Educational Application of the Internet: International Joint Teleclass

Kumiko Aoki
kaoki@uhunix.uhcc.hawaii.edu

Kunio Goto, Dr. of Engineering
goto@nanzan-u.ac.jp

Abstract

As the Internet connects universities and colleges all over the world, its educational applications have been discussed among educators and researchers in higher education. The biggest advantage of the Internet is its international connectivity. Through the Internet, students can communicate and collaborate with others across nations and cultures. This paper explores such possibilities of international collaboration through the Internet as a collaborative learning tool. It also reports the international joint teleclass conducted between the Department of Communication, University of Hawaii at Manoa and the Department of Information Systems and Quantitative Sciences, Nanzan University in Nagoya, Japan, from September 27, 1994, to December 9, 1994.

1. Introduction

The Internet offers a great educational opportunity for students around the world not only by providing access to a wealth of global information such as remote libraries, discussion groups, and computer conferences, but also connecting among students and between teachers and students beyond traditional classrooms. There are numerous cases documented in the past using computer-mediated communication (CMC) to connect a teacher and students at a distance or to facilitate active learning by implementing text-based discussion among students outside the classroom.

With the Internet, students can be connected not only to the students on the same campus but also to those who are in different universities or even in foreign countries. Such interaction beyond national boundaries will provide students with a better understanding of diverse cultures and develop their cross-cultural interpersonal skills.

A great potential of international collaboration in education as well as research among people who are geographically dispersed has started to be realized in a variety of fields. In K-12 schools, teachers have started to seek "key-pals" for their students to have an experience in interacting with students of the same grade in foreign countries. Scholars and researchers often find themselves collaborating with colleagues at remote locations via the Internet. However, there is little structured empirical research to date on how people can collaborate effectively with people across time, space and culture, although the importance of such research in coming years is beyond question.

One of the most discussed educational applications of computer networks is collaborative writing. Computer-mediated collaborative writing is different from mere co-authoring or group activities in the physically confined classroom. The underlying philosophy of collaborative writing is the constructionist view of knowledge; viewing writing as social action and learning as a cooperative, social enterprise. Computer-mediated communication such as electronic mail and computer conferencing has been considered to facilitate such social construction of knowledge among students.

One of the advantages of collaborative writing through the Internet is its distance irrelevance. With the Internet people can overcome the barriers of time and space in communicating with others. But, how about cultural barriers? The Internet has a great potential to be utilized for mutual understandings among people in different countries to share their experiences and knowledge and collaborate on a project. However, little is known about how the Internet can be best utilized for such purposes.

2. Educational Applications of Computer-Mediated Communication (CMC)

Computer-mediated communication (CMC) refers to any exchange of messages through electronic media that involves the use of computers [6], which encompasses: electronic mail, electronic bulletin board systems (BBS), news distribution systems, BITNET list servers, and conferencing

systems. In CMC, most communication is done in only a textual mode, removing social contextual cues which are apparent in face-to-face communication. Wells [9] indicates that "the potential of CMC is best realized in courses involving: discussion, brainstorming, problem-solving, collaborative work, and reflective contributions which might be based on special preparation or research." Currently over 80 programs worldwide are known to be offering courses partially or completely via CMC [4] [5] [9].

In order to utilize CMC in education, students have to learn various online skills. In general, there is a two-fold process in learning online skills: One process is to learn the computer and software mechanics, which is relatively straightforward; and the other is to learn how to communicate over the computer network, which is much more difficult because it involves learning a new mode of discourse [3].

Odasz [7] identified four psychological stages of learning online skills: uncertainty, insight, internalization, and enlightened expectations. At the first stage, participants often experience doubt as to whether they will be able to master the basic online skills. At the second stage, they accept the online skills are not beyond reach and begin to see an increasing number of ways to benefit. At the third stage, they begin to view the online skills as merely an extension of one's self and their roles. At the final stage, participants begin to make an internal commitment to fully pursue the potential of the online mode.

Numeral empirical studies have attempted to evaluate classroom communication styles of CMC vis-à-vis face-to-face communications. In a study at Ontario Institute for Studies in Education, Harasim [4] found that whereas in the face-to-face classroom environment up to 60-80% of the verbal exchange during class time comes from the teacher, this pattern is reversed in on-line courses. The research showed that on-line learning is not only active, but it is interactive. Transcript analysis of an on-line seminar indicates that the interaction is highly student-centered with over 80% of the messages referencing one another.

Quinn *et al* [8] at the University of California, San Diego, conducted the study to compare the instructional interaction among students using an electronic message system with those in a conventional classroom discussion. The analysis of the results showed that students' responses in the electronic situation were on average, longer and more complex than in the face-to-face class.

In short, most of the research on educational uses of CMC seems to support that the use of CMC in instruction gives students additional dimensions of interacting with other students as well as instructor, which transforms traditional classroom instruction into a more active and participative environment, but requires careful planning and coordination for actually facilitating students' learning.

3. CMC and International Tele-collaboration

In addition that CMC facilitates interactions among students in the class as well as interactions between an instructor and students beyond the regular class time, it also enables students to communicate with people outside the classroom. With the development of the Internet worldwide, opportunities are generated for expanding the walls of the traditional learning environment across campuses and even across nations although in reality it requires a considerable coordination and preparation in order to make such practice a meaningful learning experience for participating students.

The Internet enables students to interact with students who live in other countries and in different cultures so that students can learn first-hand about differences and similarities of other cultures in many dimensions and gain a better understanding of diverse culture through personal interactions, while developing more effective cross-cultural interpersonal skills [2]. This is crucial in preparing students for an ever-expanding global information society where people are becoming interdependent beyond national boundaries.

However, communicating with people with different cultural backgrounds is not an easy task. There is a vast amount of literature discussing the difficulty in intercultural communication. Most of them focus on face-to-face interactions of people with different cultural backgrounds. In such situations, much difficulty in communication arises from differences in language, tone of voice, the amount of silence in conversation, eye-contact, meaning of gestures, proxemics (the use of space), etc.

Seemingly, such surface level differences in communication behavior are hidden in CMC. There is a deeper level of differences in shared values and norms between cultures which are deeply embedded in its history, social structure, educational system, mass media and everyday rituals. Most people within a culture take them for granted until they encounter with a different culture. One of the utilities of international telecollaboration is to make those cultural assumptions explicit while communicating one another without realizing the surface level differences. Through dialogue with people from different cultures, people recognize their taken-for-granted assumptions and develop more global perspectives.

When people communicate and collaborate on the Internet, in a way they enter a new culture which is called the Internet culture or "virtual culture". 'Virtual' here does not mean it does not exist or is not real. As a computer is a 'virtual' machine, which is "an abstract entity or process that has found physical expression" [10], virtual culture is a simulation of culture in a traditional sense. It is independent of any particular physical embodiment, but real nonetheless. It is a mode of simulated existence resulting from computation.

Although the overall Internet culture is heavily influenced by American users, people in Japan have developed their own virtual cultures based on their own language [1]. This also indicates that the culture on the Internet is created by its diverse users to meet their own needs.

In international collaboration over the Internet, participants of a particular project will develop their own "virtual microculture" and the success of their collaborative learning and working process depends on the virtual microculture they develop. The collaborative research project described next is an attempt to examine such virtual microcultures and how students in Hawaii collaborate with students in Japan using the tools on the Internet over the period of ten weeks.

4. The Hawaii-Nanzan Joint Teleclass

In this section, the design of the joint class which was conducted between the Department of Communication, University of Hawaii at Manoa, and the Department of Information Systems and Quantitative Sciences, Nanzan University, Nagoya, Japan, from September 27 to December 9, 1994. The general design of the class is discussed below which is followed by the discussion of the technology and tools used in the class.

4.1. Design of the Class

A total of 67 students participated in this joint class. At Nanzan University, 33 students (16 from the Department of Information Systems and Quantitative Sciences, the College of Business Administration, 14 from the English Department, and 3 from the Department of Law) participated in the joint class under the guidance of Professor Kunio Goto. At the University of Hawaii at Manoa (UH), 34 students enrolled in two sections of COM341 International Communication during the Fall 1994 semester (18 students in section one and 16 students in section two) took part in the course.

Among 34 participants in Hawaii, 17 were male and 17 were female. Among 33 participants in Nanzan, seven were male and 26 are female. Twenty-nine students on the Hawaii side were native speakers of English and all the participants in Nanzan were non-English speakers. Among the Hawaii participants, 38.2 % of them had an access to the Internet from home and so did 19.2% of the Japanese participants.

Before the semester began, 8 % of the participants in Hawaii had never used e-mail and the majority (55.9%) of them had used e-mail at least once but received messages less than 10 messages per month while 55.5% of Japanese participants had never used e-mail (see Table 1 below).

Table 1. Past E-mail Usage of Hawaii and Japan Participants

E-mail Usage	*Hawaii*	*Japan*
None	3	15
<10 messages per month	19	6
<10 messages per week	6	3
<10 messages per day	4	1
>10 messages per day	2	2
TOTAL	34	27*

* Missing cases 6

Prior to the beginning of the joint class, each student at both sites was trained to use tools on the Internet (e-mail, telnet, ftp, newsgroups, gopher, WorldWideWeb, etc.) and was taught the basic concepts of the technology used. Although the level of computer literacy as well as the Internet literacy varied a great deal among the students, all the students had become able to read/send e-mails and read/post articles on newsgroups.

The total of 67 students were quasi-randomly assigned to groups of four (two students at Nanzan and two students at UH) and asked to collaboratively write a research paper on a topic of their choice relating to issues of international communication. Those groups were assigned by randomly selecting two students in the same section on the Hawaii side, one from the Department of Information Systems, and one from the English Department or the Department of Law on the Nanzan side.

The eleven-week period when the academic calendar of both institutions overlapped was divided into two five-week sessions and one week for self-introduction at the beginning of the first session. For each session totally new sets of groups are assigned to go through the same process of collaborative writing with a different topic. In other words, each student participated in two different groups, one for each of two five-week-long projects. In this way, each student was given an opportunity to work with a different group of people. The two projects differed in the way that only at the second session, students were introduced to a synchronous mode of computer-mediated group communication, Internet Relay Chat (IRC), in addition to the asynchronous mode of communication such as e-mail and newsgroups. This was done for the purpose of examining the effects of different degrees of interactivity of textual communication on group performance.

In each session, one half of the groups (nine groups) met with other members of the group at the other site via satellite video conferencing once during the project and had a 8-10 minute conversation with the group members.

The collaborative writing project consisted of several stages: 1) brainstorming topics and selecting one; 2) planning an outline; 3) preparing a draft; 4) editing and revising the draft; and 5) packaging and presenting the final paper. Each stage involved individual research activities, negotiation of sub-tasks, and constructing a knowledge among members of the group. Most of the communication among the groups was done via group mailing-lists which were set up for each group, while the class-wide communication was done through the newsgroups specially set up for this joint class.

4.2. Tools Used for the Joint Teleclass[1]

A collection of commercial products/services and publicly available software were used in the joint teleclass. Some publicly available software required customization to adapt to the international/intercultural characteristics of the class. Every student in both universities had an account and an e-mail address on a UNIX host of the respective university and was allowed to have the Internet access.

The tools used for the class are categorized into three: communication, information retrieval, and measurement tools. (see Table 2).

Table 2. Tools Used for the Joint Class

Tool	Description	Availability
Communication		
sendmail (SMTP)	E-mail delivery	Included in OS
ucbmail, mh, pine, mm, mail	E-mail user interface	Included in OS or Public
tic-ml.pl	Mailing list program	Public record/retrieval of the messages
IRC daemon (server)	Internet Relay Chat server	Public
IRC client	IRC client	Public
IRC-II client and IRC robot	IRC automatic operation	Public
Cnews+NNTP link	network news	Public
rrn, mnews, trn, tin, rn	news user interface	Public
NV	Video conference	Public
VAT	Audio conference	Public
WB	White board	Public
SD	Session directory	Public
Video conference	Video/Audio service	commercial product/service

[1]A collection of public domain software used in this class is available from
URL:gopher://gopher.nanzan-u.ac.jp/Hawaii-Nanzan-Joint-Class/English-EDU-tools.

Information Server/ Retrieval		
NCSA httpd (Web server)	WWW server	Public
NCSA Mosaic for X11	WWW browser	Public
NCSA Mosaic for Windows	WWW browser	Public
NCSA Mosaic for Macintosh	WWW browser	Public
UMN Gopher server	Gopher server	Public
UMN Gopher client	Gopher client	Public
TurboGopher	Gopher client	Public
Measurement		
mailing-list usage report	report # of lines and words	Simple shell script
trr-e	typing trainer/tester	Public

4.2.1. Tools for Communication

Asynchronous communication tools used for the class were electronic mail and NetworkNews system which has been widely used over the Internet. Since the total of 67 students were divided into 17 small groups consisting of two from each university, 17 mailing lists were prepared for the communication among group members. The program for creating the mailing lists was a Perl script called "tic-ml.pl" which had been developed by the Tokai Internetwork Council, a regional network council in Japan.

The "tic-ml.pl" is based on "hml.pl" developed by a Japanese researcher, Dr. Hirano. The script and its customized versions have been widely used in the Japanese Internet community. In addition to message summary, archive, retrieval, and remote maintenance functions provided by hml.pl, "tic-ml.pl" supports multiple mailing lists/servers of different modes with a single script: open, exclusive, registration, and server. The advantage of using "tic-ml.pl" is its ease and security of adding a new mailing list since with "tic-ml.pl" instead of modifying the script, it just needs to add a line in a configuration file to add a new list.

Open mode was used for the class. In the open mode, a message from any member of a mailing-list is redistributed to all the members in the list, while a message from non-member is marked as a guest's message and sent to the members of the list. In exclusive mode, a message from a guest does not redistribute to the members of the list. Registration and server functions are for meeting registration services as well as text/program retrieval via e-mail.

A local network news hierarchy named "uhnzu" was created for announcements from the instructors as well as discussion and informal communication among the students. The articles posted to those newsgroups were distributed only within the two universities (University of Hawaii and Nanzan University) via a direct NNTP link.

For synchronous communication tools, "talk" or "phone" function could be used. However, finding out if the other party is logged in and calling for reply are not very easy for students who are not familiar with advanced computer commands. In addition, "talk" or "phone" is limited mainly to person-to-person communication and does not allow multi-party communication. In order to have a multi-user synchronous communication, IRC (Internet Relay Chat) was chosen for the use in this class.

An IRC server was set up at Nanzan University for the above purpose and 19 channels (one for each group, one for all of them, and one for instructors) were always kept open with IRC robots, which are scripts run on an IRC-II client. Due to the time difference between Hawaii and Japan, a core hour when students at both locations could log in was defined and students joined their own group' channel or the global channel to communicate with other students in real time. Due to the difficulty of finding a time when all the four group members could log on at the same time, the usage of IRC had been minimal contrary to the researchers' expectation that students might utilize it to a great extent for brainstorming and deciding on a topic.

In many communication researches, video conferencing has been considered as the most effective interactive telecommunication tool among the currently available telecommunication technologies. For our joint class, we wanted to provide some sort of visual interaction between students at both sites to examine what effects the video conferencing has on their communication and group performance. However, still it was not an easy task to have a video conferencing with a very limited budget due to many technical constraints to connect two points internationally.

Although video conferencing tools such as NV/VAT have been developed for IP multicast experiments (i.e., MBONE) and those tools can be used also for point-to-point teleconference, it requires a quite large bandwidth of domestic and international lines to link the two universities with

the high quality video and audio transmission. Since those lines are usually shared by thousands of organizations, it is not very realistic to have a video conferencing using NV/VAT.

There are some commercial video conferencing services between Hawaii and major cities in Japan. However, those commercial services charged very high usage fee and in the case that the facility was not locally available, students had to travel to the nearest facility. Due to the limited budget, this was not a viable option for us.

Basic rate ISDN link seemed to be a reasonable choice to have the live video conference without going out from the classroom in Nanzan University since the university already had the ISDN link through Nippon Telephone and Telegraph (NTT). Commercially available video conferencing equipment provides reasonable picture quality with 2B (128Kbps) connection and the price is becoming reasonable.

In Japan, a portable picture phone with ITU-T standard H.261 in the size of a regular business telephone called "Picsend-R" was being sold at 670,000 yen (approximately US$ 6,700). Unfortunately for our joint class, not only funding to purchase or rent a set of such equipment was not available, but also any public ISDN service was not available at that time at the area where University of Hawaii at Manoa is located.

Another alternative was the use of an experimental communication satellite owned by the Japan's Ministry of Education, the Engineering Test Satellite-V (ETS-V), which had been used in a variety of experiments in tele-education and international wide area education in the Pacific region. The ETS-V earth stations have been developed and tested, and they are now located in the variety of areas in the Pacific within the footprint of the satellite, including PEACESAT which is located at the University of Hawaii.

With the generous support from the National Institute of Multimedia Education[2] (NIME) located in Chiba, Japan, we were able to have videoconference three times through the ETS-V; the first one on October 13, the second one on November 15 and the third one on December 19. The videoconference between Nanzan and UH was made possible by connecting Nanzan and the NIME through a public ISDN channel with PictureTel's equipment and then connected between NIME and UH through the ETS-V. Though the connection between Nanzan and NIME was 128kbs, the ETS-V satellite transponder could carry only 64kbs channels, which resulted in degradation in the picture quality as well as a slight signal delay.

4.2.2. Tools for Information Retrieval

For information retrieval on the Internet, WorldWideWeb and Gopher were mainly used. Students' information such as self-introduction with their pictures and voice, and course materials were stored in those servers at Nanzan University and the College of Social Science, the University of Hawaii. The students used their client software to browse those information in the classroom. Because of the privacy concern, the public access to a part of those data at host was restricted to those in the class using an access restriction method available in Gopher and WWW server (NCSA httpd or CERN httpd).

4.2.3. Tools for Measurement

Measurement of student activities was necessary due to the experimental research purpose of this class. All the messages or articles sent to the group mailing lists or the newsgroups in the class were stored as files in the server at Nanzan University. Those files were periodically scanned by a simple UNIX command script which weekly reported the sender, the date, the number of lines, and the number of words in a message.

To measure a student's typing skill, a typing training program called "trr", developed by a Japanese researcher for keyboard typing practice, was used. The "trr" is written with GNU Emacs lisp and a user can choose one of English texts from the examples to type to copy the text. Score is measured by the input speed and the number of mistakes, which is recorded for the user to see the history of the user's score or to be shared among all the users to compete for the highest score. Unfortunately, because "trr" was developed for Japanese users, all the command menus and messages were originally written in Japanese. Therefore, we made a modification to the lisp program for English-speaking users with the permission from the original authors.

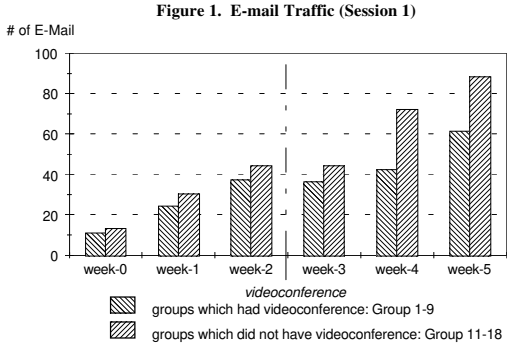
[2] The authors are heartily grateful to Professor Toshio Kobayashi, Professor Kimio Kondo, and Professor Ryutaro Suzuki at NIME for their generous support.

5. Results

5.1. E-mail Traffic

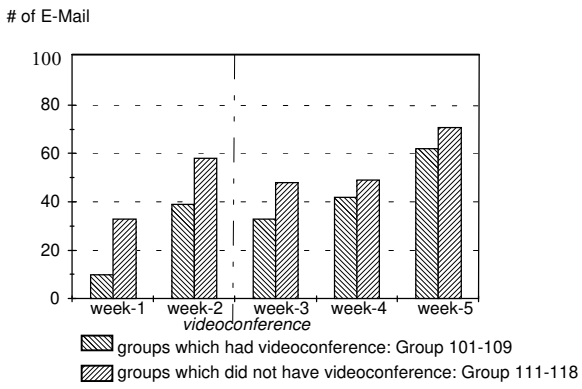
The total e-mail traffic over the first six weeks, including the very first week set aside for familiarizing themselves with e-mail systems and getting to know one another, is shown in Figure 1.

Figure 1. E-mail Traffic (Session 1)



During the first six weeks, the traffic increased steadily except for the second week and the third week when the amount of e-mail traffic stayed about the same. A similar pattern was seen in the second session; The traffic increased steadily except for the second week (See Figure 2).

Figure 2. E-mail Traffic (Session 2)



As shown above, despite the common sense hypothesis that those groups who have met the other group members via videoconference would exchange more e-mail messages, the contrary occurred. In both sessions the groups which had videoconference had exchanged in a fewer number of e-mail messages in total.

During the entire eleven-week period, the Japanese participants sent a total of 214 messages and the Hawaii participants sent a total of 253 messages. The mean of the number of messages sent by a Japanese participant was 6.5 in session one and 6.7 in session two while that of Hawaii participant was 7.4 in session one and 6.6 in session two. In terms of the mean of the number of words sent by each individual, that of a Japanese participant was 1510 in session one and 1534 in session two and that of a Hawaii participant was 2755 in session one and 2733 in session two (See Figure 3 & 4). Although those means were different in two groups (Hawaii and Japanese participants), no statistical significance was found.

Figure 3. Mean Number of Words Sent by an Individual (Session 1)

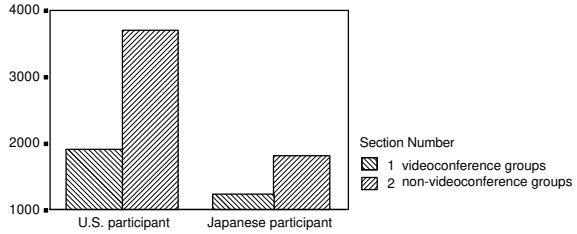
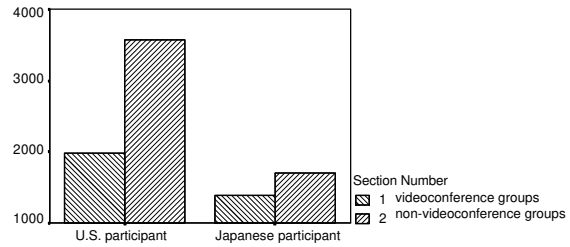


Figure 4. Mean Number of Words Sent by an Individual (Session 2)



5.2. Socioemotional Communication

Originally authors expected the students to exchange an array of socioemotional messages which were not directly related to task assigned. However, possibly due to the limited time-frame to complete an assigned task as well as the infrequent message exchanges, most groups did not go beyond task-oriented communication and discuss more informal and personal issues. Most participants sent one brief self-introductory message at the very beginning of the collaborative project, but after that all the communications were related to the task they needed to complete. Only those who had met other group members via videoconference sent somewhat courtesy but non-task related messages to follow up the videoconference such as:

> Today we were able to contact your class through the video. I thought it was very interesting and "cool".
>
> It was really nice to see and hear you on the TV.
>
> I just wanted to let you know how exciting it was to talk with both of you yesterday over the video. It was nice to see who I am talking with.

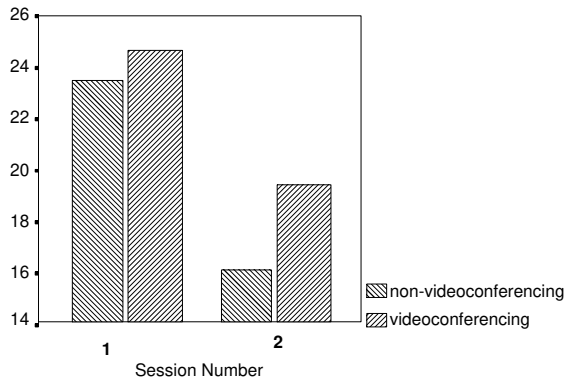
However, as we could monitor the messages sent only through group-mailing lists, it could not be

known if such non-task oriented e-mail messages were exchanged privately. Another reason of the limited socioemotional communication through e-mail would be the fact that two members of a group were at the same location and met in the class where they might had face-to-face socioemotional communication without researchers' knowing.

5.3. Collaborative Process

The groups were required to submit their outlines to the instructors once all the members had agreed upon an outline of the paper. The number of days which were taken for a group to submit an outline was counted starting with the day of the first message from one of the group members.

Figure 5. Number of Days to Agree on an Outline



It seems that the groups have learned to work more effectively over the period as the mean number of days is significantly lower in the second session than that in the first session.

Although the means of the number of days videoconference groups took to agree upon an outline were higher in both sessions, there was no significant difference found between that of videoconference groups and that of non-videoconference groups. Significant negative correlation was found with the group average of perceived quality of process indicating that those groups who took longer to agree upon an outline perceived the lower quality of process on average. This is confirming the fact that those groups who have taken longer to reach an agreement perceive less effectiveness in their group process.

5.4. Final Group Papers

The thirty-four papers were produced by the thirty-four groups (seventeen in the first session and seventeen in the second session) on a variety of subjects. In the first session, groups were asked to write similarities and differences between Hawaii (or U.S.) and Japan, and in the second sessions, they were assigned to compare the influences of Japan in Hawaii (or U.S.) and that of Hawaii (or U.S.) in Japan on a subject of their choice. The following are the topic categories and the number of papers corresponding to the category.

Television Programming	6
New Technologies	6
Advertising	5
Music	3
Movies/Films	3
Food Culture	3
Sports	2
Others	6

5.4.1. Evaluation

The final group papers were independently evaluated by the two instructors and also by one outside evaluator under the following five criteria:

1. Paper organization and the coherence of its development;
2. Clear explanation or illustration of key ideas
3. Facility in the use of language;
4. No errors in mechanics, usage, and sentence structure; and
5. Scholarly efforts

No statistically significant differences were found in any scores or combinations of scores between those of videoconference groups and those of non-videoconference groups as well as between those in the first session and in the second session.

6. Discussion

Based on the path analyses of all the variables in the research, the following conclusions can be drawn in this study.

- Those participants and groups who had videoconferencing sent significantly fewer e-mail messages than those who did not have videoconferencing;
- Those groups who had higher group average of individual typing skills exchanged more words through e-mail;
- Those participants who sent more e-mail messages expressed significantly higher individual commitment;
- Those groups who exchanged more e-mail messages showed higher group average of individual perceived cohesiveness scores;

- Those groups who exchanged more words through e-mail produced the final papers with higher evaluation scores;
- Hawaii participants expressed significantly higher individual commitment than Japan participants;
- Female participants expressed significantly higher perceived group cohesiveness than male participants;
- Those groups who had videoconferencing produced less sophisticated final group papers than those who did not have videoconferencing;
- Those groups who had videoconferencing showed more group cohesion; and
- Those groups with higher group average of individual writing skills produced the final papers with higher evaluation scores.

Though the above conclusions are by no means conclusive, there are some interesting implications in them. First of all, videoconferencing, though it was just one time brief meeting, may have reduced the need to communicate via e-mail and, on the other hand, increased the group cohesiveness. Individual skill, here individual's typing skill, was the significant predictor of communication intensity and group members' average writing skill was the significant predictor of the quality of final group papers. It seems obvious, but it is often overlooked that individuals make up groups. Developing skills necessary to complete the task are critical part of the successful telecollaboration.

At the individual level, national culture of participants seem to have played an important role in the degree of individual commitment. There seemed to be no socioemotional communication occurred among group members. There seemed to be no social relationships grown out of the collaborative activity between Japanese participants and Hawaii participants as no mail had been exchanged once the task was completed. In other words, it seemed that little virtual microculture had been developed among intercultural group members.

The biggest reason of failing in developing an appropriate microculture among participants would be the way the task was designed. In collaborating with each other, English was imposed to be a working language and the way of writing a research paper was expected to conform to the style common to American college students. The medium of low contextual cues was chosen to be used as a major communication channel though Japanese are known to rely on highly contextual communication. Even in videoconferencing, Japanese participants had to speak in their second language under a tremendous time pressure. Internet Relay Chat was introduced in vain as few Japanese participants could type fast enough to be able to have a substantial conversation with each other. Everything seemed to have worked against encouraging Japanese participants to work comfortably. In other words, the task ecology was predominated by American culture without being mutually negotiated by participants at both sites.

As a result, a virtual microculture had not been developed among group members. Almost half of the total number of papers were written mainly by Hawaii students with little contribution from Japanese members. For a diverse cultural group to work efficiently and effectively, the collaborative environment need to be negotiated among all the participants.

There are some structural factors which also hinder telecollaborative groups from developing their own virtual microculture. First of all, technical and situational difficulties of getting online seemed to have put the students under the utmost stress. Only a little over one-third of participants in Hawaii had a computer and modem at home and were capable of getting online from home. A majority of participants did not have access from home and had to use public terminals on campus[3]. Although there are several computer labs which are accessible by students, usually participants had to wait to get a terminal, and even after they had access to a terminal the network was often unreachable or frequently the computer screen froze due to the possible overload of the network traffic on campus. In addition, even those who had the network access from home, it was extremely difficult to dial in especially between 8pm and midnight.

Although more user-friendly graphically oriented e-mail interface such as Eudora was technologically available, it was not accessible to a student who did not have a dedicated terminal. As a result, all the participants were forced to use the more primitive VT100 interface in which on-screen text manipulation was minimal and often required the student to remember obscure commands. In addition, in writing and collaborating on a paper they had to go through the tedious process of converting the document which was created by

[3] The experiment was coincidental with the implementation of the "Access for All" project on UH campus in which all UH faculty, staff, and students could apply for a login ID and password on the uhunix systems. For this reason, the traffic on the local system had increased tremendously during the semester.

advanced word processing programs to ASCII text file, uploading it to their Unix home directory, and sending it to other group members as an attachment file. A more integrated and graphically-oriented system would ease the participants' stress and facilitate collaboration.

In conclusion, it is a quite unique opportunity for a student to communicate and collaborate with students in a different country as a class project. However, in order to make the project meaningful and useful experience, we have to consider a number of factors. First of all, the structural difficulties in terms of terminal access and technology interface need to be minimized. Secondly, individual skills necessary for completing an assigned task such as typing skills and writing ability should be taken into account when designing a collaborative activity. Thirdly, cultural differences and communicative competence needs to be discussed openly to avoid miscommunication. Forth, though most of the collaboration can be done asynchronously, synchronous communication would help if it is easily coordinated. Fifth, visual exchange may not directly help complete a task if the task is textually oriented, but it would increase group cohesiveness.

References

[1] Aoki, Kumiko. (1994). Virtual communities in Japan. In *PTC '94 Proceedings* (James G. Savage and Dan J. Wedemeyer, eds). 202-208.

[2] Bailey, Elaine K. and Morton Cotlar. (1994). Teaching via the Internet. *Communication Education*, 23, 184-193.

[3] Friedman, L. B. & McCullough, J. (1992). Computer conferencing as a support mechanism for teacher-researchers in rural high schools. In M. D. Waggoner (Ed.). *Empowering Networks* (pp. 139-155).

[4] Harasim, L. M. (1989). On-line education: a new domain. In R. Mason & A. Kay, (Eds.). *Mindweave* (pp. 50-62). New York: Pergamon Press.

[5] Harasim, L. M., Hiltz, S. R., Teles, L., & Turoff, M. (1993). *Learning Networks: a Field Guide.* MIT Press.

[6] McClure, C. R., Bishop, A. E., Doty, P., & Rosenbaum, H. (1991). *The National Research and Education Network (NERN): Research and Policy Perspectives.* Norwood, NJ: Ablex Publishing Corporation.

[7] Odasz, F. (1992). Grassroots networking on Big Sky Telegraph: Empowering Montana's one-room rural schools. In M. D. Waggoner (Ed.), *Empowering Networks: Computer Conferencing in Education.* Englewood Cliffs, NJ: Educational Technology Publications.

[8] Quinn, C., Mehan, H., Levin, J., & Black, S. (1983). Real education in non-real time: The use of electronic message systems for instruction. *Instructional Science, 11*, 313-327.

[9] Wells, R. (1992). *Computer-Mediated Communication for Distance Education: An International Review of Design, Teaching, and Institutional Issues.* PA: American Center for the Study of Distance Education.

[10] Woolley, B. (1992). *Virtual Worlds.* Cambridge, MA: Blackwell Publishers.