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ABSTRACT

Although there are earlier experiences from computer mediated communication (CMC) applications in which e-mail has been used as a forum for argumentation and debate, the literature lacks systematic analyses on the use of CMC for this purpose. This kind of analysis would produce knowledge on the relevance of CMC for practicing argumentation that is needed in developing study methods which could meet especially the goals of higher education. The research tasks of this study were: (1) to examine the level and development of argumentation and counterargumentation in the students' e-mail messages; and (2) to clarify associations between the quality and quantity of argumentation and counterargumentation and two different e-mail study modes. Subjects were 31 students in the Department of Education at the University of Jyvaskyla, Finland. Two top students in the field of education near their graduation were also recruited as tutors of the e-mail studies. Results indicated that the level of argumentation in the students' messages improved during the e-mail study period and that the level of argumentation was higher in the counterargumentative messages compared to those in which the writer had not attacked other peoples' standpoints. In addition, it was found that the average level of argumentation in the students' messages was considered to be quite low. The small portion of argumentative messages indicated also that disputes and debates between the students were uncommon. These results point to the need to develop study methods based on critical discussions and learning environments in the Finnish system which encourage debates, critical interaction, and exchange of opinions. (Contains 46 references.) (AEF)

ARGUMENTATION ANALYSIS OF THE CONTENT OF E-MAIL STUDIES

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INTRODUCTION

Computer-mediated communication (CMC) has frequently been used in establishing a discussion forum for academics. There are many experiences from its use especially in connection with different higher education courses (Hansen & Gladfelter, 1995; McComb 1994; Steeples, Goodyear, & Mellar, 1994), but CMC has also been used for providing a communication forum for teachers, researchers and administrative staff (Kaye, Mason, & Harasim, 1989). The central reason for this interactive use of CMC is that it facilitates and increases interaction and collaboration among participants (Wells, 1993). There are also many research results (Burge, 1994; Mason, 1993) on positive experiences and learning effects gained through collaborative CMC discussions.

In terms of higher education pedagogy, CMC has at least two relevant features. In the first place, learning in a CMC environment is largely dependent on students' own activity and motivation and, thus, CMC is seen to promote self-direction among students (Seaton, 1993). In the same vein, McComb (1994) emphasizes that CMC learners must take responsibility for their own studies and that they should be seen as active creators of learning. In this respect, CMC promotes an essential function of higher education studies which, according to Gow and Kember (1990) is to educate independent learners. In the second place, CMC can be regarded to include such characteristics that are beneficial in practising argumentative writing and argumentation and critical thinking skills whose promotion is, along with self-direction, a central goal of higher education (e.g., Banta, 1993). First, the time and place independent as well as asynchronous nature of CMC provides the students with a flexible environment in which they can consider and construct their ideas and arguments carefully; second, the written form of interaction necessitates explicit expression of thoughts; and third, in a learning environment based on many-to-many communication students can make use of various approaches and points of view to matters under examination (Harasim, 1990; Steinberg, 1992).

Mature argumentation and critical thinking skills are needed e.g. in academic discussions and debates when one has to support one's statements with relevant grounds. Voss and Means (1991) characterize persons possessing mature argumentation skills as people who are able to shape and select such grounds that support stated claims. In addition, persons skilled in argumentation ground their positions from many points of view.

The importance of teaching argumentation and critical thinking skills in higher education has been widely emphasized (e.g., Atwater, 1991; Terenzini, Spinger, Pascarella, & Nora, 1995). Experiences from teaching these skills have shown that students benefit from such learning environments in which they are

actively engaged in debate and constructive dialogue (Colbert, 1987; Littlefield, 1995). In addition, previous CMC literature (Seaton, 1993; Steinberg, 1992) suggests that CMC is suited to producing written argumentation and dialogue. In this study academic argumentation and critical thinking were practised in a learning environment based on the use of e-mail.

RESEARCH ON CMC

Previous CMC research has frequently been focused on various survey questionnaires and user interviews as well as on many practical experiments and case studies, but less frequently on the evaluation of the content of CMC messages (see Mason, 1992). However, the need for the content analysis method is commonly recognized (Kuehn, 1994; Mason, 1992) since, as Henri (1992) puts it, content analysis provides a possibility to reach a better understanding of learning in a CMC environment since it clarifies the students' cognitive processes and ways of handling information during studies.

In those studies that have concentrated on CMC messages the focus has been on the structure and intent (Hailes, 1986; Kuehn, 1993; Smeltzer, 1992) and the thematic content (Friedman & McCullough, 1992) of the messages as well as on the differences between electronic and face-to-face discourse (Black, Levin, Mehan, & Quinn, 1983). In addition, in a recent study by Newman, Webb and Cochrane (1995) the indicators of critical thinking in e-mail messages were analyzed. However, it appears that the content of e-mail messages in terms of argumentation has not been studied earlier. Although there are earlier experiences from CMC applications in which e-mail has been used as a forum for argumentation and debate (Charlton, 1993; Pugh, 1993), the literature lacks of systematic analyses on the use of CMC for this purpose. This kind of analysis would produce knowledge on the relevance of CMC for practising argumentation that is needed in developing study methods which could meet especially the goals of higher education. This study seeks to increase knowledge of CMC in this respect.

The research tasks were a) to examine the level and development of argumentation and counterargumentation in the students' e-mail messages, and b) to clarify associations between the quality and quantity of argumentation and counterargumentation and two different e-mail study modes.

METHOD

Subjects

The e-mail study period was implemented at the Department of Education, in the University of Jyväskylä, Finland, during the fall term 1990. In the beginning, 32 students volunteered to complete the M.Ed level introductory course in the sociology of education through six week e-mail discussions. Since one student dropped out, 31 completed the studies. Two top students in the field of education near their graduation were also recruited as tutors of the e-mail studies. Other 193 students of the course engaged in traditional self-study of the set books of the course.

A majority of the e-mail students were female (58%) and 23 years of age or younger (52%). In addition, most of them were students of humanities (45%) and education (15%) at the early stages of their studies.

E-mail Study Organization

During the e-mail studies the students were supposed to write at least two messages a week related to the set books (Broady, 1986; Takala, 1989) and the course lectures in order to pass the course.

Four individual e-mail study groups were established by the researcher so that there were both male and female students in each group. Two of the groups engaged in the seminar mode and the other two groups in the discussion mode of e-mail study. In the *seminar mode* the tutor selected the discussion topics from the course contents and gave the students regular content-related feedback. The tutor's role was to act as a teacher and a leader. The *discussion mode*, by contrast, was based on the students' self-direction: they had the freedom to select the discussion themes from the study contents by themselves, and thus, they could write their texts on those topics they found interesting and worth discussing. The tutor acted, rather, as a co-worker and a facilitator of learning and gave feedback to the students only occasionally.

The tutors tutored two groups simultaneously and worked with the same book during the whole e-mail study period. During the first half of the studies the seminar groups studied Takala's book and the discussion groups Broady's book, and during the second half the order was reversed.

The configuration used was an electronic mail (Elm) for Unix. The students could use the terminals located on campus at any time convenient for them. All

the messages the students sent were delivered to each member within each individual study group via the mailing list attached to the mailing system. Thus, the configuration provided the students with a forum for many-to-many communication (see Harasim, 1990). The students could also scan and reread the messages whenever they wanted.

The participants did not know each other before the experiment and they also could use pen names when signing their messages. No face-to-face meetings were organized during the study. The students met each other only once in a single face-to-face session held before the studies when they were taught how to use the e-mail program.

The aim of the e-mail discussions was to practise informal argumentation. A literature review on argumentation was delivered to the participants before the studies in order to get them familiar with the concept and procedural structure of argumentation. The students practised argumentation by presenting in their e-mail texts their own grounded standpoints, critique and counterarguments as well as defended themselves when they themselves received critique. In order to produce argumentative interaction the tutors encouraged the students to evoke and engage in debates on the issues dealt with. The tutors also gave the students guidance in argumentation by including good argumentation in their own messages and by pointing out as "model messages" those students' texts which included solid argumentation.

Data of the Study

The total number of the messages sent by the students during the study was 489. From these the messages relevant in terms of the study of the course contents (n = 441) were included in the data. The 48 excluded messages dealt solely with technical matters and practical questions related to the e-mail studies.

Data Analyses

The content analysis of the data focused on the manifestation of argumentation in the messages. Generally argumentation refers to grounding of stated claims (Toulmin, Rieke, & Janik, 1984). Yet, when a claim that is grounded is a counterclaim in nature targeted against someone else's opinion argumentation is called counterargumentation. According to Lo Cascio (1995), counterargumentation

usually concerns an attack against the validity or relevance of some previous argumentation. Since the students in this study were especially encouraged to engage in counterargumentation by presenting critique and attacking each others' arguments, counterargumentation was of special interest also in the analyses.

The data analysis of the study proceeded through two stages. In the first stage, the general level of argumentation of all the messages was analyzed focusing on both counterargumentation and argumentation that did not present contradicting standpoints to what other students had said. The second stage of the analysis concentrated on counterargumentation only.

Argumentation Analysis

The argumentation analysis of the data was carried out by using an e-mail message as a unit of analysis. The messages were classified into three categories on the basis of the researcher's general estimation of the messages' Level of argumentation' (variable X1): good (value 2), moderate (value 1), and poor (value 0).

The messages rated to include good argumentation consisted mainly of text in which the writer had presented standpoints with supporting reasons (cf. Golder & Coirier, 1994; Hintikka & Bachman, 1991) which, at least in places, provided the claim with a relevant and wide scope of support (see Perkins, 1986; Voss & Means, 1991). In the messages rated to include moderate argumentation, the proportion of argumentative text was not as large as in the messages classified into the highest category. Thus, the moderate messages could also include relatively much non-argumentative text in which the writer had not presented positions but, rather, facts relating to various states of affairs. Finally, in the messages rated to consist of poor argumentation the writer had either not put forward a position at all or had presented standpoints without any supporting grounds (cf. Golder & Coirier, 1994). The texts classified into this poorest category resembled often summaries in which the writer had presented various states of affairs but not expressed any opinions.

The reliability of the analysis was estimated by having another person classify 44 messages (10%) independently and by calculating the inter-coder reliability coefficient (see Bryman & Cramer, 1990, pp. 71-72). The reliability (r) was .71 ($p < .01$).

Analysis of Counterargumentation

First in the analysis of counterargumentation a variable 'Counterargumentativeness' (X3) was formed on the basis whether a message included counter-claims directed against fellow students' or tutors' opinions or opinions encountered in the study contents. The messages which included one or more counter-claims were named as 'Counterargumentative messages' (value 1) and those that did not as 'Non-counterargumentative messages' (value 0).

The further analysis concerned the counterargumentative messages only (N = 55). All the *counterarguments* (a counter-claim and its possible groundings) in the messages were graded into three classes according to the level of the grounding of the counter-claim: good (value 2), moderate (value 1), and poor (value 0). In the counterarguments classified into the highest category (good) the counter-claim was supported by relevant and sufficient reasons; in those classified into the middle category (moderate), the grounding was defective although somehow supportive of the counter-claim; and, in those classified into the lowest category (poor), either the grounds were totally irrelevant or the counter-claim was not supported at all.

All the *messages* were then classified into three categories on the basis of the 'Level of counterargumentation' (variable X2) included in them: good (value 2), moderate (value 1), and poor (value 0). Each message's category was based on the mean value of the counterarguments found in it: values from 0 to 0.5 = 0, values from 0.51 to 1.50 = 1, and values from 1.51 to 2.0 = 2.

Statistical Analyses

Log-linear models were used in analyzing the multidimensional associations of the categorical variables of the study (see Fienberg, 1981). Two log-linear analyses according to a symmetrical mode of inquiry (see Kennedy, 1988) were carried out. In the first analysis associations between variables 'Level of argumentation' (X1: good, moderate or poor), 'Counterargumentativeness of message' (X3: yes vs. no), 'Time of sending the message' (X4: during the first vs. second half of e-mail study), and 'Mode of the e-mail study' (X5: seminar vs. discussion) were examined. The second analysis concerned the counterargumentative messages only and examined associations between variables 'Level of counterargumentation' (X2: good, moderate or poor), 'Time of sending the message', and 'Mode of the e-mail study'.

The analyses were implemented by starting from a saturated model in which all the possible main and interaction effects of the variables were included. After this all those parameters that were not statistically significant were dropped from the model step by step by starting from higher-order terms, ending at a minimal acceptable model which fitted the data and contained as few statistically significant parameters as possible (see Andersen, 1980). The analyses are described in Tables 1 and 2.

TABLE 1
Log-linear Analysis 1 (n = 441)

Parameter	Level of X1[a]	Estim.	SE	Z	p
Saturated Model					
X1 (Level of argumentation)	(0)	.27	.12	2.21	*
	(1)	.34	.11	3.16	**
X3 (Counterargumentativeness of message)		.92	.08	10.61	***
X4 (Time of sending the message)		-.06	.09	-.66	ns.
X5 (Mode of the e-mail study)		-.15	.09	-1.68	ns.
X1.X3	(0)	.42	.12	3.49	***
	(1)	-.11	.11	-1.06	ns.
X1.X4	(0)	.29	.12	2.37	*
	(1)	-.16	.11	-1.46	ns.
X1.X5	(0)	.19	.12	1.56	ns.
	(1)	.07	.11	.67	ns.
X3.X4		-.09	.09	-.99	ns.
X3.X5		.25	.09	2.92	**
X4.X5		.07	.09	.85	ns.
X1.X3.X4	(0)	-.11	.12	-.92	ns.
	(1)	.05	.11	.50	ns.
X1.X3.X5	(0)	-.09	.12	-.73	ns.
	(1)	.04	.11	.38	ns.
X1.X4.X5	(0)	.05	.12	.44	ns.
	(1)	.09	.11	.85	ns.
X3.X4.X5		-.14	.09	-1.64	ns.
X1.X3.X4.X5	(0)	-.04	.12	-.29	ns.
	(1)	.12	.11	1.15	ns.
Minimal Acceptable Model (G^2 = 18.60, df = 13, p = .14)					
X1	(0)	.25	.11	2.20	*
	(1)	.33	.10	3.33	***
X3		.93	.08	11.33	***
X4		-.13	.06	-2.29	*
X5		-.11	.08	-1.48	ns.

TABLE 1 (continues)

Parameter	Level of X1[a]	Estim.	SE	Z	p
X1.X3	(0)	.45	.11	4.05	***
	(1)	-.10	.10	-.99	ns.
X1.X4	(0)	.18	.07	2.61	**
	(1)	-.09	.07	-1.28	ns.
X3.X5		.29	.08	3.71	***

[a]Since variable X1 has three classess there are two estimated parameters in the analysis.
* $p < .05$; ** $p < .01$.; *** $p < .001$.

TABLE 2
Log-linear Analysis 2 (n = 55)

Parameter	Level of X2[a]	Estim.	SE	Z	p
Saturated Model					
X2 (Level of counterargumentation)	(1)	.04	.21	.17	ns.
	(2)	.32	.21	1.54	ns.
X4 (Time of sending the message)		-.02	.16	-.13	ns.
X5 (Mode of the e-mail study)		-.37	.16	-2.31	*
X2.X4	(1)	.21	.21	.99	ns.
	(2)	-.01	.21	-.05	ns.
X2.X5	(1)	.56	.21	2.60	**
	(2)	-.28	.21	-1.33	ns.
X4.X5		.20	.16	1.29	ns.
X2.X4.X5	(1)	-.01	.21	-.06	ns.
	(2)	-.00	.21	-.02	ns.
Minimal Acceptable Model ($G^2 = 5.41$, $df = 6$, $p = .49$)					
X2	(1)	.07	.23	.32	ns.
	(2)	.35	.23	1.56	ns.
X5		-.43	.18	-2.50	*
X2.X5	(1)	.69	.23	3.01	**
	(2)	-.28	.23	-1.23	ns.

[a]Since variable X2 has three classess there are two estimated parameters in the analysis.
* $p < .05$; ** $p < .01$.

The analyses revealed that there were statistically significant associations between four individual pairs of variables. The first analysis (Table 1) indicated that variable 'Level of argumentation' was associated both with variables 'Counterargumentativeness of message' and 'Time of sending the message', and that 'Counterargumentativeness of message' was also associated with variable 'Mode of the e-mail study'. The second analysis (Table 2) indicated an association between variables 'Level of counterargumentation' and 'Mode of the

e-mail stu ly'. Furthermore, both analyses indicated that no statistically significant higher-order interaction effects among the variables were found.

RESULTS

Argumentation

TABLE 3
Level of Argumentation of the Messages

Level of argumentation	Counterargumentativeness of the message		Time of sending the message		
	yes *f*(%)	no *f*(%)	1. half *f*(%)	2. half *f*(%)	Total *f*(%)
2 (Good)	14(26)	42(11)	22(11)	34(14)	56(13)
1 (Moderate)	27(49)	135(35)	63(31)	99(41)	162(37)
0 (Poor)	14(25)	209(54)	117(58)	106(45)	223(50)
Total	55(100)	386(100)	202(100)	239(100)	441(100)
Mean	1.00	.57	.53	.70	.62
SD	.72	.68	.69	.71	.70

The results in Table 3 indicate that the general level of argumentation in the students' messages was rated as quite poor: in a half of the messages the level was rated as poor, in about every third (37%) as moderate, and only in about every tenth message (13%) as good.

Table 3 also represents the nature of the statistically significant associations of the level of argumentation (X1) with counterargumentativeness of the messages (X3) and time of sending the message (X4) illustrated in Table 1. Table 3 indicates, first, that the level of argumentation was better in counterargumentative messages (M = 1.00) compared to the non-counterargumentative ones (M = .57), and that this finding resulted mainly from the contrast between the amount of messages rated as poor (25% vs. 54%). Second, the results indicate that the level of argumentation improved during the e-mail study period: the level was higher among the messages sent during the latter half of e-mail study (M = .70) compared to those sent during the first half (M = .53). The difference resulted again mainly from the contrast between the

messages rated as poor (45% vs. 58%). In addition, the result that the third order association between the level of argumentation (X1), time of sending the message (X4) and the mode of the e-mail study (X5) was not statistically significant (see Table 1) means that the improvement in the level of argumentation was not dependent on the mode of the e-mail study.

Counterargumentation

TABLE 4
Counterargumentation in the Messages

Variable	Mode of the e-mail study		
	Seminar *f*(%)	Discussion *f*(%)	Total *f*(%)
Counterargumentativeness (N = 441)			
Yes	17(7)	38(19)	55(13)
No	226(93)	160(81)	386(87)
Total	243(100)	198(100)	441(100)
Level of counterargumentation (N = 55)			
2 (Good)	2(12)	11(29)	13(24)
1 (Moderate)	5(29)	21(55)	26(47)
0 (Poor)	10(59)	6(16)	16(29)
Total	17(100)	38(100)	55(100)
Mean	.53	1.13	.95
SD	.72	.67	.73

Table 4 indicates that counterargumentation in the students' messages was quite rare since only 13% of the messages included counterargumentation. Nevertheless, in those 55 messages in which counterargumentation took place its level was rated as quite good (M = .95): in about a quarter (24%) of the messages the level was rated as good, in about a half (47%) as moderate and only in about every third message (29%) as poor.

In addition, the nature of the associations of both the counterargumentativeness (X3, Table 1) and the level of counterargumentation of the messages (X2, Table 2) with the mode of the e-mail study (X5) are also represented in Table 4. The results indicate, first, that the students engaged in the discussion mode of e-mail study produced more (19% vs. 7%) counterargumentation than the students engaged in the seminar mode, and

second, that the level of counterargumentation was also higher among the discussion mode. The difference between the means was 1.13 vs. .72. A noteworthy result (see Table 2) was also that although the level of counterargumentation among the counterargumentative messages slightly improved during the e-mail study period the development was not statistically significant.

DISCUSSION

The results indicated that the level of argumentation in the students' messages improved during the e-mail study period: during the last half of the studies the students wrote more argumentative texts than during the first half. This result might be construed to be a consequence of the development in the students' skills to write argumentative texts. However, this inference is contradictory with a large body of previous evidence (see Terenzini et al., 1995; McMillan, 1987), which suggests that to achieve improvement in students' argumentation and critical thinking skills needs a longer time and that through short-termed instructional arrangements it is difficult to produce any measurable impacts. Thus, it is important to note that the reason for the improvement of the level of argumentation may also be the fact that after the students had got through their first difficulties with the new study method they internalized the idea of the studies and also got familiar with each other and, thus, during the later stages of the course felt more encouraged to express themselves and present their own points of views and arguments. At all events, the results are promising and suggest that e-mail is a reasonable tool in practising argumentation and warrants further investigation of the topic. This conclusion is supported also by earlier studies reporting on benefits of CMC in practising argumentation and critical thinking (Ahern, Peck, & Laycock, 1992; Marttunen, 1992, 1995; Newman et al., 1995). However, it should be noted that the subjects of the experiment were volunteers who may have been more experienced and interested in studying with computers than the average student. Hence, the use of randomly sampled subjects might have led to less positive results (see Hiltz, 1990).

The results indicated also that the level of argumentation was higher in the counterargumentative messages compared to those in which the writer had not attacked other peoples' standpoints. In addition, although the total number of counterargumentative messages proved fairly low (13%), counterargumentation was distinctly more common and also at a higher level in the discussion groups,

in which the students were given freedom to be self-directive, compared to the seminar groups in which the studies proceeded, rather, under the tutor's control. These results suggest, first, that interaction including critique and debates between students should be encouraged when aiming at producing argumentative writing and practising argumentation. Second, the results suggest that an e-mail environment in which the students are given freedom to be self-directive and the tutor acts a facilitator of studies is more favourable in producing debates and critical interaction between students compared to e-mail studies in which the role of the tutor is more dominant. The conclusions are parallel with previous studies reporting on benefits of academic debates and disputes in teaching argumentation and critical thinking (Colbert, 1987; Littlefield, 1995) as well as by other current results (Ahern et al., 1992; Marttunen, 1992) emphasizing the benefits of conversational and free-form style of CMC in producing argumentative discussions.

A noteworthy result in this study was that the average level of argumentation in the students' messages was considered to be quite poor. This may, at least partially, result from the fact that the students were in the early phases of their undergraduate studies, and thus, their argumentation skills probably had not been fully developed yet. This supposition is supported by previous findings indicating weak argumentation skills among Finnish students, especially in the beginning of their higher education studies (Marttunen, 1994). Furthermore, according to Pascarella (1989), just participating in university's intellectual and critical learning environment promotes the students' argumentation skills. Hence, if the participants in this experiment were more experienced the messages' level of argumentation could have been expected to be better.

The small proportion of counterargumentative messages indicated also that disputes and debates between the students were quite uncommon even if the students were encouraged to exchange opinions and critique each other's texts. This finding, along with the result showing poor argumentation, may result from the Finnish study culture, which at upper secondary as well as at undergraduate level of education does not encourage students to debate and exchange opinions. Instead, the current teaching methods are still, to a large extent, based on transmission of knowledge from the teacher to the students at the upper secondary level and on lectures and self-study of set books at the university level. Hence, the students in this study may not have been familiar with the study method based on critical discussions, which also may have contributed to the relatively poor level of argumentation in their texts.

These results point to the need to develop such study methods and learning environments in the Finnish study system in which debates, critical interaction and exchanging of opinions between students is promoted and encouraged. Furthermore, the study suggests that e-mail discussions are a reasonable way to establish such environments, and thus, also a feasible working method when aiming at reaching one fundamental objective of higher education: to teach the students a critical attitude towards knowledge.

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