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AN ANALYSIS OF STUDENTS' USE OF AN ASYNCHRONOUS COMMUNICATION TOOL FOR A LONG-TERM COLLABORATIVE PROJECT: VALUE ADDED?

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Abstract. Faculty for a cohort-based face-to-face classroom environment supported in-service teachers' learning and collaborative activities with an open-source computer-supported collaboration (CSCL) tool. The cohort met once per week during regular fall, spring, and summer university semesters for a two-year period, and the CSCL used to support the group spans the two-year period. Students in the cohort worked in long-term, cross semester projects and used an optional course discussion forum as a tool communication between classes. The purpose of this research is to evaluate the effectiveness of the optional CSCL as a way to support collaborative work at a distance. To do so, we examine the following research questions: (1) to what extent are optional discussion forums used by members of a collaborative group to support collaborative project work, (2) are group leaders clearly identifiable from the data?, (3) how is information distributed among members of a group?, (4) who refers to whom, and to what extent, among collaborative group members?, and (5) what types of postings emerge during the use of the CSCL?

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In recent years, an emerging paradigm of instructional design has focused on constructivist principles of learning (c.f. Reigeluth, 1999). Instructors who subscribe to the constructivist paradigm believe that involving students in learning environments that require social negotiation for construction of meaning and for project development is more authentic than asking students to create projects independently. Thus, many instructors require that their students work collaboratively to develop course projects. Graduate students having dual roles as in-service teachers rarely can find time outside of regularly scheduled class meetings to work on collaborative projects. Thus, instructors of in-service graduate students must find alternative ways to support collaborative work outside of class sessions.

In recent years, computer-mediated collaboration (CMC) tools have been used extensively by teachers and instructors to facilitate collaborative project work. It is increasing important, therefore, for instructors to understand group dynamics in computer conferencing and the way online groups work together over time in order to use group learning effectively (McDonald & Campbell Gibson, 19xx) and to facilitate project work at a distance. The purpose of this study was to explore how in service teachers in a cohort graduate program used an optional CMC tool to support their long-term, collaborative project work between weekly class meetings and between semesters.

Theoretical background

Constructivist learning is embedded in complex, realistic, and relevant environments and provide social negotiation as an integral part of learning (Driscoll, 1999). The relevance of social negotiation and social learning is evident in many of the theories embraced by proponents of constructivism, including Piaget's genetic epistemology (1951; 1969), Bruner's discovery

learning (1986), Vygotsky's socio-historical development theory which focuses on the social origins of thinking (1978), and more contemporary theories of learning including situated cognition (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991), socially-shared cognition (Brown & Cole, 2000), and distributed cognition (Bell & Winn, 2000; Cole & Engestrom, 1993; Pea, 1993; Perkins, 1993).

Although traditional learning environments often emphasize the individual as agent, neglecting the way people employ the environment to aspects of cognition (Perkins, 1993), current instructional theories about knowledge building communities (Scardamalia & Bereiter, 1994) and distributed cognition (Pea, 1993; Perkins, 1993) address the necessity to provide opportunities for students to articulate and reflect on their knowledge, interact with others, and view new ideas from multiple perspectives (Dornisch & Land, 2002). There is much evidence to support collaborative learning in classrooms, and similar evidence has been mounting both for what teachers learn in collegial collaborations, as well as for what all educational stakeholder groups can accomplish together. Instructors in educational graduate programs across the United States are increasingly requiring students to work collaboratively for project-based work, thus, modeling the types of environments that teachers could deliver themselves and emphasizing the importance of collaboration between teachers for developing theoretically sound, interactive, instructional environments.

Because of busy teaching schedules and extra-curricular advising and coaching responsibilities as well as the mounting requirements for professional development through their schools and districts, in-service teachers enrolled in graduate programs experience many conflicts in trying to arrange their schedules for collaborative meetings. The communicative aspects of the Internet offer an avenue for collaboration among classroom students which could

not have been easily realized in the classrooms of the past. Such tools provide instructors with the opportunity to enable sharing of data, information, resources, and multiple points of view (Dornisch & Land, 2002). Especially important when students are full-time employees with many professional and familial obligations, supporting students in collaborative project work with CMC tools provides one solution to the difficulties shared by such students to work collaboratively on such projects. Over the past fifteen years, researchers and course instructors have debated the advantages and disadvantages of using computer-mediated communication (CMC) tools to extend classroom discussion outside of regularly scheduled class meetings.

Advantages and disadvantages of CMC tools

With advancements in computer-mediated communication (CMC) tools, as well as the increasing availability of both fee-based and open source CMC tools, computer-supported collaborative learning (CSCL) has become more feasible and common, encouraging educators at all levels to integrate these tools into classrooms to enhance communication among students and between instructors and students (Kearsley, 2000). Seen over the past decade as a revolutionary tool to support learning (Hara, Bonk, & Angeli, 2000; Kang, 1998), computer-mediated communication tools are increasingly being used to promote constructive thinking among instructors and students (Tu & Corry, 2003), to foster knowledge-building communities that encourage learners to articulate and reflect upon their understanding (Scardemalia & Bereiter, 1994), to learn from others' perspectives, to work collaboratively on long term projects, and to provide support for learners through question and answer (Q&A) forums. As CMC tools have become more sophisticated, researchers and instructors have recognized that not only can the use of CMC tools support the extension of classroom discussions, but they can also potentially provide richer and more relevant learning environments than those of traditional classroom

settings where interaction takes place only within the regularly scheduled meeting times (Debler & Porras-Hernandez, 1998; Newman, 1990).

One the most advantageous aspects of integrating CMC tools into traditional classrooms, particularly with non-traditional students who are often full-time employees with additional professional and personal responsibilities, is the removal of time and space barriers afforded by such tools (Barners & Greller, 1994; Harasim, 1993; Henri, 1992). Research on the use of CMC tools by students at all levels suggests additionall advantages. First, some researchers posit that CMC use promotes reflection and critical thinking because it affords the time necessary to think thoughtfully and critically about course content before sharing ideas and because it allows for the time to construct a response (Boyd, 1990; Debler & Porras-Hernandez, 1998; Harasim, 1993). Second, CMC use often provides students with highly individualized and extensive feedback on their thoughts and ideas both by faculty, and, more importantly, by their peers (Deblar & Porras-Hernandez, 1998). Finally, very often the technology used for CMC provides a permanent record of students' work (Hara, Bonk, & Angeli, 2002), and resources shared with the group can easily be accessed again.

However, research on CMC use suggests that despite the promise of CMC tools, students very often do not use them as anticipated by course instructors (Fishman & Gomez, 1997; Guzdial 1997). Findings from previous research indicate that often the contributions in CMC environments are made by a select few students, and, even more problematic, interactive dialogue is often absent. Limitations of CMC add to this problem, as many of the current communication technologies are unable to support the iterative nature of conversation and collaboration (Klemm, 1998). Some researchers suggest that activities using CMC technology

must be thought-provoking, but also iterative, providing a pattern of development that requires the users to actively build upon the work of others (Land & Dornisch, 2002).

Additionally, although the use of CMC tools addresses the problem many students, traditional and non-traditional alike, have with time constraints, the use of CMC tools can be time consuming for both students and instructors. Reading and analyzing the postings is certainly more time consuming than participating in face-to-face discussions, as is crafting reflective, critical responses to postings. The lack of visual cues usually obvious in face-to-face communication require students to make assumptions about the meaning of the postings (Hara et al., 2000; Kuehn, 1994), and, perhaps more importantly, learners whose verbal skills are not their strength may be placed at a disadvantage, since the communication outside of class between group members is primarily text-based (Hara et al., 2000).

Purpose and Research Questions

Most research in the use of CMC tools by students spans several weeks, or at the very most, a university semester. Although some studies focus on the use of CMC tools by collaborative groups working on projects, most analyze discussion forums that extend classroom discussion or topics. Evaluation of long-term use of CMC tools by students engaged in project-based activities will not only provide information on how students use CMC tools to facilitate long-term collaborative project work, it will also provide information on how teachers and other professionals working on projects together can facilitate collaborative work. Additionally, such evaluation will provide further understanding about how instructors should design instruction that integrates CMC tools specifically for support for project-based collaborative work.

Unlike most research conducted in CMC, this research spans the two years the students were enrolled in the cohort program, as described in the participants and instructional context

section. This research attempts to analyze patterns in CMC use among students who use the tool to support long-term collaborative group activities between class meetings. The investigation did not focus on learning and achievement, but rather on how students used the tool to promote dialogue about project issues and to inform others of their personal progress in project-based work.

In most cases, students are required to use CMC tools for class credit, since research indicates that students rarely use CMC tools if the use is optional. However, instructors for this cohort of students determined to use the tool only to support students' collaborative project work with the tool. Additionally, instructors did not mediate the use of the tool, even though research in CMC indicates that electronic interaction among students is dependent upon the role of the moderator (Ahern, Peck, & Laycock, 1992; Howell-Richardson & Mellar, 1996; Kuehn, 1994). Instructors felt it was important to allow the students to control the use of the discussion forums, since they were being used primarily to support collaborative work. In fact, instructors posted rarely to the site, allowing the students to develop their own conversation threads and to mediate their own discussions.

The purpose of this study, then, was to determine the value students place on supportive CMC tools by analyzing how students use an optional tool to support collaborative project work. Specifically, the research questions for this study were:

1. To what extent are optional discussion forums used by members of a collaborative group to support collaborative project work?
2. Are group leaders clearly identifiable from the data?
3. How is information distributed among members of a group?
4. Do students use the tool to support social interaction as well as project work?

5. When students use CMC tools to support collaborative project work, to what extent are their postings group versus task oriented?

Methods

Participants and Instructional Context

The research for this study took place within an educational technology cohort-based graduate program at a university in the northeastern United States during the fall 2003, spring 2004, summer 2004, fall 2004, spring 2005, and summer 2005 semesters. The classes for this cohort-based graduate program were held weekly during each of those semesters in a traditional classroom setting. Students in the cohort worked collaboratively on a long-term, constructivist, collaborative project that spanned the six semesters of their graduate program. Early in the program, students brainstormed project ideas for their long-term collaborative projects. Students were told that the projects could span the entire program. At the same time, instructors assured students that if they decided that the project was not moving forward, or if the project came to a meaningful end, they would be able to revisit the project idea and choose to work on another long-term project.

Participants in this study were in-service teachers and/or administrators in elementary and secondary public schools in the northeastern United States. Specifically, data from the asynchronous conferences of one of the collaborative groups from this cohort comprised the case for this action-research oriented investigation. Participants, then, were six graduate students (5 females, 1 male) enrolled in a two-year cohort program in educational technology. One student entered the collaborative group during the second semester of study, and one student left the group at the beginning of the second year of study.

Because of the nature of graduate programs where students are full-time, in-service teachers who have many professional obligations outside of school hours, students have difficulties meeting on a regular basis outside of their scheduled class sessions. However, students in the educational technology program are required to work on long-term, constructivist, collaborative projects during their tenure in the program. The removal of space and time barriers (Barners & Greller, 1994; Harasim, 1993; Henri, 1992) prompted the faculty for the cohort to support collaborative groups outside of class through an open source course management system (*i.e.*, PostNuke). The faculty decided on using an asynchronous CMC tool over a synchronous CMC tool because of the "time and place independence" afforded by asynchronous communication specifically meets the needs of the specific student population. Additionally, research in asynchronous vs. synchronous CMC tools indicates that asynchronous tools foster more depth as well as more interaction and response from students than do synchronous discussions (Bonk, Hansen, Grabner-Hagen, Lazar, & Mirabelli, 1998; Hara, Bonk, & Angeli, 2000).

Data and Instruments

As mentioned previously, the data for this study were collected while participants were engaged in a long term collaborative project using a CMC tool to support their work outside of regularly scheduled class sessions. Computer transcripts of the discussions were quantitatively and qualitatively analyzed using content analysis (Bonk et al., 2000; Henri, 1992; Howell-Richardson & Mellar, 1996). According to Schwandt (1997), content analysis involves comparing, contrasting, and categorizing data and often includes both numeric and interpretative data analyses.

The two years of conference postings within the asynchronous discussion forum tool provided in PostNuke were analyzed quantitatively, including the total number of messages posted during each month, the average word length of postings, and the number of student and instructor participations per month. The data indicate the extent to which the CMC tool was used over the two years of the project. Additionally, from this analysis, project leaders were identified and the patterns of leadership within the online collaboration were defined.

The data were also analyzed qualitatively using content analysis. Each posting was first separated into independent statements or units of meaning. Based on a coding scheme described by Howell-Richardson and Mellar (1996), each unit of meaning was judged on multiple criteria including whether or not it referred, either explicitly or implicitly, to a previous posting, and whether it was addressed to an individual or to the entire collaborative group. Additionally, each unit of meaning was identified as having one of the following structural properties: interrogative, declarative, directive, or elicitative. Finally, each unit of meaning was also identified as having either a group focus, a task focus, or as being off-task. If the unit of meaning was identified as having a group focus or a task focus, it was further analyzed based on the Howell-Richardson and Mellar (1996) coding scheme as presented in table 1. The Howell-Richardson and Mellar (1996) content analysis scheme was used for this data because it worked better than other schemes to analyze the content of postings in a project-based asynchronous discussion.

Table 1. Coding scheme for group and task focused postings[a]

Focus	Type	Description
Group	Organizational	A posting that addresses procedures of working as a group
	Rechannel	A posting that focuses attention on a neglected area of discussion
	Socio-affective	Concerns the social dynamics of the group
	Debilitative	A posting that is overtly critical or overly harsh
	Metacomment	A posting that comments on the outcome of group procedures or on group factors
Task	Initiate	A posting that initiates, suggests, or proposes a new thread of discussion
	Reject/disagree	A posting that expresses disagreement with a previous posting
	Confirm/affirm	A posting that further develops a topic or idea presented in an earlier message
	Refer	A posting that refers to external sources or activities not contained in the conference itself
	Summarize	A posting that summarizes information from a previous posting or postings or summarizes outside work
	Request	A posting that requests clarification, information, or elaboration

[a] *This coding scheme is based on Howell-Richardson and Mellar (1996)*

Results

Question #1: To what extent are optional discussion forums used by members of a collaborative group to support collaborative project work?

To answer this question, computer transcripts of the discussions were quantitatively analyzed. The total number of messages from students and the instructor in the collaborative group for each month of the cohort-based program are presented in Table 2. The data indicate

the total number of monthly postings, the frequency of student and instructor postings, the average number of postings per student, and the standard deviation.

Table 2. Monthly participation

Month	Total # of Postings	Total # of Instructor Postings	Total # of Students' Postings	Total # of Student Members	Average # of Postings per Student	Standard Deviation
November 2003	27	2	25	5	5	1.6
December 2003	17	1	16	5	3.2	1.9
January 2004	35	3	32	5	6.4	4.8
February 2004 [a]	49	4	45	6	7.5	4.5
March 2004	37	2	35	6	5.8	3.3
April 2004	19	0	19	6	3.2	.9
May 2004	16	3	13	6	2.2	2.1
June 2004	14	0	14	6	2.3	2.4
August 2004	15	0	15	6	2.5	2.1
September 2004 [b]	10	3	7	5	1.4	.9
October 2004	12	2	10	5	2	2
November 2004	8	1	7	5	1.2	.8
December 2004	1	0	1	5	.2	.4
January 2005	4	3	1	5	.2	.4
February 2005	2	1	1	5	.2	.4
March 2005	1	0	1	5	.2	.4
April 2005	0	0	0	5	0	0
May 2005	0	0	0	5	0	0
June 2005	0	0	0	5	0	0

[a] A group member joined in this month.
[b] A group member dropped out in this month.

The findings indicate that students used the optional discussion forums extensively during the first year of the program, and particularly through April of the first year. In the months from November 2003 through April 2004, the average number of postings per student per month was 3 or above, which is a significant number of postings given that participation in the discussion forum was optional. However, in each of these months the fairly large standard deviation indicates that students used the forums differently. Some students were seemingly diligent about using the forums while others rarely posted to the forum.

The data also indicate that the CMC tool was used much differently by the group in the second year of the program. During this time, the average number of postings was less than two per person per month, and from December of the second year, the forum was used rarely, if ever. There are several possible explanations for this pattern of use. First, it is possible that the students found the CMC tool to be valuable during the first year of the program while they discussed initial ideas and plans for the long-term project, and that during the second year, they were less likely to use the discussion forum since they were no longer in the initial stages of the project, and therefore were more engaged in collecting data and developing the final project, rather than discussing ideas about the project. Second, it is possible that excitement for the project just diminished, since two years is a long time to sustain excitement in a project. Third, from the data it is clear that the pattern of using the CMC tool diminished after one group member left the group. If this person had been a leader in the group, it is possible that the departure of this group member significantly affected the value the others placed on the discussion forums as a tool for collaborative work. It is also possible that the departure of any group member, regardless of whether he was a group leader or not, could have negatively affected the momentum of the group. If so, with the new dynamics, the group may have used other forms of communication to connect between classes.

Question #2: Are there group leaders clearly identifiable from the data?

To answer this question, computer transcripts of the discussions were quantitatively analyzed. The number and percentages of postings each month, delineated by group member, are presented in Tables 3 and 4, along with the number and percentage of words posted by each group member.

From this data, we identified group member number one as a leader in the first year of the cohort program. This group member posted over 20% of the postings during for every month during the first year of the collaboration, and he or she also posted over 25% of the words during each month of the first year, except for during one month. No other group member was as consistent in posting to the site, either with the number of postings or with the length of the postings.

Interestingly, group member one left the group after the first year of the cohort to join another group. The data suggest that at the same time, the use of the discussion by the remaining members of the group dramatically changed. In the first year, the average number of postings per month was 25.44. During the second year, this average changed dramatically to an average of just 3.8 postings per month, with no postings during the last three months of the program and less than 5 postings per month after November of the second year.

There could be several explanations for the lack of use during this period. First, the group could have been very strongly affected by the departure of their group leader. It is clear, in fact, that after group member #1's departure, no other group leader emerged in the use of the CMC tool. This is not indicative, however, of whether or not a group leader emerged in the in-class, or even out-of-class, work. One thing that is clear, however, from this data is that the

Table 3. Number and percentage of postings and words, first year of the cohort

	November. 2003				December. 2003			
Member	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words
1	7	26%	790	31%	4	24%	397	28%
2	5	19%	661	26%	2	12%	124	9%
3	4	15%	427	17%	3	18%	190	14%
4	3	11%	141	6%	6	35%	610	44%
5	6	22%	482	19%	1	6%	74	5%
6	0	0%	0	0%	0	0%	0	0%
Ins	2	7%	56	2%	1	6%	7	0%
	27	100%	2557	100 %	17	100%	1402	100 %

	January. 2005				February. 2004				March. 2004				April. 2004			
Member	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words
1	14	40%	1674	60%	15	31%	1679	29%	9	24%	543	25%	4	21%	208	16%
2	2	6%	127	5%	7	14%	975	17%	3	8%	182	8%	3	16%	103	8%
3	8	23%	437	16%	7	14%	816	14%	7	19%	398	18%	4	21%	241	19%
4	3	9%	183	7%	8	16%	884	16%	10	27%	611	28%	2	11%	243	19%
5	5	14%	294	11%	7	14%	1039	18%	2	5%	179	8%	4	21%	368	29%
6	0	0%	0	0%	1	2%	87	2%	4	11%	211	10%	2	11%	113	9%
Ins	3	9%	71	3%	4	8%	220	4%	2	5%	91	4%	0	0%	0	0%
	35	100%	2786	100%	49	100%	5700	100%	37	100%	2215	100%	19	100%	1276	100%

	May. 2005				June. 2004				Summer. 2004			
Member	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words
1	6	38%	344	36%	6	43%	483	50%	5	33%	539	32%
2	1	6%	39	4%	0	0%	0	0%	2	13%	240	14%
3	1	6%	25	3%	0	0%	0	0%	2	13%	178	10%
4	3	19%	265	27%	3	21%	185	19%	1	7%	127	7%
5	2	13%	79	8%	4	29%	226	23%	5	33%	613	36%
6	0	0%	0	0%	1	7%	79	8%	0	0%	0	0%
Ins	3	19%	212	22%	0	0%	0	0%	0	0%	0	0%
	16	100%	964	100%	14	100%	973	100%	15	100%	1697	100%

Table 4. Number and percentage of postings and words, second year of the cohort

	September. 2004				October. 2004				November. 2004				December. 2004			
Member	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words
1	0	0%	0	0%	0	0%	0	0%	1	13%	159	20%	0	0%	0	0%
2	1	10%	169	23%	0	0%	0	0%	1	13%	97	12%	0	0%	0	0%
3	2	20%	57	8%	2	17%	161	16%	2	25%	212	27%	0	0%	0	0%
4	0	0%	0	0%	4	33%	341	35%	1	13%	138	18%	0	0%	0	0%
5	2	20%	59	8%	4	33%	251	25%	2	25%	159	20%	1	100%	54	100%
6	2	20%	240	33%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Ins	3	30%	203	28%	2	17%	233	24%	1	13%	22	3%	0	0%	0	0%
	10	100%	728	100 %	12	100%	986	100 %	8	100%	787	100 %	1	100%	54	100%

	January. 2005				February. 2005				March. 2005				April. 2005			
Member	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words
1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2	0	0%	0	0%	1	50%	28	60%	0	0%	0	0%	0	0%	0	0%
3	1	25%	46	14%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
4	0	0%	0	0%	0	0%	0	0%	1	3%	91	100 %	0	0%	0	0%
5	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
6	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Ins	3	75%	289	86%	1	50%	19	40%	0	0%	0	0%	0	0%	0	0%
	4	100%	335	100 %	2	100%	47	100 %	1	3%	91	100 %	0		0	

	May. 2005				June. 2005			
Member	# of Postings	% of Postings	# of Words	% of Words	# of Postings	% of Postings	# of Words	% of Words
1	0	0%	0	0%	0	0%	0	0%
2	0	0%	0	0%	0	0%	0	0%
3	0	0%	0	0%	0	0%	0	0%
4	0	0%	0	0%	0	0%	0	0%
5	0	0%	0	0%	0	0%	0	0%
6	0	0%	0	0%	0	0%	0	0%
Ins	0	0%	0	0%	0	0%	0	0%
	0		0		0		0	

group no longer felt that the CMC tool supported their collaborative efforts during the second year of the program. Possible reasons for this are discussed in the results section for question #1.

Question #3. How is information distributed among members of a group?

To answer this question, computer transcripts of the discussions were quantitatively analyzed. First, the researchers parsed each posting into idea units, units of meaning, or "speech acts" (Howell-Richardson & Mellar, 1996). Each of the idea units was then identified to be addressed to either the group as a whole or to a specific individual. Additionally, each idea unit was further identified as referring to a prior posting, either explicitly or implicitly, or referring to no prior posting.

From this data, we discovered that information is clearly distributed among all members of the group since the highest percentages of postings were meant for the group in general, but even those postings that were directly addressed to a specific individual were accessible by all members of the group. What is interesting about the use of the discussion forums, however, is that in the second and third semesters of the first year of the program, the forum was used dramatically differently than in the first semester, and in the final year of the program the use of the discussion form tapered off until it completely diminished in the final four months of the program.

The data indicate that during the second semester, there was much more interactivity among group members. Not only did the number of idea units dramatically increase, the percentage of idea units that were specifically addressed to individuals increased, as did the percentage of idea units that specifically referred to previous postings, either explicitly or implicitly. Because the forums were used so seldomly in the final year, this use of the discussion forums did not continue into the second year.

There are several possible explanations for the increased interactivity and information distribution over the second and third semesters. The first is that students were perhaps more excited about their project during this time. It is possible that once they had determined what they would work

on during the program, which may have taken a significant amount of time during the first semester, they had a high level of excitement not easily sustained over a two-year time period. It is also possible that students had more decision making to do during this time period and the discussion forums served as a useful arena in which to discuss ideas and possibilities. That might explain the increased percentage of specific references to previous postings. Additionally, the forum may have been used for community building and for building a learning community, and once established, the tool may have lost its value to the group. At the same time, it is possible that after students developed a working learning community, more traditional and immediate forms of communication prevailed, such as email and telephone. Of course, as always, it is possible that while there was a clear group leader, the discussion forums were used interactively by students who were expected to check the discussions several times a week, but that when a clear leader did not emerge after the departure of the first group leader, the others were no longer expected to use the forums. Regardless, what is clear from the data is that the postings were distributed to all group members, but that this distribution was not equal and relied heavily on the individual group member's use of the forum. Those who used the forum most were referenced most often, and those who used the forum least were rarely referenced. Future research should analyze closely the social networks of discussion forum postings by individuals involved in long term project work to examine the question of how information is distributed by group members more fully.

Table 5. Percentages of idea units first year: Illocutionary act, focus, addressee, and inter-message reference.

			Nov-03	Dec-03	Jan-03	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Summer-04
Idea Units		Total Number of Idea Units	55	16	17	99	57	31	20	22	28
Illocutionary Property		Interrogative	5%	11%	11%	5%	5%	3%	20%	14%	0%
		Declarative	76%	82%	82%	90%	84%	94%	75%	86%	100%
		Directive	18%	7%	7%	5%	11%	3%	5%	0%	0%
Focus	Group	Organizational	67%	18%	18%	28%	100%	20%	20%	29%	22%
		Rechannel	13%	0%	0%	0%	0%	0%	7%	0%	11%
		Socio-Affective	7%	45%	45%	34%	0%	0%	0%	0%	0%
		Debilitative	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Metacomment	13%	36%	36%	38%	0%	80%	73%	71%	67%
			27%	39%	39%	29%	14%	32%	75%	82%	32%
	Task	Initiate/Propose	29%	38%	38%	20%	25%	0%	67%	22%	20%
		Reject/Disagree	0%	0%	0%	0%	4%	0%	0%	0%	0%
		Confirm/Affirm	48%	0%	0%	71%	50%	60%	0%	44%	60%
		Refer	5%	0%	0%	3%	8%	0%	0%	0%	0%
		Summarize	14%	50%	50%	0%	8%	0%	0%	0%	0%
		Request	5%	13%	13%	6%	4%	40%	33%	33%	20%
			38%	29%	29%	35%	42%	16%	15%	41%	18%
	Off-task	Off-task	35%	32%	32%	35%	44%	55%	10%	27%	61%
Addressee		All	87%	82%	82%	96%	77%	77%	80%	32%	68%
		Individual	13%	18%	18%	4%	23%	23%	10%	68%	32%
Inter-message Reference		No Reference	82%	75%	75%	89%	47%	68%	50%	32%	61%
		Explicit Reference	11%	14%	14%	10%	32%	32%	35%	68%	39%
		Implicit Reference	5%	11%	11%	1%	21%	0%	15%	0%	0%

Table 6. Percentages of idea units second year: Illocutionary act, focus, addressee, and inter-message reference.

			Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05
Idea Units		Total Number of Idea Units	13	16	17	1	6	2	1	0	0	0
Illocutionary Property		Interrogative	8%	13%	12%	0%	0%	0%	0%	0%	0%	0%
		Declarative	92%	88%	88%	100%	100%	100%	100%	0%	0%	0%
		Directive	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Focus	Group	Organizational	25%	67%	50%	0%	0%	100%	0%	0%	0%	0%
		Rechannel	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Socio-Affective	0%	17%	50%	0%	33%	0%	0%	0%	0%	0%
		Debilitative	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Metacomment	75%	17%	0%	0%	67%	0%	0%	0%	0%	0%
			31%	38%	24%		50%	50%	0%	0%	0%	0%
	Task	Initiate/Propose	29%	0%	25%	100%	33%	0%	0%	0%	0%	0%
		Reject/Disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Confirm/Affirm	43%	0%	38%	0%	33%	0%	0%	0%	0%	0%
		Refer	0%	0%	0%	0%	33%	0%	0%	0%	0%	0%
		Summarize	14%	100%	38%	0%	0%	0%	100%	0%	0%	0%
		Request	14%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			54%	38%	47%	100%	50%	0%	100%	0%	0%	0%
	Off-task	Off-task	15%	31%	29%	0%	0%	50%	0%	0%	0%	0%
Addressee		All	92%	88%	82%	100%	100%	100%	100%	0%	0%	0%
		Individual	8%	13%	18%	0%	0%	0%	0%	0%	0%	0%
Inter-message Reference		No Reference	85%	88%	76%	100%	100%	100%	100%	0%	0%	0%
		Explicit Reference	8%	13%	24%	0%	0%	0%	0%	0%	0%	0%
		Implicit Reference	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Question #4. Do students use the tool to support social interaction as well as project work?

Question #5. When students use CMC tools to support collaborative project work, to what extent are their postings group versus task oriented?

To answer this question, computer transcripts of the discussions were quantitatively analyzed. Percentages of idea units referring to off-task, social activity, group-related collaborative work, and specific task-related collaborative work are presented in tables 5 and 6. Group and task related work are further broken into subareas.

From this data, we determined that students definitely used the discussion forums to support social interaction. The percentages of off-task, social idea units during the first year tell the story with little description needed.

From this data, we also identified that the collaborative work-related postings varied from month to month on whether they were group or task related. The most reasonable explanation for this is that the students used the discussion forums to support the work they perceived to be most important. Postings about the group primarily focused on trying to organize times to meet outside of class, to make suggestions in general about the project (not related to specific task related things), and to deal with the social dynamics of the group. At times, the students used the forums to rechannel; that is, to refocus discussion on a neglected area. On the other hand, task-related postings focused specifically on sharing ideas, updating each other about work completed and work assigned, providing elaboration and further ideas on how to complete projects and activities, summarizing work done when others were not available and requesting information from others. Future research should focus on the quality of the postings.

Conclusion and Implications for Practice

As with previous research (McDonald & Campbell Gibson), the results of this study indicate that when students are given CMC tools to use to support collaborative group work, the interaction often decreases over time, and the percentage of off-task or social communication between group members in comparison to group or task related work is typically high. Interesting, while some research reports interpersonal or social activity to constitute up to 75% of the idea units posted by students (McDonald & Campbell Gibson), the highest percentage of interpersonal idea units posted in any one month of the use of this CMC tool by this group was 61%. In most months, however, fewer than 35% of the idea units posted were interpersonal or social in nature. Unlike other studies, this study reports students use of a CMC in an optional environment; students were not required to post a specific number of postings to the discussion forum, nor were they required to use the tool at all. Thus, this percentage of interpersonal postings is relatively small.

Previous studies have indicated that when students are required to use discussion forums, they do not use them as intended. Very often, in fact, students post to the sites just to meet the requirements for posting. Although it might be imperative to require students in certain situations, it is perhaps detrimental to the progress of a collaborative group to require the students to post to a CMC to support their collaborative project work. The results from this study indicate that at least as long as there is a clear group leader, or one person who by example indicates to the group that using the CMC tool is a viable method of communication, students will find their own value in the tool and use it to facilitate group work. In fact, at times when students are highly engaged in either planning or creating projects, they tend to use the tool extensively. At the same time, when there is an ebb in either planning or creating, students use the tool less often.

Nissenbaum and Walker provide a list of six items necessary to success in the integration of a CMC tool into classrooms. First, the group of people for whom the tool is created must share interest

in a task and have a difficult time meeting face-to-face. Second, the task must be well-specified. Third, students must have easy access to a reliable network. Fourth, students must have a sense of responsibility to the group. Finally, the group must have strong leadership. The authors indicate that if the group deviates from this list by more than two features, they are likely not to be successful in their group project, and certainly, in their use of the tool. Students in this group definitely had difficulty meeting face-to-face, they were required to have high speed internet access at their homes, and they all had a sense of responsibility to the group. Although the group struggled during the first year to identify a well-specified task, this deviated from the original list by only one item. However, during the second year, the leadership of the group fell apart, and at the same time, the use of the CMC tool diminished dramatically.

If instructors decide to use optional CMC tools to support collaborative project work, they must continually ensure that most, if not all, of the items in the list above are being met by the group if they hope that the CMC is used successfully by students. Usually, leaders emerge in groups and instructors do not assign one group member as the group leader. However, if a group member does not emerge, or if the group leader leaves the group for some reason, the instructor should really try to help the group identify a new leader, though discussions, or encouraging students to take charge.

Additionally, while it seems like a terrific idea to have students choose their own group projects, it is imperative that the instructor help the students specify their task. Perhaps, if the project crosses several semesters, this need not be done in the first semester, but students should have a reasonably specific task stated fairly early on in the process.

It is important to note, however, that this case study describes the use of a discussion forum by only one group, whose major problem was the lack of leadership in the second year. We should continue to investigate how students use discussion forums, both optional and required, and what

specific types of discussions or activities engender the highest quality of response. Therefore, future research must address the quality of postings as well as the quantity.

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