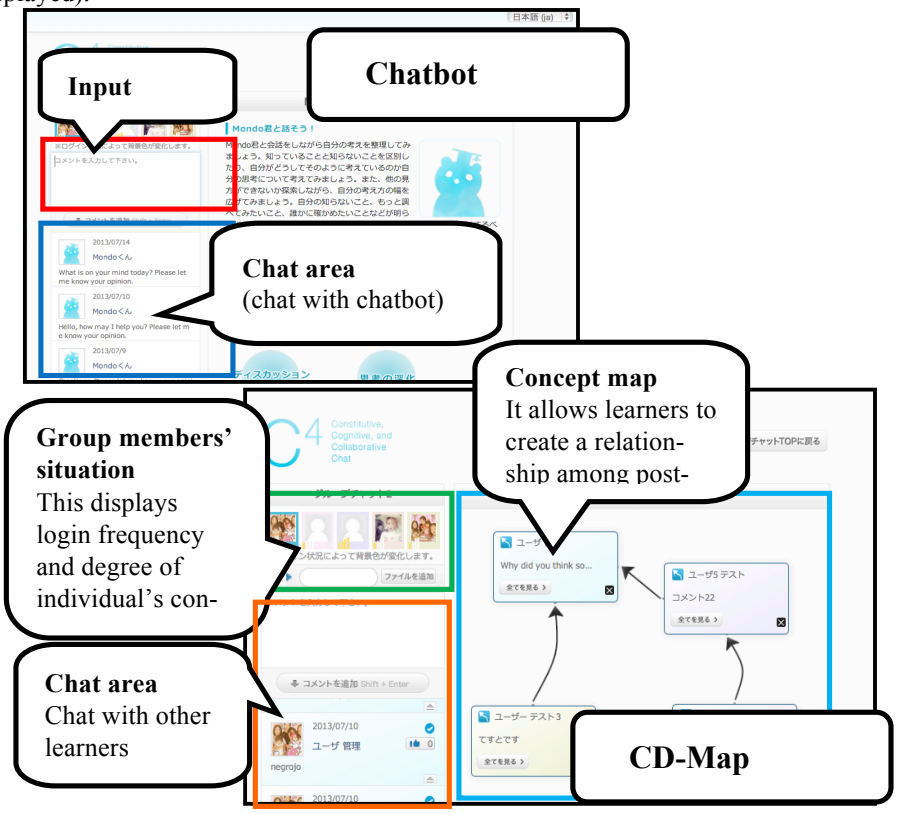

Fig. 2. Interface of the CSCL system used in Experiment 2

Data Collection

The methods of data collection were the same as Experiment 1. We used the same questionnaire for perceived social and cognitive presence and indicator for the categorization of utterances into expressive social and cognitive presence.

Results

Perception and Utterances of Social and Cognitive Presence. One hundred eleven subjects completed the questionnaire and took part in the online discussion. Table 1 shows the average total score for each presence (SD) in each group. Reliability for each presence (Cronbach's alpha) are as follows: social presence (9 items): 0.84, cognitive presence (13 items): 0.91. Each reliability value was statistically acceptable, owing to scores over 0.8.

Table 3. Average total scores on the CoI questionnaire (social and cognitive presence) in Experiment 2

Chat bot	Concept map	Perceived social presence (min: 9; max: 45)	Perceived Cognitive presence (min: 13; max: 65)
Yes	Yes	29.00 (6.31)	39.10 (7.44)
Yes	No	30.63 (6.46)	40.26 (8.58)
No	Yes	30.16 (4.49)	40.41 (7.56)
No	No	27.56 (7.47)	36.19 (9.47)

Table 4. Average number of utterances in each presence

Chat bot	Concept map	Expressive social presence	Expressive Cognitive presence
Yes	Yes	6.74 (6.26)	2.66 (2.29)
Yes	No	11.31 (8.02)	2.16 (2.24)
No	Yes	6.18 (5.78)	2.05 (1.88)
No	No	5.75 (3.71)	1.36 (1.74)

Path Analysis.

We conducted a path analysis using STATA 12 in order to determine the relationship between functions, perceived factors, and expressive factors. Dummy variables were used to differentiate the function used. The variable "Chatbot" was set to 1 when the chatbot was available and 0 when it was not. "Concept map" was set in the same way. Fig. 3 shows the path model among these relationships.

Discussion and Future Work

We conducted practical and comparative research within a University class in order to consider the effective design of a CSCL using a CoI framework. The chatbot and concept maps have slightly significant effects on expressive presence; however, a concept map had a negative effect on the enhancement of expressive social presence. One possible reason for this is that the concept map allows subjects to focus on constructing their own ideas without sharing the concept map function. One of the features of social presence is socio-emotional communication (e.g., using emoticons). Thus, a concept map seems to reduce opportunities to create a social atmosphere during an online discussion. However, the chatbot, which also allows subjects to

construct their own ideas during communication, had a positive effect on the enhancement of expressive social presence, but not on expressive cognitive presence. This might be because the chatbot function seems to enhance readiness to communicate with group members. Thus, such cognitive tools might provide important means for enhancing active discussion.

Expressive cognitive presence had a direct positive effect on perceived social presence and an indirect effect on perceived cognitive presence. Several expressions, such as the question and statement of a stance, are concerned with both social and cognitive presence; therefore, expressive cognitive presence can lead to the enhancement of perceived social and cognitive presence.

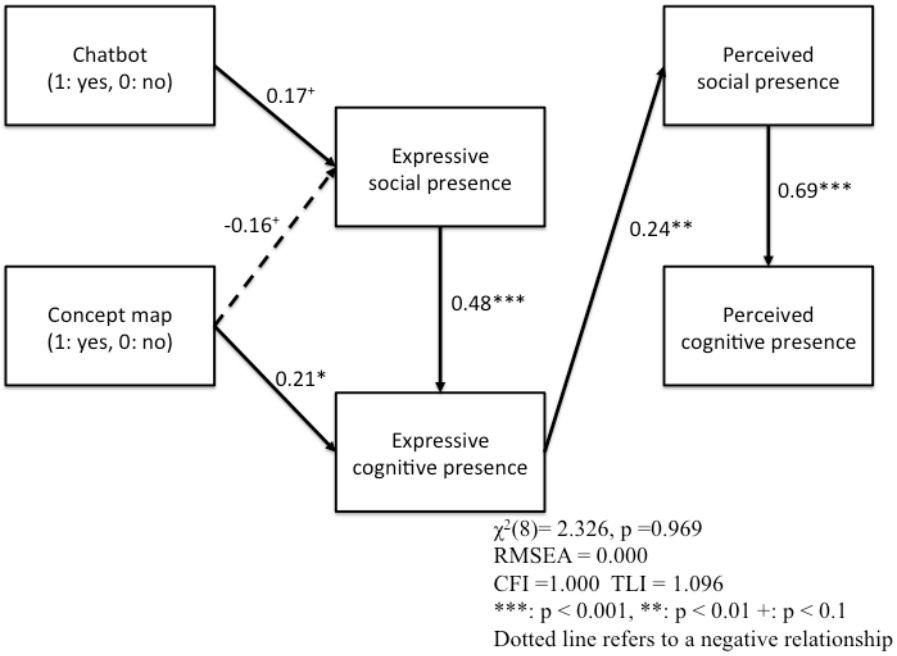

Fig. 3. Path model assessing the relationship between functions, perceived presence and, expressive presence

In Experiment 1, a path from the perceived to the expressive appeared in the model, but in Experiment 2, a path from the expressive to the perceived existed with statistical significance in the model. The differences of two experiments' results might have been caused by presence or absence of the collaborative learning func-tions, chatbot and concept map. The functions might directly work on learners' behavior (i.e., utterances) since they were designed to support establishing learners' social and cognitive presences. Interactions with the functions help learners express their ideas in the group discussion, and this would be a reason to have the path from the expressive to the perceived in the Experiment 2 model. Then, behavior came first and the behavior might affect their perceived presences. On the other hand, without the functions, students might have to interpret situations and use a cognitive approach first, which might case the path from the perceived to the expressive. Previous research have not

come to the agreement about the relationships between the perceived and the expressive in CoI and further investigation should be necessary.

Future research should address the following three points. One involves the influence of sharing the concept map function. Yamada (2010) suggests that sharing a concept map enhances perceived social presence [14]. The relationship between sharing a concept map function and the enhancement of social and cognitive pres-ence should be investigated. Secondly, future research should investigate the relationship between the use of these functional tools, language learning performance, and the CoI framework out-of-class setting for a long term. In the next fiscal year, we will be collecting and analyzing data related to these two points. Third point recommends to investigate the concrete relationship between use of the functions used in experiment 2. Utterances in chatbot and the use of concept map seem to affect on the quality and quantity of utterances in chat with other learners. Chatbot seems to support readiness for online discussion in English. This research focused on quantitative data analysis, but next research should analyze the relationship between the use of the functions by mixing qualitative research methods. Therefore, we will be able to further determine effective designs of a CSCL for language learning.

Conclusion

The results in two experiments indicated that the communication tool added several functions, which support social and cognitive learning, promoted expressive elements of CoI directly. Expressive CoI elements played important roles in the enhancement of the sense of community for learning. In CoI model, researchers indicated the relationship between social and cognitive presences [2], [3], [4], however, it was not clear what element(s) supports this relationship. This research suggested the learning system design which is possible to support active collaborative learning based on CoI framework. However, several points, which we should improve, were also found, as mentioned in Discussion. Future research should be required to be conducted, in order to establish effective model for the design of CSCL using CoI framework.

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Appendix A Community of Inquiry Instrument (Swan et al, 2008)

#	Category	Item
1	Teaching	The instructor clearly communicated important course topics
2	presence	The instructor clearly communicated important course goals
3		The instructor provided clear instructions on how to participate in course learning activities.
4		The instructor clearly communicated important due dates/time frames for learning activities.
5		The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
6		The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking
7		The instructor helped to keep course participants engaged and participating in productive dialogue.
8		The instructor helped keep the course participants on task in a way that helped me to learn.
9		The instructor encouraged course participants to explore new concepts in this course.
10		Instructor actions reinforced the development of a sense of community among course participants.
11		The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
12		The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.
13		The instructor provided feedback in a timely fashion.
14	Social	Getting to know other course participants gave me a sense of belonging in the course.
15	presence	I was able to form distinct impressions of some course participants.
16		Online or web-based communication is an excellent medium for social interaction.
17		I felt comfortable conversing through the online medium.
18		I felt comfortable participating in the course discussions.
19		I felt comfortable interacting with other course participants.
20		I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
21		I felt that my point of view was acknowledged by other course participants.
22		Online discussions help me to develop a sense of collaboration.
23	Cognitive	Problems posed increased my interest in course issues.
24	presence	Course activities piqued my curiosity.
25		I felt motivated to explore content related questions.
26		I utilized a variety of information sources to explore problems posed in this course
27		Brainstorming and finding relevant information helped me resolve content related questions.
28		Online discussions were valuable in helping me appreciate different perspectives.
29		Combining new information helped me answer questions raised in course activities.

30	Learning activities helped me construct explanations/solutions.
31	Reflection on course content and discussions helped me understand fundamental concepts in this class.
32	I can describe ways to test and apply the knowledge created in this course.
33	I have developed solutions to course problems that can be applied in practice.
34	I can apply the knowledge created in this course to my work or other non-class related activities.

Appendix B Social and Cognitive presence indicator (Garrison, 2011)

Social presence (pp. 38-39)

Category	Indicator	Definition
Interpersonal communication	Affective expression	Conventional expressions of emotion or unconventional expressions of emotion, including repetitious punctuation, emoticons, etc.
	Self-disclosure	Presents biographies, details of life outside of class, or expressing vulnerability
	Use of humor	Teasing, cajoling, irony, understatement, sarcasm
Open communication	Continuing a thread	Using the reply feature of software, rather than starting a new thread
	Quoting from others' messages	Using software features to quote another's message in its entirety, or cutting and pasting selections from others' messages
	Referring explicitly to others' messages	Direct references to contents of others' posts
	Asking questions	Asking questions of other students or the moderator
	Complimenting, expressing appreciation	Complimenting others or the contents of others' messages
	Expressing agreement	Expressing agreement with others or the content of others' messages
Cohesive	Vocatives	Addressing or referring to participants by name
	Addresses or refers to the group using inclusive pronouns	Addresses the group as "we," "us," "our," etc.
	Phatics, salutations	Communication that serves a purely social function: greetings, closures

Cognitive presence (p. 52)

Phase	Descriptor	Indicator
Triggering event	Evocative(inductive)	Recognize problem
		Puzzlement
Exploration	Inquisitive(divergent)	Divergence
		Information exchange
		Suggestions

		Brainstorming
		Intuitive leaps
Integration	Tentative(convergent)	Convergence
		Synthesis
		Solutions
Resolution	Committed(deductive)	Apply
		Test
		Defend