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Collaborative Interaction in EFL Web-Based Debates: How Do Learners Develop Socially Constructed Knowledge?[1]

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Abstract

This paper focuses on interactions between Japanese learners of English as a foreign language using computer-mediated communication (CMC) in the second language (L2) classroom. CMC provides potential benefits for L2 learning because it enables a broader range of interactions. In this study, a synchronous online debate was conducted using a Bulletin Board System (BBS). Interactions through the on-line debates were analyzed based on Gunawardena, Lowe, and Anderson's (1997) "Interaction Analysis Model" for examining the social construction of knowledge. Based on their methods and theory of social constructivism, an investigation was made on how the on-line interactions could be qualitatively assessed, and on whether negotiations between the participants would generate the construction of knowledge. In this paper, two representative debate logs were analyzed to scrutinize how knowledge was co-constructed through social interaction. The value of debates for pedagogical use was also reconsidered, and new criteria for the debate evaluation were proposed.

Introduction

The main purpose of this paper is to qualitatively analyze CMC based interactions between Japanese learners of English as a foreign language (EFL). While there have been some studies on CMC in L2 settings conducted, very few studies have explored the quality of L2 learning through CMC. The major purpose of this study, thus, is to conduct a qualitative analysis of online debates in L2 settings.

In this research, synchronous on-line debates are conducted using a BBS. In particular, this paper focuses on the interactions in the online debates, because debates by their nature allow the participants to express different points of view, which would be assumed to facilitate active interactions between the debaters. It is further conceived that participants' learning will be deepened in active interaction.

To obtain an analytical model and evaluation methods for this study, the "Interaction Analysis Model" by Gunawardena, Lowe, and Anderson (1997) is of particular interest here. Based on the methods used in their study of the social construction of knowledge in computer conferencing, the greater part of this paper is devoted to the examinations of on-line debates between Japanese EFL learners and the co-construction of knowledge observed in the debates.

Review of Literature

Some characteristics of CMC in L2 settings

Studies that compare face-to-face interaction and CMC reported that CMC has several benefits for language learning. For example, CMC demands no turn-taking competition (Kitade, 2000), provides for more equal participation (Beauvois, 1992; Chun, 1994; Kelm, 1992; Kern, 1995) and allows shy and less motivated learners to interact with others (Beauvois, 1992; Kelm, 1992). Another advantage is that the learner re-examines and edits the text-based communication to make the interaction more meaningful and comprehensible. In other words, learners are more aware of the language structures that they and their peers use to compose messages (Lee, 2002). Subsequently, this may lead them to attend to feedback or attempt frequent self-correction. Learners benefit from a focus on form (Lightbown & Pienemann, 1993; Pica, 1996) in attempting to overcome incorrect target language features. This internal monitor facilitates language acquisition.

Other studies indicate that CMC enables learners to increase their language production and complexity because the participation structure is significantly different from a typical classroom interaction (Chun, 1994; Kern, 1995). For example, a reduction of teacher talk in CMC is a benefit of learners' language production. Learner-learner on-line interaction, therefore, should result in greater language production than that achieved in teacher-learner interaction. Other studies show that on-line interaction in language learning not only supports the development of students' language skills but also fosters students' interest and motivation in language learning in general (Cononelos & Oliva, 1993; Warschauer, 1996).

Those observations are the fruit from the studies of CMC in L2 settings. However, very few studies have been conducted to make a qualitative assessment of L2 CMC interaction. Therefore, in this paper, the qualitative aspects of the interaction by EFL learners will be focused on.

Gunawardena, Lowe and Andersons' Model (1997) (See Appendix 1)

Gunawardena, et al. developed the “Interaction Analysis Model” for examining the social construction of knowledge in computer conferencing. They conducted a global on-line debate and analyzed the logs obtained from it. The purpose of their study was to develop an assessment system of the quality of interactions and the quality of the learning experience in a computer-mediated conferencing which has not been satisfactorily investigated.

Their research was based on the studies by Garrison (1991), Henri (1991), and Newman, et al.'s (1995) models. They pointed out, however, that previous studies did not fully examine how to evaluate the process of knowledge construction that occurs through social negotiation in CMC. Moreover, they stated that the definitions of interaction in the models employed were “either unclear or not very applicable to the pattern of interaction observed in the debate.” (p. 402)

What is social constructivism? There are several theoretical positions on social constructivism in academic circles. Some of them are based on Vygotsky's social development theory. Vygotsky (1978) states, “Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (inter psychological) and then inside the child (intra psychological).” (p. 57)

He stresses the influence of cultural and social contexts in learning and he holds the view that learning first takes place in the interaction between two people (inter psychological) before it becomes a mental process for the individual (intra psychological). In this research, CMC is used for on-line debate, because CMC is thought to provide an appropriate environment that supports collaboration and social interaction. Collaboration occurs when learners share others' views and they make a coordinated effort to solve problems together. Collaboration can increase social interaction and social interaction can develop the construction of knowledge, which leads to improved learning outcomes and promote deep learning. Based on the social constructivist theory, Gunawardena, et al. developed a constructivist model of CMC interaction, which is visualized in Figure 1. Each piece represents contributions by one or more persons based on experience, research, theory, etc.

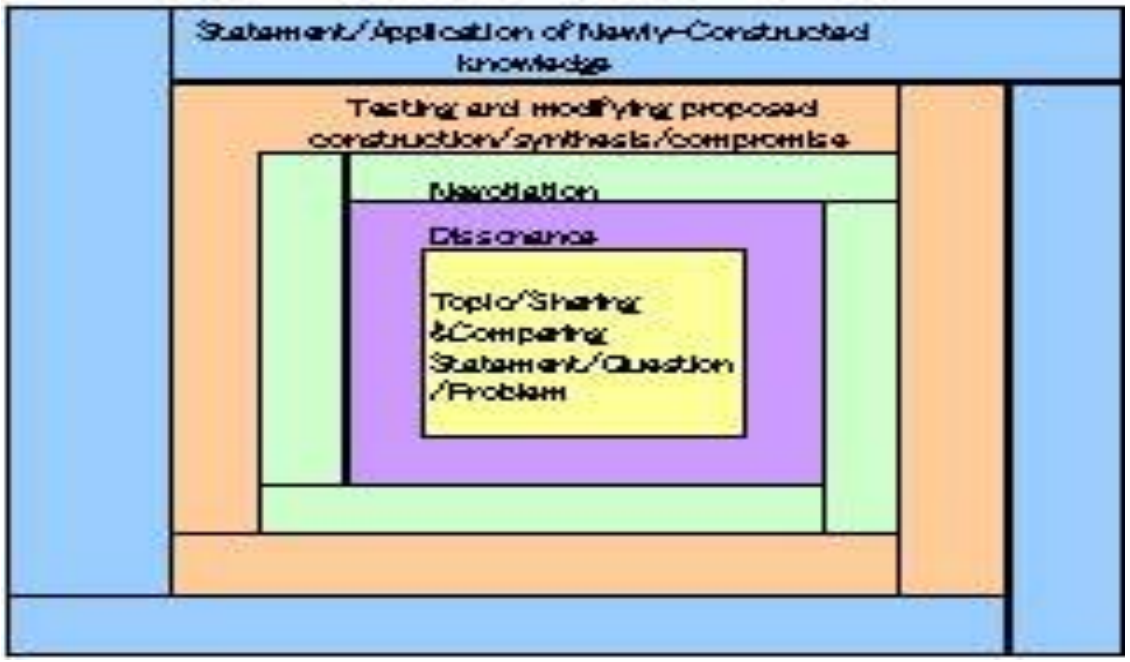

Figure 1: A constructivist model of CMC interaction (Gunawardena, et al., 1997: 411)

Gunawardena et al.'s Interaction Analysis Model, which encompasses five phases and qualitatively assesses CMC interactions, is based on the criteria described in Appendix 1. By elaborating on the model, it can be applied to this study as an analytical tool. Gunawardena et al. could confirm that their Interaction Analysis Model enabled them to provide the means to determine that knowledge construction occurred within a group through interaction among participants.

Research

Gunawardena, et al. conducted an on-line debate in an L1 setting, in which most of the participants were teachers and graduate students who were involved in distance education. By using the “Interaction Analysis Model”, they confirmed that the co-creation of knowledge and negotiation of meaning had occurred in the process of interaction. In the

present study, I will look at how I conducted on-line debates between Japanese learners of English and analyze the interactions using Gunawardena et al.'s "Interaction Analysis Model". I am particularly concerned with how the interaction can be qualitatively assessed and whether negotiation between the participants will bring about the construction of knowledge.

Purpose of the Research

The most distinguishing feature of this study is to qualitatively examine how learners of English develop the social construction of knowledge through CMC. This study provides a qualitative analysis of the CMC interaction between NNSs in an e-learning context. I understand that the effectiveness of CMC is brought about when it is used in telecollaboration, in which the participants are located in different places and work together through CMC. In this research, however, each pair is requested to sit in the same room and to join in the debates. Although the conditions under which this study was conducted may have affected the interaction among the participants, the learning environment presented here, I assume, is the one that is accessible in ordinary school settings. Also, the bottom line is how we use computers. According to Chun (1994), "what computers can facilitate though, is human interaction among people in the same room as well as continents apart." (p. 17)

Procedures

Experimental research on on-line debates between Japanese EFL learners of English was carried out. Using a web-based debate interface, which was originally developed for this study, how Japanese learners of English develop a social construction of knowledge through CMC was investigated. Three pairs of university students learning English as a foreign language participated in six debates and each of the pairs exchanged messages around the propositions presented by posting messages on a BBS. Two debate logs are chosen here to scrutinize how the participants construct their knowledge as a result of the interaction.

Tasks and participants

Synchronous online debates through BBS were carried out in June 2002. Six students[2] (four females and two males), whose ages range from 19 to 22, voluntarily participated in the research. All were undergraduate students enrolled in a general English course at the Hyogo University of Teacher Education, and all sessions were not related to their academic results. All participants were native speakers of Japanese and had been learning English for more than seven years. There were seven sessions in total, and each session lasted for about 90 minutes. Some portions of the second-grade level of STEP (the Society for Testing English Proficiency) test were administered in the first session to evaluate their English proficiency. The maximum score was 50 points, and their results were as follows: A:40, B: 28, C:24, D:24, E:22, F:35.

To ensure that all learners would feel comfortable using the computers, practice sessions were conducted before data collection began. Therefore, the first topic in the debate was omitted from the data analysis of this research. The participants were paired throughout the sessions according to their schedule availability.

The following six propositions were used for the debates:

- Cellular phones use should be banned in public places.
- English should not be included in the entrance examination.
- English should be taught in every primary school.
- Telephone is better than e-mail.
- Juku (cram schools) should be abolished.
- Campus should be downtown.

All the participants were given the propositions in advance and they also knew which side (affirmative or negative) they had to take. They were required to prepare their opinions as constructive arguments for each proposition in English. In the session, twenty minutes were allotted for writing constructive arguments on the BBS. The first rebuttal argument was always started from the con side, but in the first few sessions, the participants were confused and did not follow the rule. After posting their constructive arguments, they started exchanging their rebuttal arguments for about 50 to 60 minutes.

The interface on the web site

I developed the original interface using a web, as shown in Figure 2. The web browser displays three windows. The left window shows the information which helps the participants construct their opinions. In the right window, the BBS, the participants post their messages. The top window shows several icons, each of which is linked to an on-line dictionary, word lists, and useful expressions for debates, and search engines.

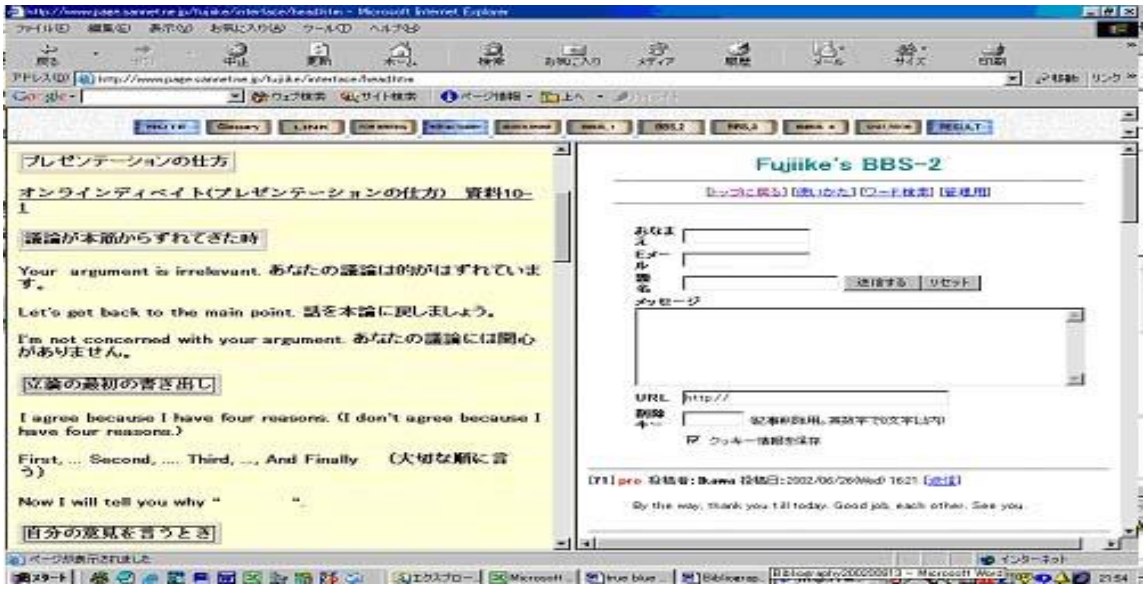

Figure 2. Original interface

Use of on-line scaffoldings

In this research three on-line "scaffolding" devices were prepared to facilitate the interaction. The idea of scaffolding is often referred to by educational psychologists who advocate Vygotskyan approaches to learning and teaching. This approach is concerned with learning in which a social interaction between an expert and a novice takes place. In this situation, an expert or a teacher first jointly does most of the tasks with the child. Gradually, however, the child becomes able to handle the tasks on his own and the teacher's temporary supports are removed until they are no longer necessary. The supportive action by the teacher is called "scaffolding" (Newman, Griffin and Cole, 1989). I assumed the on-line devices I designed on the web page would support the participants to do the tasks and would be less frequently used when they became more competent debaters. The devices included a list of useful expressions for debates, glossaries, and an on-line dictionary.

A collection of useful expressions for the debate could be accessed from one of the icons allotted at the top of the window. Some basic and frequently used expressions for debating were listed and the participants were able to organize effective text structures by making use of them. Moreover, using useful expressions seemed to help to make a natural flow of argument.

Next, I will explain how the on-line dictionary was used by the participants. The online dictionary is a very strong tool for language learners. One of the advantages of using an online dictionary is that an entry found in the Japanese-English dictionary can be instantly switched into the English-Japanese one. With this process, we can check whether the English word found in the dictionary is equivalent to the Japanese counterpart.

Data analysis

The data were analyzed focusing on the interactions based on the "Interaction Analysis Model" by Gunawardena, et al. (1997).

A) Inter-rater reliability

To analyze the interaction qualitatively, two raters independently evaluated every log posted in the BBS based on the "Interaction Analysis Model" by Gunawardena et al. Both raters had extensive experience in teaching English as a foreign language (EFL) in Japan and understood the "Interaction Analysis Model". The inter-rater reliability was calculated by coefficient reliability (CR) by Holsti (1969, cited in Garrison, Anderson, and Archer, 2001) and kappa (&kappa) by Cohen (1960).

CR is a percent-agreement measure in which the number of agreements between the first rater and the second-rater is divided by the total number of coding decisions. Cohen's kappa is a chance-corrected measure of inter-rater reliability using a computational procedure. The results of the CR of three dyads were .88, .92, and .92 respectively, indicating a high level of agreement between the raters.

In addition to the CR, Cohen's kappa was calculated. According to Cohen, high reliability should range between .80 and .90. The results of kappa were .84, .85, and .81, which indicate a high level of agreement between the raters. (See Appendix 2[2])

B) Number of each phase

Since the interaction analysis is a nominal evaluation whose characteristics are descriptive and qualitative, there were some debate logs in which it was hard to reach an agreement between the two raters. Raters discussed these logs at length until the disagreements were resolved.

Table 1.
Numbers of total messages in each phase by each dyad

	Dyad A	Dyad B	Dyad C
Phase I	28	32	45
Phase II	64	47	71
Phase III	4	5	5
PhaseIV	0	0	0
Phase V	0	0	0

Table 2.
Numbers of Phase III by each dyad

	1	2	3	4	5	6	Total
Dyad A	2	1	0	1	0	0	4
Dyad B	0	2	1	1	1	0	5
Dyad C	1	1	2	0	0	0	4
Total	3	4	3	2	1	0	13

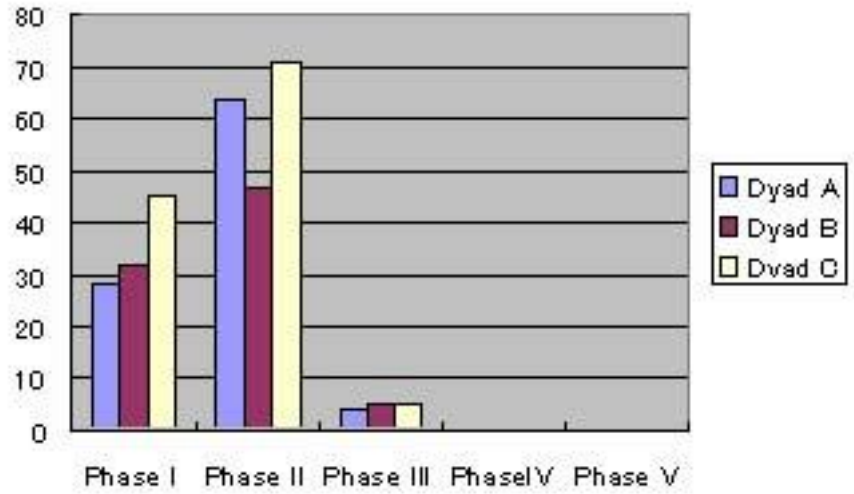

Figure 3: Total numbers of messages in each phase by each dyad

The number of each phase by each dyad is shown in Table 1 and Figure 3. All the constructive arguments were classified into Phase I, and most of the arguments in rebuttal sessions belonged to Phase II, where cognitive dissonance or inconsistencies among ideas were expressed. The debate format seemed to hinder participants from arriving at a compromise or synthesis, but some arguments were able to be classified into Phase III

where participants changed their understandings or constructed new knowledge as a result of the interaction. The number of Phase III by each dyad is shown in Table 2. This issue will be dealt with later.

Proposition and development of argument

Unlike ordinary face-to-face debates, about 45% of the constructive arguments posted at the beginning of the debates did not develop into further arguments. For example, in one of the games, the affirmative side posted four constructive arguments but the pair argued only one of them. One of the factors which constrained the on-line debate is time. Fifty to sixty minutes is not enough for the participants to exchange their messages. This restricted the expansion of an argument, and, as a result, only a few constructive arguments were developed into a debate.

Another characteristic of our on-line debates which contrasts with ordinary face-to-face debates is that some messages exchanged are classified as Phase III, which is "the compromise or synthesis of the proposition". In an ordinary debate, it is difficult to reach a compromise or a synthesis on the propositions because either side has to present a more convincing argument to win the debate game. However, our data shows new ideas and compromised views that emerged in Phase III as a result of social interaction.

By analyzing two debate logs I will examine how knowledge is co-constructed through social interaction. In the following analyses, the English language used by the students has been altered a little for clarity, but not to the extent that the intention of the contributor is changed.

Analysis of debate logs

A) A telephone is better than e-mail. (A vs B) (See Appendix 3)

Both the affirmative and negative sides posted three constructive arguments. Each is classified as Phase I, i.e., "Sharing/comparing of information." The affirmative side supported the argument and posted three constructive arguments, which were: (1) People can directly understand the feeling of the people on the other side, (2) It is sometimes uncertain whether or not the addressee has received e-mails, and (3) E-mail causes misunderstandings.

The negative side posted three constructive arguments as well, which were: (1) People need not worry about the other party, (2) Words can be chosen more carefully using e-mail, and (3) E-mail is cheaper than the telephone.

Within these six constructive postings, the argument was developed around one posted by the affirmative side: "People can directly understand the feeling of those on the other side." The first posting from the negative side [043][4] was "We also express our feelings by sending e-mail", which was judged as operation A, Phase II "Identifying and stating areas of disagreement". From [043] to [045] both sides exchanged messages, which were all judged as "Phase II/A" messages, claiming strengths of the telephone and e-mail. In [046] the affirmative side wrote "Yours is an irrelevant argument. Get back to the main point." Here the affirmative side controlled the flow of the discourse. The

negative side agreed and the argument progressed at the pace of the affirmative side. The affirmative side gave a further argument, "In case of an emergency, would you still want to use e-mail [048]?", which is classified as "Phase II/B", "Asking and answering questions to clarify the source and extent of disagreement." After this posting until [051], both sides argued which medium was more useful or efficient in the case of emergency and all the arguments were judged as Phase II. Then, they went back to one of the arguments, "Which is more affordable?" The affirmative side agreed that the debater accept it as the fact and she seemed to have no intention to argue further about money matters. In [052] she put, "It's true. E-mail is cheaper but when you have many things to talk about, the telephone is better [Phase II/A]." In conclusion, she added, "Mail can't work in the case of an emergency." The affirmative side ended up this argument by claiming, "Mail and telephone have their roles [052]." The argument stopped here but this statement could be accepted by the negative side because in the process of argument both sides seemed to have noticed that both e-mail and telephone have their advantages and disadvantages. This is classified as "Phase III"; "Negotiation of meaning/co-construction of knowledge." In this case, it is operation D which is "Proposal and negotiation of new statements embodying compromise, co-construction." After exchanging their arguments several times, one debater reached the stage of "Phase III". The message implies that a good discussion about telephone and e-mail could not be held unless the roles of each medium are understood. In an ordinary oral debate, this process should be avoided because it is less convincing to propose a compromised argument, but we could say that the participants tried to transform the argument so that they could have an "agreement" as a result of the interaction. We judged this as a co-construction of the new knowledge through social interaction.

B) A telephone is better than e-mail. (C vs D) (See Appendix 4)

In this session, the first messages posted by both sides included six constructive arguments in total [140, 141], which were all classified as "Phase I" i.e., "Sharing/comparing of information". Throughout the session, however, one constructive argument posted from the affirmative side, "E-Mail causes misunderstanding [140]" was discussed.

The negative side claimed that misunderstandings which happen in exchanging e-mail would be avoided by carefully choosing language [142] and that what was good about e-mail was that it is possible to express what can't be said on the phone without worrying about the language used [142]. The affirmative side showed disagreement, raising "junk e-mail" as a counterexample. She implied that annoying e-mail was a result of communication in which the senders had never considered how their language irritated the receivers [143]. The negative side pointed out that the same thing happened by using a telephone and if the price was cheaper they would choose e-mail [144]. Again the affirmative side argued that we are more aware of the language when we talk on the phone and that people are more irresponsible when they use e-mail [145]. These messages were classified as Phase II/A. After exchanging those arguments, Phase III: "Negotiation of meaning/co-construction of knowledge" Operation D: "Proposal and negotiation of new statements embodying compromise, co-construction" appeared in [147]. The affirmative side shifted attention from the issue of miscommunication to the nature of interpersonal communication, stating that if one cannot build a closer relationship without e-mail, then

it is not a true friendship. To have good communication, one needs to be thoughtful of others with whom they are communicating. The student developed her idea further to argue that if someone gets used to communicating without thoughtfulness, they will not be able to communicate well. Although this argument was of the debate theme of "Telephone is better than mail", participants started discussing what good communication was and they deepened their ideas as a result of the social interaction between the participants. This clearly showed that a series of arguments can be transformed from a specific and simple one of "which is better, A or B?" type question to a higher-order problem such as "How should communication be carried out?"

Discussion

Here I would like to reconsider the value of debate for pedagogical use. Debates, by their nature, allow participants to have different points of view, which facilitate active interactions between the debaters. This study was able to confirm that not only conflicts of opinions occurred, but also compromise (i.e., co-construction of knowledge) during on-line debate sessions. While persuading others who had different viewpoints, the participants learned how to better organize their ideas by externalizing and reflecting on their thoughts through the use of the BBS.

The existence of other people served to deepen their understandings and they were able to become much more competent debaters. From such points of view, I can say that debate is a very effective activity for pedagogical purposes.

What the traditional debate format hindered was the desire of the participants to reach a compromise or a synthesis of the propositions (Gunawardena, et al., 1997), but this research shows that in some sessions the participants were able to reach a compromise and synthesis of the different positions. Although there were few, some messages were evaluated as Phase IIIs, in which participants constructed knowledge collaboratively.

As the analysis of the session on "Which is better, telephone or e-mail?" shows, the participants discussed the strengths of each medium, and their arguments developed into the issue of the fundamental nature of communication. One participant claimed, "E-mail and telephone have their roles". This argument might be evaluated as indecisive and weak in the traditional debate. However, when we observed it from the social constructivism viewpoint, the argument could be considered to have deepened the argument. That is, the participants might have felt uncomfortable about the way they debated the topic and have been aware that they should have been more specific so that more constructive arguments could be generated.

The analysis of online debates in this study yielded significant implications on the use of debate for pedagogical purposes. In the traditional face-to-face debates, highly evaluated aspects of the participant's behaviors have been, for example, "logic", "analysis", "argument", "evidence", "delivery", and "questions and answers". As far as evaluation is concerned, educational debates in the English classroom are still being carried out using these criteria mentioned above. According to Matsumoto (2001), however, this judging system disappeared in the early 1970s in the field of formal debating in Japan. Here I would like to propose how the debate, including on-line debate, should be evaluated in the classroom. In this study, I evaluated the interaction using three criteria, which were: quantity, persuasiveness, and organization. The participants were

informed of those criteria beforehand. We believe that it is necessary to decide the winners or losers to enhance the participants' motivation as is done in the traditional debate.

Matsumoto (2001), discussing evaluation methods of the debate, claimed that rather than by using the criteria such as "delivery", and "questions and answers", the debates should be judged by comparing and examining the arguments each party posted, and the team which presents the most collaborative and constructive ideas in the very last session wins. That is, to make the interaction more collaborative, we should rate the performance based on the presentation of new and better ideas, newly constructed knowledge, or showing the solution to the problem. All of these contribute to the co-construction of meaning. This decision-making process makes the debate not just a fun game, but a true problem-solving task and encourages participants to become more competent debaters.

Conclusion

The most important aspect of this study has been a qualitative analysis of CMC interaction. The analyses were made on how the Japanese NNSs of English at the college level interacted with each other and how they collaboratively constructed knowledge.

The analyses indicated that the co-construction of knowledge through social interaction occurred during the sessions, and that on-line debate was an excellent medium for generating “Phase II” arguments; expressing cognitive dissonance or inconsistency among ideas. Although the debate format did seem to hinder the participants from arriving at compromise or synthesis of ideas, some “Phase III” arguments expressing co-construction of knowledge appeared. Therefore, it would be interesting to utilize Gunawardena et al.'s model to analyze different types of CMC formats such as e-mail exchanges and computer-assisted classroom discussions to determine if they support or hinder the co-construction of knowledge through social negotiation.

This research was conducted with only small groups of participants (N=6), and all of them knew each other. As a result, further research is needed to examine the effects of other interactional variables, including how participants exchange their opinions in a larger scale situation, such as overseas teleconferences. Finally, further research into NS-NNS interactions in a similar forum would be valuable.

Notes

1. This study derives from my Master of school education thesis presented to Hyogo University of Teacher Education in 2002. (Fujiike, 2002)
2. To maintain the confidentiality of participants, they are identified by one alphabetical letter from A to F.
3. The first coder's decisions are read horizontally and the second coder's decisions are read vertically. Numbers on the diagonal indicate agreement between the coders. Numbers off the diagonal indicate disagreement. The disagreements between two raters were worked out through discussion until an agreement was met.

4. The head of each message indicates the following: "[041]": The first digit "0" refers to Dyad A, "1" to Dyad B, and "2" to Dyad C. The other two digits means a serial number of the messages posted between the pairs. "Con: B" represents that a contributor B is on the negative side. "Pro: A" represents that a contributor A is on the affirmative side. "2002/06/20 16:50": Date and Time.

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Appendix 1: Interaction Analysis Model (Gunawardena, et al., 1997)

PHASE I: SHARING/COMPARING OF INFORMATION. Stage one operations include:

- A statement of observation or opinion [PhI/A]
- A statement of agreement from one or more other participants [PhI/B]
- Corroborating examples provided by one or more participants [PhI/C]
- Asking and answering questions to clarify details of statements [PhI/D]
- Definition, description, or identification of a problem [PhI/E]

PHASE II: THE DISCOVERY AND EXPLORATION OF DISSONANCE OR INCONSISTENCY AMONG IDEAS, CONCEPTS, OR STATEMENTS. (This is the operation at the group level of what Festinger calls cognitive dissonance, defined as an inconsistency between a new observation and the learner's existing framework of knowledge and thinking skills.) Operations which occur at this stage include.

- Identifying and stating areas of disagreement [PhII/A]
- Asking and answering questions to clarify the source and extent of disagreement [PhII/B]
- Restating the participant's position, and possibly advancing arguments or considerations in its support by references to the participant's experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate a point of view. [PhII/C]

PHASE III: NEGOTIATION OF MEANING/CO-CONSTRUCTION OF KNOWLEDGE

- Negotiation or clarification of the meaning of terms [PhIII/A]

- Negotiation of the relative weight to be assigned to types of argument [PhIII/B]
- Identification of areas of agreement or overlap among conflicting concepts [PhIII/C]
- Proposal and negotiation of new statements embodying compromise, co-construction [PhIII/D]
- Proposal for integrating or accommodating metaphors or analogies [PhIII/E]

PHASE IV: TESTING AND MODIFICATION OF PROPOSED SYNTHESIS OR CO-CONSTRUCTION

- Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture [PhIV/A]
- Testing against existing cognitive schema [PhIV/B]
- Testing against personal experience [PhIV/C]
- Testing against formal data collected [PhIV/D]
- Testing against contradictory testimony in the literature [PhIV/E]

PHASE V: AGREEMENT STATEMENT(S)/APPLICATIONS OF NEWLY-CONSTRUCTED MEANING

- Summarization of agreements(s) [PhV/A]
- Applications of new knowledge [PhV/B]
- Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking(cognitive schema) have changed as a result of the conference interaction [PhV/C]
- Interaction analysis model for examining social construction of knowledge in computer conferencing.

Appendix 2

Inter-rater reliability

A vs B k=0.94 CR=0.873%

		RATER 1														
		PhI/A	PhI/B	PhI/C	PhI/D	PhI/E	PhII/A	PhII/B	PhII/C	PhIII/A	PhIII/B	PhIII/C	PhIII/D	PhIII/E	others	Total
RATER 2	PhI/A	27														27
	PhI/B							1								1
	PhI/C			1												1
	PhI/D															
	PhI/E															
	PhII/A						23	4	4	1						37
	PhII/B							21								21
	PhII/C								5							5
	PhIII/A															
	PhIII/B															
	PhIII/C															
	PhIII/D						1	1	1				3			6
	PhIII/E															
	others														6	6
	Total	27		1			29	27	10	1			3		6	104

C vs D k=0.93 CR=0.92%

		RATER 1														
		PhI/A	PhI/B	PhI/C	PhI/D	PhI/E	PhII/A	PhII/B	PhII/C	PhIII/A	PhIII/B	PhIII/C	PhIII/D	PhIII/E	others	Total
RATER 2	PhI/A	30														30
	PhI/B															
	PhI/C															
	PhI/D				2											2
	PhI/E															
	PhII/A						20						1			21
	PhII/B							13	3							16
	PhII/C								11							11
	PhIII/A															
	PhIII/B												2			2
	PhIII/C											1	1			2
	PhIII/D															
	PhIII/E															
	others														3	3
	Total	30			2		20	13	14			1	4		3	87

E vs F k=0.91 CR=0.92%

		RATER 1														
		PhI/A	PhI/B	PhI/C	PhI/D	PhI/E	PhII/A	PhII/B	PhII/C	PhIII/A	PhIII/B	PhIII/C	PhIII/D	PhIII/E	others	Total
RATER 2	PhI/A	37														37
	PhI/B															
	PhI/C			1												1
	PhI/D				7											7
	PhI/E															
	PhII/A						25	1	5				1			32
	PhII/B							23	1	1						25
	PhII/C								14							14
	PhIII/A											1				1
	PhIII/B															
	PhIII/C											2				2
	PhIII/D												2			2
	PhIII/E															
	others														3	3
	Total	37		1	7		25	24	20	1		3	3		3	124

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Appendix 3 (A vs B: Telephone is better than e-mail)

TITLE	CONTENTS
[041] Side : Con, Name : B Date:2002/06/20(Thu) 16:50	I don't agree. I have three reasons. First, When send a message, we don't need to care the time of a companion. Second, when we send a meessage, we can choose the words more carefully. Third, e-mail is cheaper than telephone.
[042] Side : Pro, Name : A Date:2002/06/20(Thu) 16:51	Now I'll tell you why telephone is better than mail. First, on the telephone, we can understand our feeling each other with vocal condition. Second, when we use mail, we can't know whether they have recieved the message or not until they return the mail. So mail is unfavorable for emergency. And finally, sometimes we have misunderstandings on the mail by some miss expressions. When we comminucate on the mail, we have to use only letters. It's difficult to clear up the misunderstanding with only letters.
[043] Side : Con, Name : B Date:2002/06/20(Thu) 16:58	Yes. we can understand our feeling each other with vocal condition. But, we can express my feeling with writing.
[044] Side : Pro, Name : A Date:2002/06/20(Thu) 17:06	No, we can tell a lie easier on the mail. If you don't tell a lie, it's difficult to understand one's TRUE feeling on the mail.
[045] Side : Con, Name : B Date:2002/06/20(Thu) 17:12	It is the same thing on the telephone. The lying person tell a lie allthe time.
[046] Side : Pro, Name : A Date:2002/06/20(Thu) 17:16	Not only the lie. But this argument is irrelevant I think. I et's get back to the main point. May I ask you a question?
[047] Side : Con, Name : B Date:2002/06/20(Thu) 17:20	Yes.
[048] Side : Pro, Name : A Date:2002/06/20(Thu) 17:20	I see your point. But how do you deal with an emergency by using mails? How do you do if one whom you send massage don´t return the mail? Don´t you call him or her and ask about the mail which you sent?
[049] Side : Con, Name : B Date:2002/06/20(Thu) 17:37	<first> I see your point. But , no emergency, we send and get a message all the time. For example, We can´t call in midnight. But, we can send a message. <second> How do you do if one whom you call don´t catch the telephone ? <third> NO. I send a message again.
[050] Side : Con, Name : B Date:2002/06/20(Thu) 17:44	If we use the e-mail, we don't think a companion's condition. So, it is very useful.
[051] Side : Pro, Name : A Date:2002/06/20(Thu) 17:47	I see. But I said about emergency. NOT the rdinary time. And you want the reply at once. I ast my question want to say this point. That's all. Anyway, if one don't catch the tellephone, it can't helped. After all, in the emergency, telephone is much reliable than mail.
[052] Side : Pro, Name : A Date:2002/06/20(Thu) 17:50	Mails can´t deal with an emergency. Both mail and telephone are way to contact. So they must play their role. And fainally, I´d like to tell you my next opinion. It´s true that e-mail is cheaper than telephone. But when you have a lot of things to talking, telephone is better than mail.
[053] Side : Pro, Name : A Date:2002/06/20(Thu) 17:52	Sorry, in [051], I typed"rdinary" but I wanted to type"ordinary".

Appendix 4　(C vs D: Telephone is better than e-mail)

TITLE	CONTENTS
[140] Side : Pro, Name : D Date:2002/06/19(Wed) 15:14	I agree because I have two reasons. First, to talk on the phone is easier to comunicate than mail. Have you ever felt inconvenience to send mail many times? Second, mail is misleading（誤解を招きやすい）. Have you ever experienced such a thing? I think that electronic letters give a cold-hearted impression.
[141] Side : Con, Name : C Date:2002/06/19(Wed) 15:29	I don´t agree because I have four reasons. First, mail is cheep. Second, we don't call someone on the phone ,if have something to do. But mail can sent at ease . We can correspond regularly, and we can have intimate passages with our friend for many a long year . Second, if you don't answer the phone when you call ,you can't make contact. Mail can convey messages all the time . Forth, mail have more time to think. So we can choose the words more carefully.
[142] Side : Con, Name : C Date:2002/06/19(Wed) 15:35	I understand mail is misleading. But we can choose the words more carefully. mail can say that we can't say the tel well. Don't you think?
[143] Side : Pro, Name : D Date:2002/06/19(Wed) 15:44	Do you really choose the words more carefully with mail? We can say anything with mail, because we don't need to face to face. It produces the opposite effect. For example, annoying mail and so on.
[144] Side : Con, Name : C Date:2002/06/19(Wed) 16:02	Annoying telephon cause damage to us ,too. Tel don't need to face to face, too. If you are screwed with mail and tel, I want to select more cheep
[145] Side : Pro, Name : D Date:2002/06/19(Wed) 16:05	I'm sorry. I said wrong thing. Telephone don't need to face to face too. But you said that you can send mail at ease. In other words, it means that you can send mail appropriately（適当に）. You worry about a partner with telephone, don't you?
[146] Side : Con, Name : C Date:2002/06/19(Wed) 16:15	I say mail can sent at ease . But it do less harm than good . We can correspond regularly, and we can have intimate passages with our friend for many a long year . Don't you think??
[147] Side : Pro, Name : D Date:2002/06/19(Wed) 16:22	It is not friends who you cannot build a closer relationship without mail. Mail is cheep, mail is easy, mail is convenience... You should comunicate with others with more carefully. Comunication is to worry about a partner. If you get used to comunicate without worry, you will not be able to comunicate well in parson. That's all. Thank you, bye-bye.