

Miika Marttunen

Studying
Argumentation
in Higher
Education by
Electronic Mail

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in Higher Education
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UNIVERSITY OF JYVÄSKYLÄ

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To my family:

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ABSTRACT

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Finnish summary

Diss.

The study reports on an e-mail study experiment in which 31 undergraduate students practised argumentation by engaging in mutual e-mail discussions. The study sought to find out whether the students' argumentation skills developed during the e-mail study period.

Two tutor-led and two student-led e-mail study groups were formed. During the six-week study period the students prepared e-mail messages on the basis of a course in the sociology of education which consisted of two set books and a series of lectures. The e-mail students practised argumentation by presenting their own grounded standpoints and counterarguments. The students of the comparison group ($n = 193$) did not practise argumentation but completed the course through self-study of the required course readings.

After the course the level of the students' ($n = 224$) argumentation skills was measured. In addition, the e-mail students ($n = 31$) were sent a questionnaire, the e-mail tutors ($n = 2$) were interviewed, and the students' e-mail messages ($n = 441$) were analysed. The analyses addressed a) the differences in the level of the argumentation skills between the e-mail and the self-study students, and between students of the two different e-mail study modes, b) the e-mail students' and tutors' perceptions and experiences from the e-mail studies, and c) the quality and quantity of argumentation and counterargumentation in the students' e-mail messages, and factors that affected them.

The level of the students' argumentation skills proved poor. However, the e-mail students' argumentation skills turned out to be better than the self-study students'. Similarly, the students in the student-led mode performed better in the tasks measuring argumentation skills than the students in the tutor-led mode. In addition, the e-mail students' motivation to learn was high and most of them found that the e-mail discussions included a lot of constructive critique and advice. The tutors found that the e-mail discussions frequently included the students' own standpoints and critical comments. In addition, the level of argumentation in the students' messages improved over time, although the general level of argumentation in the messages was poor. Furthermore, the students in the student-led mode presented more and higher-level counterargumentation than the students in the tutor-led mode.

The study suggested that the argumentation skills of Finnish university students should be developed and that e-mail study is a reasonable means for doing this. In addition, the results showed that in particular, the student-led mode of e-mail study provides the students with a good learning environment for the practising of argumentation skills.

Keywords: Electronic mail, Argumentation, Higher education, Computer-mediated communication, Computer-assisted instruction, Teaching methods

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Jyväskylä, April 28, 1997



Miika Marttunen

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following articles, which are referred to in the text by their Roman numerals. When there is a reference to the tables and figures in the original articles, their number and the relevant page number is indicated.

- I Marttunen, M. 1992. Commenting on written arguments as a part of argumentation skills - comparison between students engaged in traditional vs on-line study. *Scandinavian Journal of Educational Research* 36 (4), 289-302.
- II Marttunen, M. 1994. Assessing argumentation skills among Finnish university students. *Learning and Instruction* 4 (2), 175-191.
- III Marttunen, M. In press. Teaching argumentation skills in an electronic mail environment. *Innovations in Education and Training International*.
- IV Marttunen, M. 1997. Argumentation course by electronic mail. *Scandinavian Journal of Educational Research* 41 (1), 15-32.
- V Marttunen, M. In press. Electronic mail as a pedagogical delivery system: An analysis of the learning of argumentation. *Research in Higher Education*.

Copies of the articles are included in the thesis as attachments.

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1 PROBLEMS OF THE STUDY

The main task of the study was to examine the university students' argumentation skills and to ascertain whether studying based on electronic mail (e-mail) provided the university students with a feasible environment for the practising and learning of argumentation.

The problems of the study were as follows (the figures in parentheses indicate how they are addressed in the five articles on which the thesis is based).

1. What is the level of the argumentation skills of Finnish university students like? (I, II)
2. Do the level of argumentation skills and mastery of study contents show variation, on the one hand, as between e-mail and self-study students, and on the other hand, as between e-mail students in the seminar and in the discussion groups? (I, III)
3. What are the students' and the tutors' perceptions of the e-mail discussions and e-mail as a study method? (IV)
4. What is the level of argumentation and counterargumentation in the students' e-mail messages, and what factors are associated with the quality and quantity of argumentation and counterargumentation? (V)

2 INTRODUCTION

The current development in society has been characterized as a shift from an "information society" towards a "network society" (Tella 1995, 1-3). This change is mainly the result of the rapid development of information technologies that have facilitated the transfer and availability of information as well as made global human communication through information networks, such as the Internet, possible. Due to this change in society, the educational system has also faced new challenges, and been given new possibilities for development. In this study some of the possibilities of the new information technology for the development of higher education are investigated.

A fundamental aim of higher education is to educate people who possess a critical attitude towards knowledge and are able to present well-grounded arguments (Gow & Kember 1990; Terenzini, Spinger, Pascarella & Nora 1995). Argumentation skills are needed when engaging in academic discussions in which it is essential to be able to assess the strengths and weaknesses of other peoples' standpoints, and to form one's own positions supported with relevant and adequate grounds. The task of higher education in developing these skills is particularly emphasized in the "network society" in which people have to be able to cope with the large amount of information available. Important in this new situation is the ability to select relevant information from the information mass, which means that the skills to assess information critically from different points of view and to evaluate its strengths and weaknesses are essential.

Studies on teaching argumentation and critical thinking skills (Colbert 1987; Littlefield 1995) suggest that students benefit from learning environments based on active interaction and debate. In this respect Finnish higher education faces a problem, as it appears to be characterised by a scarcity of learning environments based on the critical discussion of issues (Väliverronen 1992), and more broadly, the lack of an argumentative discussion culture (Mauranen 1993). Finnish higher education has been judged to be school-like, which is manifested in the authoritative teaching methods and in the students' instrumental attitude towards their studies (Aittola 1992, 10, 41). Hence, it could be argued that study

methods based on active interaction and discussion should be promoted in Finnish universities.

An essential feature of e-mail is that it makes possible interaction that is independent of time and place, and thus, facilitates communication between people (Harasim 1989). In addition, many studies have also shown that the use of e-mail has increased the extent of human-human interaction (Hailes 1986; Riedl 1989). These features make e-mail suitable to higher education and have also led to its increasing use in university-level studies (Pitt 1996; Steeples, Goodyear & Mellar 1994).

In this study university students practised academic argumentation by using e-mail. In the study the feasibility of the e-mail study environment in promoting the students' argumentation skills was examined.

2.1 Argumentation

2.1.1 Formal and informal argumentation

In a discussion on argumentation it is important to make a difference between formal and informal argumentation. In formal argumentation, often also referred to as formal logic, the artificial and symbolic language of mathematics and logic is used. The formal reasoning process is based on logical rules and its aim is to prove things to be true (Perkins 1985; Thomas 1981, 4-5; Toulmin, Rieke & Janik 1984, 126-128). Informal argumentation, by contrast, deals with subject matter in which there are no undoubted truths to be found, but which can rather be approached from various points of view. It is essential in informal argumentation to support stated claims and opinions with valid and acceptable grounds which are appropriate in particular situations (Cerbin 1988; Toulmin et al. 1984; Walton 1989). The focus of this study is on informal argumentation. When the term "argumentation" is used in the text it refers to informal argumentation.

2.1.2 Toulmin's approach to argumentation

Toulmin's (Toulmin et al. 1984) concept of argumentation is based on the division of an argument into several components. The main components of an argument are the *claim* and the *grounds*. The claim indicates the position of the presenter, and the purpose of the grounds is to provide evidence for supporting the claim and indicate that the claim is true and correct.

An argument also includes a warrant, a backing, a rebuttal, and a qualifier. The *warrant* indicates how the grounds support the claim and are connected with it. The warrant, which is often implicitly included in the text, can be said to form a "bridge" from the grounds to the claim. The *backing* demonstrates the basis of the warrant and indicates how the warrant is justified. The backing may, for example, refer to a law; to some commonly accepted rule in society; or

to statements based on practical experience. The *rebuttal*, often termed a counter-argument (Voss 1988), makes the truth of the warrant conditional by explicating such exceptional circumstances in which the grounds are not relevant. Finally, the *qualifier* is a mediating word (usually an adverb like apparently, presumably, plausibly etc.) that indicates the nature of the qualification between the warrant and the rebuttal. (Toulmin et al. 1984.)

In this study the approach to argumentation is based on the toulminian way to understand argumentation. Toulmin's definition of an argument provided the study with the conceptual apparatus for investigating and analyzing argumentation.

2.1.3 Argumentation skills

It is essential in argumentation to present reasons for supporting the stated claims (Hintikka & Bachman 1991). Voss and Means (1991) emphasize that people possessing mature argumentation skills are able to present relevant and sufficient reasons for supporting their claims. People practised in argumentation are also skilled in assessing the strengths and weaknesses of different approaches to the matters under examination as well as able to present counter-arguments targeted against other peoples' arguments and against their own arguments as well (Cerbin 1988). Furthermore, people skilled in argumentation are also able to change their opinions in the light of new or more precisely defined information (Voss & Means 1991). People possessing weak argumentation skills, in contrast, often present only a few grounds for supporting their points of view and are normally not able to take into account information that in some way conflicts with their own views (Perkins 1985).

Argumentation skills are closely related to critical thinking skills. Developing the students' ability to think critically is, along with promoting their ability to present grounded opinions, a fundamental task of higher education. Norris and Ennis (1989, 3-4) characterize critical thinking as reasonable, reflective and focused thinking. They state that critical thinking is reasonable in that it relies upon the use of good reasons in reaching conclusions, reflective in that it relies upon the examination of the reasonableness of one's own and others' thoughts, and focused in that it does not occur accidentally or without reason. In the same vein, Halpern (1993; also see Quellmalz 1987) stresses that argumentation skills are an essential part of critical thinking skills which, according to her, presuppose the ability to synthesize and analyze information, identify main ideas, and cite evidence for supporting conclusions.

Argumentation and critical thinking skills both play a central role in well-developed scientific thinking. Perry (1981) describes the development of scientific thinking from a phase of fact-centred knowledge acquisition to the more developed phases in which one is able to form independent scientific opinions. Argumentation is connected to the upper phases described by Perry, in which independent logical thinking, reasoning, and the critical assessment of knowledge are all essential (Leeman 1987). Meyers (1986, 95-99) states that in the developed level of thinking one understands the relative and many-dimensional nature of knowledge and is also able to form grounded opinions independently. The aim of this study was to develop the skills students needed

in scientific discussions: the ability to present their own grounded positions as well as a critique based on relevant evidence.

2.1.4 Level and development of argumentation skills: Review of research

The focus of many studies on argumentation and critical thinking skills has been the examination of factors associated with their level and development. The results have indicated that at least intelligence (Perkins 1985), gifts (Voss & Means 1991), age (McCann 1989), and the level of education (King, Wood & Mines 1990; Voss, Blais, Means, Greene & Ahwesh 1986) are connected with a person's level of argumentation and critical thinking skills. In addition, students' knowledge of the particular issues addressed (Furlong 1993; Perkins & Salomon 1989) and the teaching strategies employed (Yli-Luoma 1992) have also been found to be connected with their skills in forming sound and valid arguments. Studies of the development of argumentation and critical thinking skills have shown that in particular, engaging in higher education promotes these skills (Pascarella 1989; Voss et al. 1986). However, according to McMillan (1987), it has not been indicated clearly which factors affect the development. Answers to this problem have been sought in many studies and teaching experiments in which argumentation and critical thinking skills have been taught to students in short-term critical thinking courses. In his review of 27 studies of attempts to enhance students' critical thinking skills by means of short-term programs, McMillan (1987) reported on both supportive and non-supportive results with regard to the effectiveness of the programs. The study of Terenzini et al. (1995) also questions the effectiveness of short-term teaching of argumentation and supports the conclusion that argumentation and critical thinking skills are developed over longer time periods as a result of many contributory factors. Nevertheless, many studies (Colbert 1987; Littlefield 1995) report the positive effects of short-term argumentation and critical thinking courses in which the students have especially benefited from learning environments based on their own active debates and interaction.

To sum up, the literature suggests that when measuring the level and development of argumentation and critical thinking skills one is dealing with a complicated and many-sided phenomenon whose investigation, due to the many simultaneously contributing factors involved, is a difficult task. But in any case, the study results indicate that argumentation and critical thinking skills can be developed by particular teaching interventions, although determining the factors that affect the development is complicated. The results also indicate that along with teaching interventions, the skills are developed naturally as a result of the students' natural learning experiences especially in academic environments, and as a result of their natural maturation process.

2.2 Electronic mail

2.2.1 Computer-mediated communication and electronic mail

In this study communication is defined in accordance with Rogers and Kincaid (1981, 63-66), who stress that communication is a mutual process between two or more persons in which information is created and shared with the aim of reaching mutual understanding. Furthermore, Rogers and Kincaid state that communication is a joint occurrence which always implies a relationship between people.

According to Santoro (1995), computer-mediated communication (CMC) is a name given to various functions in which computers are used to support human communication. He also states that broadly defined, CMC encompasses almost all computer uses. Another common, but more narrow definition of CMC is that it includes electronic mail, computer conferencing (CC) systems, and electronic bulletin-board systems (BBS) (Holden & Wedman 1993; Paulsen 1995a). Defined broadly or narrowly the essential element in CMC is that human communication takes place with the help of computers, and that this communication is based on the use of e-mail.

Paulsen (1995a) notes that, depending on the system employed, e-mail communication may be one-to-one, one-to-many or many-to-many in nature. The ordinary e-mail communication is the one-to-one type, while the electronic bulletin board systems engage the users in one-to-many communication by enabling them to leave messages to be read by many people simultaneously. Finally, computer conferencing programs, such as Cosy, PortaCom, Participate or EIES (Manninen 1990; Rapaport 1991, 2-10; Romiszowski & de Haas 1989), make many-to-many communication possible, since all the messages sent within the conference are delivered automatically to all the participants. Furthermore, when using CC-programs the user may engage in many conferences simultaneously, and may also establish new conferences. Along with the use of CC-programs it is also possible to create many-to-many communication by means of ordinary e-mail if a distribution list is attached to the system (Palme 1995, 72-75). When a distribution list is used all the messages are delivered to each of the pre-determined participants.

2.2.2 Pedagogical features of electronic mail

The educational use of e-mail has increased rapidly. A great deal of experience has recently been gained from its use in elementary and secondary levels of education (Tella 1992a; Wells 1993), as well as from academic studies (Lowry, Koneman, Osman-Jouchoux & Wilson 1994; Paulsen 1992; Pitt 1996; Wells 1993). An essential feature of the use of e-mail is that interaction between participants is facilitated. Harasim (1990) states that interactivity is an important pedagogical attribute of e-mail. According to her, e-mail encourages the students to actively involve themselves in the learning process instead of passively receiving information. Many studies have also indicated that the use of e-mail has

especially increased student-student interaction, and thus, made the students' role active during the course of their studies (Hailes 1986; Hiltz 1986; Riedl 1989).

Along with the possibilities of enhancing interaction Mason (1988; also see Seaton 1993) emphasizes that the use of e-mail supports self-direction among students. She characterizes e-mail students as learners who actively search for knowledge and define their learning objectives independently. In the same vein, Zucchermaglio (1993) defines e-mail environments as examples of systems of "technology for doing" since they are based on the constant activities of the user. Harasim (1990) finds that the opportunity to engage in many-to-many communication in e-mail environments supports collaborative learning, which she regards as another essential pedagogical element in e-mail studying. Furthermore, she stresses that active sharing and seeking of information and playing with ideas takes place in e-mail study environments, and thus, the process of idea-generating is enhanced. Gundry (1992) characterizes e-mail collaboration as a process of learning from others, not about others. In the same vein, Hiltz (1990) suggests that knowledge in an e-mail environment is not something that is delivered to students, but something that occurs and develops in an active dialogue between learners. Study results also suggest that the use of e-mail supports collaborative learning. Tella (1992a, 243), for example, found that studying by e-mail increased cooperation between students and encouraged them to exchange thoughts and ideas, also globally. In addition, many other studies have indicated that positive learning effects have been gained through collaborative e-mail interaction (Burge 1994; Hiltz 1989; Mason 1993; Paulsen 1992).

A fundamental feature of the use of e-mail is that it is based on writing. This is pedagogically important since writing is regarded as an essential means in teaching higher-order thinking skills: through writing it is possible to develop active knowledge structures and critical thinking skills (Capossela 1992; Tynjälä 1996). Emig (1977) is an early exponent of the view that writing makes our thinking visible and in this way develops our thinking skills. Harasim (1990) stresses that new ideas are generated when students respond to reading and the comments of other students and when they begin to verbalize their understanding of the relevant concepts. Thus, writing enables us to interact with our own thoughts, and constantly revises our thinking (Emig 1977). In the same vein, Bereiter and Scardamalia (1987) stress that the writing process includes an interaction process between constantly-developing knowledge and constantly-developing text. Writing also promotes the learning of argumentation, since writing necessitates the accurate expression of thoughts. This is important, for example, in an e-mail study environment, where the students must carefully explicate their thoughts and arguments before sending their messages.

2.2.3 Educational use of electronic mail: Review of research

The focus in many CMC studies has been on the pedagogical aspects of educational e-mail applications. The use of e-mail has been found to promote students' autonomy and self-directiveness (Harasim 1989; Mason 1988; Tella

1992b) as well as to increase student-student interaction (Hailes 1986; Quinn, Mehan, Levin & Black 1983). Furthermore, Hiltz (1986) found that the increased interaction correlated positively with how efficiently the students experienced e-mail. Previous studies have also indicated that interaction, on the one hand between male and female (Hardy, Hodgson & McConnell 1994), and on the other hand between people with different backgrounds (Dubrovsky, Kiesler & Sethna 1991) was more equal when established through e-mail compared to a face-to-face environment.

In the studies that have examined the participants' experiences of e-mail study, such things as a democratic environment (Harasim 1987; Kirby & Cugh 1992), support of the group (Harasim 1987; Hiltz 1989), friendly and equalitarian interaction (Hiltz 1990), free access with no time and place restrictions in use (Grabowski 1990; Hiltz 1990), as well as the possibility of exchanging opinions and ideas with other students (Burge 1994; Hailes & Richards 1984; McConnell 1990; Saunders & Heyl 1988), generating ideas (McConnell 1990), and showing agreement or disagreement (Saunders & Heyl 1988) have been reported as the essential advantages of e-mail studies. The main disadvantages of e-mail study have been found to be the information overload (Harasim 1987; McConnell 1990), the fact that e-mail is a laborious and work-demanding way of studying (Hiltz 1990), and that it is an inefficient way of getting to know other people (McConnell 1990).

The interest in a large body of studies has been to compare e-mail based studying with other study modes. The results have indicated that the use of e-mail has led to as good or better learning outcomes compared with such traditional study modes as face-to-face teaching (Alavi 1994; Davie 1988; D'Souza 1991; Hiltz 1993), self-study of books (Konttinen & Sajavaara 1990) and correspondence teaching (Paulsen 1992, 14-15). Quinn et al. (1983) compared the content of e-mail and face-to-face interaction and found that in a face-to-face environment teachers presented more questions to students while in an e-mail environment students' answers were longer and more versatile. They also found that e-mail discussions included more critical interaction between students. In their review of CMC research literature Garton and Wellman (1995) conclude that to achieve agreement between participants takes more time when e-mail is used compared to face-to-face communication, while the decision quality is better when attained through e-mail. Similar findings are also reported in a study by Olaniran (1994), who found that to reach consensus required more time in e-mail groups than in face-to-face groups, although e-mail students generated more original ideas.

The focus in many other content analyses of e-mail communication has been the intents, functions, themes and the interactive elements of e-mail messages (Friedman & McCullough 1992; Hailes 1986; Howell-Richardson & Mellar 1993; Kuehn 1993; Levin, Kim & Riel 1990; McCormick & McCormick 1992; Smeltzer 1992). However, students' cognitive processes during e-mail studies have been studied much less often, although some such studies are available. In recent studies by Newman, Webb and Cochrane (1995) and Newman, Johnson, Cochrane and Webb (1996), the analyses of the transcripts of both e-mail and face-to-face seminars revealed a deeper overall critical thinking ratio in the e-mail discussions. In another study Ahern, Peck and Laycock (1992) compared students' e-mail discussions produced through

different e-mail study modes. They found that in those e-mail groups in which the role of the tutor was not dominant and the students had more freedom to present their points of view, most student-student interaction and argumentative discourse took place.

Although critical thinking, and to some extent argumentation as well, have been the topics of some previous studies, the literature still largely lacks results based on systematic analyses of the occurrence and learning of argumentation in study environments based on the use of e-mail. A central purpose of this study was to investigate the possibilities of e-mail study in producing argumentative interaction and in promoting the university students' argumentation skills.

3 IMPLEMENTATION OF THE STUDY

3.1 Subjects and design

The subjects of the study ($n = 224$) were the students taking an introductory course in the sociology of education at the Department of Education in the University of Jyväskylä during the autumn term 1990. A majority of them were female, young, and in the early phases of their studies (III, Table 1, 9). Furthermore, the subjects mainly represented the faculties of arts (45 %) and education (15 %).

The students engaged in two study modes in completing the course: e-mail study ($n = 31$) and traditional self-study ($n = 193$). A quasi-experimental static-group comparison design was used (Borg & Gall 1989, 688-689). The e-mail students were selected from volunteers and divided further into four individual e-mail study groups, two seminar and two discussion groups. The e-mail groups acted as experimental groups and the self-study group as a comparison group. The e-mail students practised argumentation by engaging in six-week e-mail discussions based on the set books (Broady 1986; Takala 1989) and lectures of the course. The self-study students did not practise argumentation but completed the course traditionally by studying the course contents by themselves.

All the students participated in an end-of-course examination (posttest) after the course. For the self-study students the exam was obligatory and served as an ordinary exam, while the e-mail students engaged in it only for the benefit of the present research.

3.2 E-mail study arrangements

The e-mail studies were organized by using the university's mainframe computer (Sun) and its electronic mail program (Elm) equipped with the text editor Emacs. A distribution list was attached to the e-mail system, which made many-to-many communication between the students possible. The students could operate e-mail by using the terminals and personal computers located on campus, or at home if they had access to a computer and a modem.

Two students near their graduation were recruited as tutors to the e-mail studies. In the *seminar groups* the tutor selected the discussion topics and gave the students regular feedback. His role was to act as a teacher and a chairman of studies. In the *discussion groups*, by contrast, the students had more freedom to direct their studies: they were allowed to select the discussion topics by themselves while the tutor acted as a co-learner and a facilitator of learning.

During their studies the students were supposed to send from two to three messages a week in order to pass the course. Within each individual e-mail study group the messages were automatically delivered to all the group members and to the tutor through the distribution list.

In their e-mail messages the students were supposed to deal with the contents of the set books and course lectures. The students practised argumentation by presenting in their texts their own opinions on issues included in the course contents, by offering criticism of the other students' arguments, and by defending their own arguments when these were attacked by others. The students were particularly encouraged to put special emphasis on the careful grounding of their opinions and criticisms.

3.3 Data collection and analyses

In the end-of-course examination the students' mastery of the study contents and level of argumentation skills were measured. In the exam the students completed three set books on the sociology of education (Broady 1986; Kivistö & Vaherva 1981; Takala 1989) and the course lectures. The tasks based on Broady's book were obligatory for all of the students. In addition, the e-mail students performed the tasks based on Takala's book, while the self-study students had a choice between tasks based on Takala's book, and tasks based on Kivistö-Vaherva's book. The students' answers to the tasks based on Broady's and Takala's books were included in the data of the study since they were common to both the e-mail and self-study students, and thus, comparable (Table 1).

TABLE 1 Structure of the posttest

Task type	E-mail students	Self-study students	Total
	n	n	n
STUDY CONTENTS			
Broady's book			
an essay question (task 1)	31	139	170
a grounding question (task 2)	31	193	224
Takala's book			
an essay question (task 3)	31	75	106
a grounding question (task 4)	31	103	134
ARGUMENTATION SKILLS			
Commenting on written arguments			
a non-provocative argument (task 5)	31	193	224
a provocative argument (task 6)	31	193	224
Analysis of argumentative text			
a text from Broady's book (task 7)	31	193	224
a text from Takala's book (task 8)	31	103	134
Composing of one's own arguments			
a theme from Broady's book (task 9)	31	193	224
a theme from Takala's book (task 10)	31	103	134

The examination was organized twice. In the first examination, data were collected from 27 e-mail students and 139 self-study students, of whom 75 answered the questions on Takala's book. In the re-examination, data were collected from the remaining four e-mail students and from 54 self-study students who had attended the examination first time. Of these 54 self-study students, 28 chose Takala's book.

For the four e-mail students the re-examination was similar to the first one. For the self-study students the essay questions in the re-examination were, however, changed, since the essay questions acted as the primary criterion for the passing of the course. All answers to the changed essay questions were excluded from the data, and thus a smaller number of students' answers to the essay questions than to the grounding questions was included in the data in the case of both of the books (Table 1).

Furthermore, data on the e-mail students' and tutors' perceptions and experiences of the e-mail studies after the e-mail study period were collected using a student questionnaire and tutor interviews. The students' e-mail messages were stored automatically by the computer, and the paper printouts of the messages included in the data as well. The nature of the different kinds of data and the data analyses are described below.

3.3.1 Mastery of study contents (I)

Mastery of the contents of the set books was measured by two ordinary essay questions and two grounding questions (tasks 1-4, Table 1; Appendix 1). The essay questions were traditional exam questions in which the students were allowed to indicate their knowledge in an open-ended manner. In the grounding questions the students were required to indicate the basis on which the author of the book had established the truth of one or other of the fundamental claims made in the book. The answers were analyzed using an assessment scale of 13 classification categories, ranging from 0 to 3. The assessments were made by the course lecturer, who was an expert in the sociology of education, and the person in charge of the course.

3.3.2 Argumentation skills (I, II, III)

The level of the students' argumentation skills was measured with six tasks (tasks 5-10, Table 1; Appendix 1). In tasks 5 and 6 the students were given two written arguments, a non-provocative one (task 5) and a provocative one (task 6). Both of the arguments included a claim, and evidence that purported to support this claim. The students were asked to write their free-form comments on the arguments.

According to Toulmin et al. (1984, 14), people show their rationality, or lack of it, by the manner in which they handle and respond to the offering of reasons for or against claims. In accordance with this view the students' answers were analyzed on two dimensions: first, in terms of the *degree of analytical approach*¹, and second, in terms of the *degree of argumentation*. According to the first dimension, an analytical answer was judged to include responses to the essential points of the argument: to the claim and the grounds. An analytical answer was interpreted as rational, indicating that the student had understood that when commenting on an argument it is essential to respond to the argument's structural elements. Thus, an analytical answer was interpreted as expressing good argumentation skills. A general (non-analytical) answer, in contrast, expressed weak argumentation skills, since instead of including responses to the claim or grounds, a general answer included responses to some unessential points. Finally, answers classified as falling into the middle category were a mixture of the other two categories, and hence, were interpreted as expressing moderate argumentation skills. According to the second analytical dimension, an argumentative answer included criticism and problematization of the thoughts presented in the task argument. Argumentative answers were interpreted to be rational in that they implied that the student had understood that when responding to an argument it is essential to evaluate it critically. Hence, argumentative answers were interpreted as expressions of developed argumentation skills. A non-argumentative answer, by contrast, expressed weak argumentation skills since, instead of criticism, it mainly consisted of repetition of the thoughts presented in the task. Finally, answers classified as falling into

¹The names of variables are in italics

the middle category expressed moderate argumentation skills and included elements of the other two categories. (Details in I.)

The inter-rater reliability (Bryman & Cramer 1990, 71-72) of the analyses was good: the reliability coefficient ($n = 20$) of the variable "Degree of analytical approach" in task 5 was .44 and of the variable "Degree of argumentation" .74, and the corresponding values in the analysis of task 6 were .86 and .70.

In tasks 7 and 8 the students were presented with argumentative fragments of texts, one selected from Broady's book (task 7) and another from Takala's book (task 8). The students were asked to analyze the texts by identifying in them the main claim and the grounds that supported the claim, as well as to draw their own conclusion based on the grounds. In tasks 9 and 10 the students had to compose their own arguments, including a claim and supporting grounds, relating to given themes. One of the themes was selected from Broady's book (task 9) and another from Takala's book (task 10).

The analyses of the tasks from 7 to 10 were merged. The claims the students identified and composed were analyzed in terms of their *clearness* and *substance*. A clear claim included a contention, referred to one contention only, and its content was understandable. The substance of the claim - analyzed only from answers to tasks 7 and 8 - indicated how well the claim the student had identified corresponded to the main claim included in the text. In addition, the grounds the students identified and composed were analyzed in terms of the *accuracy of grounding*, and the conclusions (included only in tasks 7 and 8) in terms of their *justification* and *consistency*. The inter-rater reliability coefficients of the variables varied from .43 to 1.0. (Details in II.)

The results relating to argumentation skills were compared, first, between e-mail students and self-study students, and second, between students engaged in seminar and discussion modes of e-mail study.

3.3.3 Students' and tutors' perceptions and experiences (IV)

The students' and tutors' perceptions and experiences of the e-mail study were examined using a student questionnaire and by personal interviews of the tutors (appendices 2 and 3). The questionnaire included modified Likert-type questions and open-ended questions. The Likert-type questions were related to the students' perceptions of the e-mail discussions, their activities and aspirations during the study, and their experiences of the use of e-mail as a study tool. In the open-ended questions the students were asked to evaluate the advantages and disadvantages of the studies and to make suggestions as to how to develop the use of e-mail as a study tool.

In the interviews the tutors were asked to evaluate the level and development of argumentation in the students' messages. In addition, they were asked about their experiences of the nature of their work during the studies, as well as their perceptions of e-mail as a study tool in higher education. The interviews were recorded and transcribed.

3.3.4 Argumentation in students' e-mail messages (V)

The students wrote 489 messages during the e-mail study period. From these the messages relevant in terms of the study of the course contents were included in the data ($n = 441$). The 48 excluded messages dealt solely with technical matters and the organization of the e-mail studies.

The focus of the content analysis of the messages was on the quality and quantity of argumentation and counterargumentation. In the "argumentation analysis" the messages were classified into three categories indicating good, moderate or poor levels of argumentation. The messages rated as good consisted mainly of text in which the writer had put forward claims with supporting grounds, while the messages rated as moderate also included a substantial amount of non-argumentative text, including facts and the descriptions of various states of affairs. Finally, the messages rated as poor were mainly non-argumentative in nature, where the writer had not presented arguments, but had rather summarized the study contents. The inter-coder reliability (r) of the analysis was .71.

In the "analysis of counterargumentation" the messages were, first, classified into counterargumentative and non-counterargumentative messages on the basis of whether they included counter-opinions directed against someone else. The counterargumentative messages ($n = 55$) were then classified into three categories indicating good, moderate or poor level of counterargumentation. In the messages rated as "good" the writer had advanced relevant reasons that supported his/her counter-opinion, while the poor messages either did not include any supporting evidence, or the reasons given were irrelevant. The moderate messages did include evidence for the counter-opinion, but it was always defective in one way or another.

Log-linear models were used in examining the multidimensional associations of the categorical variables (Fienberg 1981). The analyses clarified the level of argumentation and counterargumentation in the students' messages and the factors associated with the quality and quantity of argumentation and counterargumentation.

4 SUMMARY OF THE RESULTS

In this chapter the main findings presented in the original articles are summarized. The results in tables 2, 3 and 4 are merged from the results quoted in different articles, and are presented in a previously unpublished form.

4.1 Mastery of study contents (I)

The results indicated that the self-study students mastered the study contents better than the e-mail students: in the case of Broady's book the means were 7.24 vs 5.73 ($t = -3.49$, $df = 167$, $p = .001$) and in the case of Takala's book 6.46 vs 2.95 ($t = -6.23$, $df = 102$, $p = .000$). The results for the students engaged in the different modes of e-mail study did not differ from each other. (I, Figure 2, 297.)

4.2 Argumentation skills (I, II, III)

4.2.1 The whole subject group (I, II)

The results in table 2 indicate that the general level of the students' argumentation skills was poor: in the case of five variables out of the total of 12 variables, the achievements of a half or more of the students were rated as poor. Only the skill to compose clear claims was good among the majority of the students.

TABLE 2 Students' argumentation skills

Variable	Level of the skill						Total	M	SD	
	Good		Moderate		Poor					
	f	%	f	%	f	%				
A NON-PROVOCATIVE ARGUMENT										
Degree of analytical approach ^a	53	24	70	32	99	45	222	100	.40	.40
Degree of argumentation ^a	63	28	55	25	104	47	222	100	.41	.42
A PROVOCATIVE ARGUMENT										
Degree of analytical approach ^b	36	16	74	33	112	50	222	100	.33	.37
Degree of argumentation ^b	47	21	80	36	95	43	222	100	.39	.39
CLAIMS										
Clearness ^c	105	89	13	11	0	0	118	100	.90	.09
Substance ^h	51	40	61	48	15	12	127	100	.64	.33
GROUNDNS										
Accuracy (Banal ^d)	34	15	84	38	102	46	220	100	.35	.36
Accuracy (BComp ^e)	27	13	52	25	132	63	211	100	.25	.36
Accuracy (TAnal ^f)	21	17	40	31	66	52	127	100	.32	.38
Accuracy (TComp ^g)	40	30	46	35	46	35	132	100	.48	.40
CONCLUSIONS										
Justification ^h	17	13	43	34	67	53	127	100	.30	.36
Consistency ^h	9	7	46	38	66	55	121	100	.26	.32

Note. Range of all variables is from 0 to 1.

^aVariable related to task 5 (commenting on an argument).

^bVariable related to task 6 (commenting on an argument).

^cAn aggregated variable based on tasks from 7 to 10.

^dVariable related to task 7 (text analysis).

^eVariable related to task 9 (argument composition).

^fVariable related to task 8 (text analysis).

^gVariable related to task 10 (argument composition).

^hAn aggregated variable based on tasks 7 and 8.

4.2.2 E-mail vs self-study students (I, III)

The comparison between the e-mail and self-study students' argumentation skills portrayed in table 3 shows that three variables out of 12 indicate better skills among the e-mail students. One variable indicates better skill among the self-study students.

TABLE 3 Students' argumentation skills in different modes of study

Variable	Mode of study						t	df	p
	E-mail study			Self-study					
	N	M	SD	N	M	SD			
A NON-PROVOCATIVE ARGUMENT									
Degree of analytical approach ^a	31	0.55	.45	191	0.37	.39	2.29	220	*
Degree of argumentation ^a	31	0.53	.43	191	0.39	.42	1.77	220	n.s.
A PROVOCATIVE ARGUMENT									
Degree of analytical approach ^b	31	0.35	.41	191	0.32	.37	.42	220	n.s.
Degree of argumentation ^b	31	0.47	.41	191	0.38	.38	1.18	220	n.s.
CLAIMS									
Clearness ^c	31	0.91	.11	102	0.89	.10	1.00	131	n.s.
Substance ^h	30	0.60	.36	97	0.65	.33	-.78	125	n.s.
GROUNDNS									
Accuracy (Banal ^d)	30	0.49	.43	190	0.33	.35	2.26	218	*
Accuracy (Bcomp ^e)	28	0.34	.39	183	0.24	.35	1.41	209	n.s.
Accuracy (Tanal ^f)	31	0.29	.34	96	0.34	.39	-.55	125	n.s.
Accuracy (Tcomp ^g)	30	0.34	.34	102	0.52	.42	-2.25	130	*
CONCLUSIONS									
Justification ^h	31	0.32	.35	96	0.30	.36	.35	125	n.s.
Consistency ^h	30	0.43	.38	91	0.21	.28	2.81	39.97	**

* $p < .05$; ** $p < .01$.

The other notes are explained in table 2.

4.2.3 Students of seminar vs discussion modes of e-mail study (I, III)

The results relating to the comparison of the argumentation skills of the students engaged in different e-mail study modes in table 4 indicate that one variable out of 12 shows a higher level of skill for the students who had engaged in the discussion mode. The means in the remaining variables indicate a clear trend also in favour of the students in the discussion mode.

TABLE 4 Students' argumentation skills in different modes of e-mail study

Variable	Mode of e-mail study						t	df	p
	Seminar			Discussion					
	N	M	SD	N	M	SD			
A NON-PROVOCATIVE ARGUMENT									
Degree of analytical approach ^a	15	0.47	.40	16	0.63	.50	-.97	29	n.s.
Degree of argumentation ^a	15	0.40	.43	16	0.66	.40	-1.72	29	n.s.
A PROVOCATIVE ARGUMENT									
Degree of analytical approach ^b	15	0.27	.37	16	0.44	.44	-1.16	29	n.s.
Degree of argumentation ^b	15	0.50	.38	15	0.44	.44	.42	29	n.s.
CLAIMS									
Clearness ^c	15	0.91	.10	16	0.91	.11	-.09	29	n.s.
Substance ^h	14	0.46	.37	16	0.72	.32	-2.05	28	*
GROUNDINGS									
Accuracy (Banal ^d)	14	0.43	.43	16	0.53	.43	-.65	28	n.s.
Accuracy (Bcomp ^e)	13	0.27	.44	15	0.40	.34	-.89	26	n.s.
Accuracy (Tanal ^f)	15	0.27	.32	16	0.32	.36	-.37	29	n.s.
Accuracy (Tcomp ^g)	14	0.29	.33	16	0.38	.34	-.73	28	n.s.
CONCLUSIONS									
Justification ^h	15	0.27	.37	16	0.38	.34	-.95	29	n.s.
Consistency ^h	14	0.32	.37	16	0.52	.38	1.41	28	n.s.

* $p < .05$.

The other notes are explained in table 2.

4.3 Students' and tutors' perceptions and experiences (IV)

The e-mail students assessed the working of the tutors in a positive way: the majority of the students found that the tutoring they received was motivating and encouraging and also prompted them to engage in argumentation (IV, Table 1, 19). Furthermore, the students found the critique included in the messages in their own group as a whole to be mainly constructive, the manner of presentation considerate and encouraging, and the advice they received, affirmative (IV, Table 2, 20). During their studies the aspiration of the majority of the students was also to engage in argumentation with one another by taking part in debates, by presenting new points of view, and by expressing their own thoughts and opinions (IV, Table 3, 21). In addition, almost all the students were highly motivated, felt a sense of togetherness, and got support from the group (IV, Table 4, 26). Finally, the students found that the main advantages of e-mail studies were the chance to plan their own timetables by themselves, the

chance to reflect carefully on the study contents, and the free and equal study atmosphere. The laboriousness of studying and the lack of face-to-face contacts were, on the other hand, regarded most often as disadvantages (IV, Table 5, 27).

The tutors' perceptions were similar to those of the students. The tutors found the e-mail interaction to be mainly argumentative in nature: according to the tutors, the discussions included a lot of the students' own points of view and criticisms. Furthermore, the tutors thought that after the first difficulties were over the quality of argumentation improved over time as the students became familiar with the study environment and gained more confidence in expressing and defending their thoughts.

4.4 Argumentation in students' e-mail messages (V)

The general level of argumentation in the students' e-mail messages proved fairly poor: half of the messages were rated as poor, and only about every tenth message as good (V, Table 3, 356). In addition, only about a tenth of the messages included counterargumentation, although among that tenth the level of counterargumentation was fairly high (V, Table 4, 357). However, counterargumentation chains in which the student responded to criticism presented by a fellow student were very rare².

The log-linear analyses indicated that the *level of argumentation* of the messages was associated both with *counterargumentativeness of message* and *time of sending the message* (V, Table 1, 355). The analyses also revealed associations of the *mode of e-mail study* with both *counterargumentativeness of message* (V, Table 1, 355) and *level of counterargumentation* (V, Table 2, 356). Furthermore, no statistically significant higher-order interaction effects among the variables were found.

The results of the log-linear analyses mean that the level of argumentation was higher in the counterargumentative messages compared to the non-counterargumentative ones, and that the level of argumentation of the messages improved during the e-mail study period (V, Table 3, 356). The improvement was manifested by the finding that the level of argumentation was higher among the messages sent during the latter half of e-mail study compared to the messages sent during the first half. In addition, neither the level nor the improvement of argumentation was dependent on the mode of e-mail study. Furthermore, the results mean that the students engaged in the discussion mode of e-mail study produced both more and higher-level counterargumentation than their counterparts engaged in the seminar mode (V, Table 4, 357).

²A previously unpublished result

5 GENERAL DISCUSSION

5.1 Main findings and conclusions

The results of the study indicated that the level of the e-mail students' argumentation skills after the e-mail study period was higher compared to the skills of the students engaged in the self-study. Furthermore, the analyses of the e-mail messages indicated that the level of argumentation in the students' texts improved during the study. These findings suggest that the students' argumentation skills developed during the e-mail studies, and thus, e-mail provided the students with a feasible environment for practising argumentation. This conclusion is also supported by the results, which suggest that the pedagogical objective of the e-mail discussions, the practising of argumentation, was realized: most students reported that they aimed at taking a personal stance on the matters under consideration, aimed at presenting their own opinions and developing a constructive critique of other students' viewpoints, and also aimed at paying special attention to the logical grounding of their own positions. The majority of the students were also willing to participate actively in the discussions and to create new discussions. Several previous studies also support the conclusion by indicating the benefits of student-student interaction and debates in teaching argumentation (Colbert 1987; Littlefield 1995), and suggesting the suitability of CMC environments for practising argumentation and critical thinking (Charlton 1993; Newman et al. 1996; Pugh 1993).

Although the e-mail students succeeded better in the tasks measuring argumentation skills, their scores in the tasks relating to the study contents were worse than the scores of the self-study students. When interpreting this result it should be noted that the test employed was an ordinary end-of-course examination, and thus, favoured the self-study students who, according to the normal practice, probably studied and learned the contents just before the test. Their passing of the course was also dependent on their exam scores, contrary to the case of the e-mail students, who already had passed the course before the

exam by engaging actively in the e-mail discussions. For this reason, it is probable that the e-mail students did not find it necessary to go through the books so carefully simply on account of the test. Furthermore, the e-mail students also read the contents over a longer time period, so that the time gap between the first week of e-mail study and the day of the exam extended to seven weeks. Hence, due to the differences in both the students' motive to succeed in the exam, and in the way the contents were studied, the better achievements of the self-study students are understandable. If the mastery of the contents had been measured again, for example, after a couple of months, a more reliable understanding of the learning effects of different study modes would have been achieved.

The results also advocate the superiority of the self-directive discussion mode of e-mail study over the tutor-led seminar mode. This conclusion is supported, first, by the result, which show that the students in the discussion mode were more skilled in finding the essential claim from an argumentative text after the e-mail studies than the students in the seminar mode. Second, in their self-reports the students in the discussion mode more often regarded the independence of their studies, and the need to reflect on the study contents as essential advantages of the e-mail studies. Third, the results based on the analyses of the students' e-mail messages indicated that counterargumentative interaction was most likely to come about among the students in the discussion mode, who were provided with more freedom to direct their studies. The level of counterargumentation was also higher in the messages of the students in the discussion mode compared to the seminar mode. These results are particularly significant in terms of modern cognitive learning theory, according to which such aspects as students' autonomy and self-directiveness as well as their own activity during studies play an important role in the learning process (Knowles 1990). Similar results have also been found in the study by Ahern et al. (1992) in which a self-directive mode of CMC was found to be more feasible in producing argumentative discussions than modes in which the studies were strongly under the tutor's control.

Since the possibility of improving argumentation and critical thinking skills, especially as a result of short-term teaching interventions, have been questioned in many studies, the results of this study must also be exposed to criticism. In his review of several studies on critical thinking McMillan (1987) reported only weak evidence for the development of students' critical thinking skills as a result of attending short-term critical thinking courses. Instead, argumentation and critical thinking skills have been characterized as skills that develop as a result of participation in the intellectual atmosphere of college and university studies, and as a result of natural maturation (Greenstreet 1993; Pascarella 1989; Terenzini et al. 1995). However, there are also studies that support the opposite stand: both Leeman (1987) and Mier (1984) report on the positive effects of short-term argumentation and critical thinking courses. Thus, one can count on the main conclusion of this study: the students' argumentation skills developed during the e-mail studies. However, analyses based on a longer practising period undoubtedly would have produced more reliable knowledge of the effects of e-mail studies in promoting the learning of argumentation.

5.2 Evaluation of the methodology

When examining the design employed in the measurement of argumentation skills, it is important to note that the lack of randomization of the subjects weakened the quality of the design: the conclusions made on the basis of a non-randomized design are not as reliable as they would be if the subjects were randomly selected. However, the quality of the design and the reliability of the results were improved by controlling for the possible effects of students' age, study experience, and gender on the results (appendix 4). All of these factors were irregularly distributed over the compared groups (III, Table 1, 9), and are also important factors when argumentation skills are concerned .

Furthermore, the credibility of the results may also be questioned by asking whether the students' development in their argumentation skills was dependent on the teaching of argumentation they engaged in and on the tutors' personal teaching skills, rather than on the argumentative e-mail discussions. In this respect it must be emphasized that the actual teaching intervention by the tutors was quite slight: the tutors did not teach argumentation in the strict sense, but they gave feedback to the students on both the subject contents and the students' argumentation, and also provided the students with models of good argumentation. Yet the tutors' role during the studies was essential, in that they made the students think about the argumentation process and pay attention to its important aspects: stating positions and providing evidence. In this kind of study the tutors' personal teaching skills obviously did not play as important a role as in traditional face-to-face teaching. Instead, the students themselves had the main responsibility for their studies; in the discussion mode to a larger extent than in the seminar mode. The role of e-mail as a study environment was also important because e-mail provided the students with a practical tool with which to practise argumentation and utilize the tutors' comments. Hence, both the tutors' activities and the students' e-mail discussions can be regarded as important in terms of the development of the students' argumentation skills.

Concerning the generalizability of the results to larger populations, it is worth noting that the study includes results concerning both all the subjects of the study ($n = 441$) and the e-mail students only ($n = 31$). The results concerning all the subjects indicated that the students' argumentation skills were relatively poor. Since the subjects represented all the faculties of the University of Jyväskylä the result can, to some extent, be applied to all the students of the University. The negative result is more understandable when one takes into account that the majority of the students were at the early stages in their academic studies, and thus, not yet experienced in engaging in academic discussions. Furthermore, it also should be noted that the majority of the students represented the faculties of arts and education, and thus the results apply mainly to the students of these two faculties.

The results concerning the e-mail students only should be regarded as being based on a case study, where instead of assessing the results' generalizability, it is important to assess the nature of the case (Corrie & Zaklukiewicz 1989). In this respect it is essential to note that the e-mail students were volunteers, and that the e-mail course was integrated as a part of the

regular curriculum of the Department of Education. Since the case was implemented in a natural environment its ecological validity can be regarded as good. Hence, it is realistic to assume that a similar experiment could equally well be carried out somewhere else as well. In this respect the results concerning the e-mail students may be regarded as reliable.

Furthermore, the results based on different kinds of data supported one another. First, the results based on the posttest suggested development in the e-mail students' argumentation skills during their studies; in their self-reports the e-mail students reported their aspiration to practise argumentation and to engage in e-mail debates, and the results of the content analysis of the students' e-mail messages indicated that the messages' level of argumentation improved over time. Thus, the results support a similar conclusion: the e-mail students' skills in presenting arguments developed during the e-mail studies, and e-mail provided the students with a feasible environment in which to practise argumentation. Second, both the results relating to the measurement of the level of argumentation skills, and the results of the content analyses of the students' e-mail texts suggested that the students' argumentation skills were quite poor. In addition, although the level of argumentation in the students' own texts was low, with several messages including the summarizing of ideas presented in the books, a majority of the students judged in their self-reports, that there was only some or no weak argumentation, and not very much summarizing of the books in the messages. This result also suggests that the students' ability to assess the general standard of argumentation of the discussions was not yet developed. Since parallel conclusions are drawn on the basis of different kinds of data from the same subjects, the study can be regarded as internally valid.

A noteworthy conclusion of the study was that when dealing with argumentation skills at least two different skills are involved: analysing and composing skills (II, Table 9, 187). Although these two subskills occurred only to some extent independently the result clarifies the nature of argumentation. Such more elaborated knowledge on the characteristics of argumentation is important when, for example, more sensitive and reliable instruments are developed to measure argumentation. Furthermore, the results indicated that where the ability to compose arguments was concerned, the subject content of the task affected the students' achievements: the students composed better arguments on the topic based on Takala's book (equality between the sexes in school) compared to the topic based on Broady's book (the hidden curriculum in school). It is worth noting that the difference was found even though the students had the source book available all the time. Thus, the ability to compose arguments is dependent on the students' previous knowledge of the topic and on how familiar they are with the issues addressed. This feature clearly needs to be taken into account when constructing instruments to measure argumentation skills and when interpreting the results. The conclusion is supported by previous studies emphasizing students' previous knowledge as an important factor affecting the level of their argumentation (Furlong 1993; Perkins & Salomon 1989).

5.3 Discussion of e-mail as a study environment

An essential character of e-mail interaction is that it is usually non-real time in nature. In a non-real time environment, careful consideration and formulation of one's arguments are essential when aiming at winning debates, in contrast to real-time face-to-face situations in which the debater's skill in repartee, and his/her verbal talents often play a central role. In this respect e-mail has been characterized as a media which provides the users with equal possibilities to present their views and by means of which a democratic atmosphere for discussions can be created (Brookshire 1991; Kirby & Chugh 1992). In addition, an e-mail environment can be regarded as equal, in that many such factors as, for example, the dominance of verbally talented persons, status aspects, and various external characteristics of people (Hiltz & Turoff 1993, 137-138), which often impede discussions in face-to-face settings, do not play as significant a role in an e-mail environment. The above-mentioned factors may cause the atmosphere in face-to-face situations to be often experienced as even threatening (Saiedian 1993), in contrast to CMC environments, in which, according to Brookshire (1991), people tend to discuss delicate or difficult issues that they probably would not treat face-to-face. The students in this study also found the e-mail study atmosphere to be equal and free, and reported having expressed things by e-mail that they would not have expressed face-to-face. Hence, the non-real time and equal nature of the e-mail environment may have lowered the students' threshold for presenting their arguments and facilitated their participation in the discussions, which may have affected the fairly positive results of the study.

However, the use of e-mail may have had negative effects as well. For example, eye contacts and social pressure, that are normally included in face-to-face situations, are lacking in the e-mail environment. This may have reduced the students' responses to fellow students' criticisms. In particular, it can be assumed that when an immediate contact between students was missing it might have been easier for students to leave the criticism unanswered. The results of this study supported this inference, since counterargumentation chains in the students' messages proved rare. The students' responses to one another's criticisms would probably have been more frequent in a face-to-face environment.

Typical of e-mail communication is that, although it is based on written text, it includes many features that are characteristic of spoken language. Tella (1992a, 247) found that e-mail texts included a lot of fragmentary and disconnected sentences typical of the informal use of spoken language. Similarly, Graddol (1989) has stressed the informal nature of e-mail communication in which turn taking is easy and equal for all the participants. In this respect, e-mail communication has been defined as located somewhere between spontaneous spoken language and deliberate written language (Tella 1992a, 205-206). In terms of argumentation this special nature of e-mail communication is important, since when writing through e-mail people have enough time to consider their arguments, while being at the same time allowed to present the text in an informal and open-ended format by not worrying so much about the grammatical accuracy of the text. This possibility, most

probably, also helped the students in writing their arguments and affected the favourable results of the study.

5.4 The pedagogical relevance of the results for higher education

From the viewpoint of higher and adult education many of the present results are pedagogically meaningful. First, the students found the possibility to plan one's timetables independently to be an advantage of the e-mail studies, and the students' common aspiration was also to maintain argumentative discussions by creating debates and opening new discussions. These findings suggest the suitability of e-mail study for adult education in which, according to Knowles (1990), learners' self-direction and the possibility to be responsible for one's own studies should be particularly emphasized. Still, as Seaton (1993) puts it, in CMC studies it is not the technology itself that promotes self-direction, but among other things, the type and pedagogy of the course offered. In this study the students were allowed to present their own opinions and points of view on the discussion topics, as well as to direct the discussions according to their own interests. In this way the students were offered the chance to engage in self-directive studies.

Second, the results indicated that the aspiration of almost all of the e-mail students was to take a personal stance on the issues presented in the books, and that the e-mail study made the students consider the issues carefully. Thus, e-mail study supported the students' deep approach to learning (Entwistle & Waterson 1988). In this study the e-mail students, instead of only reading the study contents, exchanged opinions on the basis of the contents and put forward supporting reasons for their positions. The condition for the students' engagement in studying based on argumentative discussions was that they reflected carefully on the issues dealt with, and that they at the same time formed a personal relationship with the topic in question. This kind of studying can be assumed to advance both the students' deep processing of knowledge and the learning of the contents. This assumption is supported by many previous results reporting as good and sometimes better learning outcomes through CMC studies compared with such traditional methods as face-to-face teaching (Hiltz 1990), self-study of books (Konttinen & Sajavaara 1990) and correspondence teaching (Paulsen 1992, 14-15).

Third, along with the results suggesting the students' self-direction and deep approach to learning, the results indicated that the students had a high motivation to study and that they acted as active subjects during their studies. These results are meaningful in terms of the constructive approach to learning which has recently been a central topic of concern in research on learning and instruction (Glaser 1991; von Wright 1996). In constructivism the students' previous experiences and knowledge structures play a central role (Cooper 1993; Tella 1994a, 31-32). Simons (1993; also see Salomon 1991) stresses that an essential feature of constructive learning is that new information must be elaborated and related to the learner's previous knowledge of the subject, and that learning is cumulative in that all new learning builds upon and/or utilizes

the learner's prior knowledge. Furthermore, in constructive environments learning is basically seen as a social process that takes place in the mutual interactions between people. During the interactions the learner's thinking processes become visible to him/herself and for other people as well, which makes it possible for someone to reflect on his/her thoughts both by him/herself and reciprocally with the co-learners (Rauste-von Wright & von Wright 1996, 36-37). Jonassen, Mayes and McAleese (1993) emphasize that constructive environments are appropriate contexts to support the development of students' higher-order thinking skills, and thus, suitable learning environments in higher education in particular. In the present study, while engaging in debates by e-mail the students had to utilize their previous experiences and knowledge, as well as to reorganize and prioritize their knowledge on the basis of the new information gained during the discussions. In this way the students were directed to construct a new capital of knowledge.

Furthermore, the results indicated a fairly poor level of argumentation both in the measurements of the students' argumentation skills and in the content analyses of the students' e-mail messages. Although the results mainly represent students at the early phases of their university studies, they still suggest that a typical Finnish higher education student displays neither a critical attitude nor an eagerness to engage in argumentative discussions. Other recent results support the same conclusion (Hirsjärvi, Böök & Penttinen 1996; Mauranen 1993; Steffensen 1996). Thus, the development of students' argumentation and debating skills should be emphasized more in Finnish higher education (Laurinen 1996). In addition, the learning of the critical attitude should, most probably, be stressed more before university studies begin. Some introductory studies on argumentation and critical thinking before undergraduate studies would probably strengthen the Finnish students' readiness to proceed to higher education studies where the students' self-directiveness and the critical evaluation of the issues confronted are of primary significance.

5.5 Research and pedagogical implications in the future

This study suggested that argumentation skills can be divided at least into two subskills which appear, to some extent, independently. More research is needed to clarify further the nature of argumentation skills and the ways in which different subskills are connected with one another. This kind of knowledge would help researchers in constructing more valid and accurate instruments with which to measure and study argumentation. On the other hand, in terms of the pedagogical aspects of argumentation, further studies on argumentative interaction in different learning environments should be carried out. For example, comparisons of the nature of argumentative discussions in e-mail and face-to-face environments would broaden the knowledge concerning feasible means for promoting students' argumentation and critical thinking skills during their undergraduate studies.

In the recent discussion concerning the pedagogical applications of computer-mediated communications, the development of virtual school has been a central topic (Mattila 1993; Tella 1995; Tiffin & Rajasingham 1995). Virtual school means those information-delivery arrangements in which all the school functions, or some parts of them, are organized through information technologies without the need for any physical school buildings (Tella 1995, 14; Wagner & Mattila 1993). E-mail plays a central role in the arrangements concerning virtual school, since e-mail provides a flexible means for communication which can be utilized in studies. Previously e-mail has been utilized, for example, in developing cooperative learning environments through information networks in comprehensive and high school education (Tella 1992a, 1994b). At a higher education level a reasonable way to take advantage of e-mail would be to develop its use in establishing different kinds of argumentative discussion forums for students. According to this study, it seems to be pedagogically reasonable to substitute e-mail discussions for self-study of those set books whose contents are suited for critical discussion, and when the students' learning of the contents can be assumed to be promoted by argumentative debates. E-mail could also be used to supplement lecture teaching, so that the examination of the lectured topics would be broadened by the e-mail discussions afterwards. This kind of arrangement would increase both the lecturer-student and student-student interaction, the lack of which is regarded as one of the main problems in lecture teaching. Furthermore, with e-mail it is also possible to develop the inflexible end-of-course examination practice whose common problem is the students' instrumental attitude towards their studies: too often students study contents as near the exam day as possible, being concerned primarily with passing the course, rather than with the actual learning of the contents. The students could, for example, be assigned some written tasks delivered through e-mail during the course, followed by the teacher's feedback. In this way the students could already complete a part of their studies during the study process, which means that the importance of the end-of-course examination would be diminished.

Concerning the development of the pedagogical use of e-mail, it is also essential to examine the role of the tutor and the organization of the tutor's work. A common view in the current CMC literature is that the e-mail students' active and self-directive role during their studies should be respected by the tutor, and that the tutor should act as a facilitator of learning for the students (Berge 1995; Davie & Wells 1991). According to this view, such tasks as the summarizing and focusing of discussions and giving feedback to the students are emphasized in the tutor's work (Freenberg 1989; Paulsen 1995b). The results of this study also indicated, that such an organization of the e-mail tutor's work is reasonable in which the tutor acts as a co-learner and a resource person for the students who, in turn, have the freedom and opportunity to direct their studies by themselves. However, the e-mail tutors' heavy workload proved to be a problem in this study. It is also a big obstacle for establishing e-mail studies as a permanent part of higher education studies. Thus, such e-mail study arrangements should be investigated in which the students and the instructor share the tutor's tasks. Tagg (1994), for example, stresses that students could well take care of such functions as opening the discussions, setting the agenda, and to some extent, also the summarizing and focusing of the

discussions. This kind of arrangements would lighten the workload of staff and help them in finding such e-mail applications that work well in higher education.

Nowadays a number of studies have been made on different technical solutions of e-mail studying as well as on students' and tutors' experiences of e-mail study environments. However, much more seldom have such topics as the students' learning and learning strategies in e-mail environments been investigated. In particular, content analysis of e-mail messages is still a relatively little used method, although e-mail transcripts are easy to collect, and provide researchers with an access to large amounts of data (Mason 1992). Through content analysis it is possible, as Henri (1992) puts it, to reveal those elements in the messages that best describe the nature of the students' learning process. This kind of knowledge of learners' cognitive processes during e-mail studies is important when aiming at finding the most suitable and beneficial pedagogical applications of e-mail.

To conclude, the future network society needs people able to assess information critically in order to cope with the information flood delivered by means of the constantly developing media technology. Higher education in particular, faces a big challenge in the education of these people. Thus, universities should emphasize the development of learning environments in which the students' learning of argumentation and critical thinking is promoted, and questioning attitudes towards the issues confronted are aroused. A fundamental skill in the society of the future will be the ability to select information: society needs independent critical thinkers.

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YHTEENVETO

Johdanto

Suomalaisen korkeakouluopetuksen puutteena pidetään opiskelijoiden vuorovaikutukseen perustuvien opetustilanteiden vähyyttä ja yleisemminkin argumentoivan keskustelukulttuurin kehittymättömyyttä. Opiskelijoiden välisen kriittisen vuorovaikutuksen on todettu edistävän argumentointitaitojen ja kriittisen ajattelun kehittymistä. Vaikka vuorovaikutukseen perustuvia opiskelutilanteita on korkeakouluopinnoissamme vähän, opiskelijoiden argumentointitaitojen edistäminen sekä opiskelijoiden kasvattaminen kriittiseen ja perustelevaan keskustelukulttuuriin on korkeakouluopetuksen olennainen tehtävä. Tästä syystä tieteellisten vuorovaikutustaitojen edistämiseen soveltuvien opiskelumuotojen kehittäminen korkeakouluopetuksessa on tarpeellista.

Taito argumentoida on tärkeää tieteellisessä keskustelussa, jossa keskeistä on itsenäisten perusteltujen näkemysten ja perustellun kritiikin esittäminen. Argumentointitaitojen ja kriittisen ajattelun merkitys korostuu myös nykyajan tieto- ja verkkoyhteiskunnassa, jossa saatavilla olevan informaation määrä lisääntyy nopeasti ja informaatiota on jatkuvasti helpompi hankkia. Tällöin relevantin informaation valitseminen edellyttää taitoa arvioida kriittisesti erilaisien asioiden ja näkökantojen vahvuuksia ja heikkouksia.

Opetuksessa uusi informaatioteknologia, kuten sähköposti, on helpottanut ja lisännyt erityisesti opiskelijoiden välistä vuorovaikutusta. Tästä syystä sähköpostio opiskelu osana korkeakouluopintoja soveltuu hyvin argumentoivan keskustelun taitojen harjoitteluun. Sähköpostin käyttöön perustuva opiskeluympäristö tarjoaa myös mahdollisuuden itseohjautuvaan ja opiskelijoiden omaan aktiivisuuteen perustuvaan opiskeluun. Opiskelun sähköpostiympäristössä voidaan tulkita perustuvan pitkälti konstruktivistiseen oppimisenäkemykseen, joka korostaa opiskelijoiden itseohjautuvuuden, motivaation ja aktiivisuuden merkitystä oppimisessa sekä oppimisen sosiaalista luonnetta. Tällöin oppimisen

ymmärretään rakentuvan paljolti opiskelijoiden aikaisemman tiedon varaan vuorovaikutuksessa muiden kanssa.

Tässä tutkimuksessa yliopisto-opiskelijat harjoittelivat argumentoivaa tieteellistä keskustelua sähköpostiympäristössä. Tutkimuksessa selvitettiin a) yliopisto-opiskelijoiden argumentointitaitojen tasoa, b) sitä, oliko toisaalta sähköpostioiskelijoiden ja itsenäisesti opiskelleiden ja toisaalta eri tavalla sähköpostin avulla opiskelleiden argumentointitaidoissa ja oppisisältöjen hallinnassa eroa, c) opiskelijoiden ja tutorien näkemyksiä ja kokemuksia sähköpostioiskelusta ja d) argumentoinnin ja vasta-argumentoinnin tasoa opiskelijoiden sähköpostikirjeissä sekä argumentoinnin ja vasta-argumentoinnin tasoon yhteydessä olevia tekijöitä.

Tutkimuksen toteuttaminen

Tutkimukseen osallistuivat Jyväskylän yliopiston kasvatustieteiden perusopin-
tojakson opiskelijat syksyllä 1990 (n = 224). Heistä valtaosa oli opintojensa alku-
vaiheessa, useimmat olivat naisia ja humanistisen tai kasvatustieteiden tiede-
kunnan opiskelijoita. Opiskelijoista 31 vapaaehtoista suoritti opintojakson har-
joittelemalla argumentointia sähköpostin avulla. Sähköpostioiskelukoikeilu järjes-
tettiin kasvatustieteiden laitoksella syyslukukaudella 1990. Opintojakson muut
opiskelijat muodostivat vertailuryhmän. Vertailuryhmän opiskelijat eivät harjoi-
telleet argumentointia, vaan suorittivat opinnot itsenäisesti tenttimällä kirjat ja
luennot.

Sähköpostioiskelijat jaettiin neljään itsenäiseen opiskeluryhmään: kahteen
seminaari- ja kahteen keskusteluryhmään. Opiskelijoita ohjasi kaksi tutoria.
Kuusi viikkoa kestäneen sähköpostioiskelun aikana opiskelijat laativat
opintojakson teoksiin liittyviä kirjallisia puheenvuoroja, jotka he lähettivät oman
ryhmänsä jäsenille ja tutorille. Puheenvuoroissaan opiskelijat harjoittelivat
argumentointia esittämällä perusteltuja näkemyksiä sekä kommentoimalla
ryhmänsä muiden opiskelijoiden ajatuksia ja mielipiteitä. Seminaariryhmissä
tutor laati keskusteluteemat, huolehti keskustelun suuntaamisesta ja antoi
opiskelijoille sisällöllistä palautetta. Seminaariryhmissä tutorin rooli oli opettaja-
mainen ja ohjaava. Keskusteluryhmissä opiskelijat päättivät itse keskusteluai-
heista ja huolehtivat keskustelun etenemisestä tutorin toimiessa lähinnä muiden
tavoin opiskelijana ja tukihenkilönä.

Sähköpostioiskelun jälkeen sekä opintojakson itsenäisesti opiskelleiden
että sähköpostioiskelijoiden argumentointitaitojen taso mitattiin. Tällöin
tarkasteltiin opiskelijoiden taitoa a) kommentoida argumentoivia puheenvuoroja,
b) etsiä argumentoivista teksteistä keskeiset väittämät ja perustelut ja vetää
niiden pohjalta johtopäätöksiä sekä c) perustella omia väittämiään. Kommenttien
analyysissä kiinnitettiin huomiota kommenttien erittelevyyteen ja argumen-
toivuuteen. Väittämien analyysissä tarkasteltiin väittämien selkeyttä ja sitä,
kuinka hyvin tekstistä etsitty väittämä vastasi tekstin keskeisintä väittämää.
Perustelujen analyysissä oltiin kiinnostuneita perusteiden täsmällisyydestä ja
kattavuudesta ja johtopäätösten analyysissä tarkasteltiin sitä, kuinka
oikeutettuja ja johdonmukaisia johtopäätökset olivat. Tuloksia vertailtiin

toisaalta sähköpostiopiskelijoiden ja itsenäisesti opiskelleiden kesken ja toisaalta eri tavoin toteutettuun sähköpostiopiskeluun osallistuneiden kesken. Lisäksi sähköpostiopiskelijoille lähetettiin kyselylomake ja tutorit haastateltiin. Sekä opiskelijoilta että tutoreilta tiedusteltiin heidän näkemyksiään ja kokemuksiaan sähköpostikeskusteluista ja sähköpostiopiskelusta opiskelumuotona. Myös opiskelijoiden sähköpostikeskustelut analysoitiin. Analyyseissä selvitettiin tekstien argumentaation ja vasta-argumentaation tasoa sekä argumentaation ja vasta-argumentaation tasoon yhteydessä olevia tekijöitä.

Tulokset ja johtopäätökset

Opiskelijoiden argumentointitaidot olivat heikot. Valtaosassa opiskelijoiden sähköpostikirjeistä argumentaation laatu oli niin ikään heikko. Sähköpostiopiskelijoiden argumentointitaidot kuitenkin paranivat opiskelun aikana. Taitojen kohenemisesta kertoo ensinnäkin se, että opintojakson jälkeen sähköpostiopiskelijoiden argumentointitaidot olivat paremmat kuin perinteisesti opiskelleiden. Toiseksi opiskelijoiden sähköpostiopiskelun puolivälin jälkeen lähettämien kirjeiden argumentaation taso oli korkeampi verrattuna niihin kirjeisiin, jotka he lähettivät opiskelun puoleenväliin mennessä. Lisäksi lähes kaikki opiskelijat pitivät sähköpostiopiskelua motivoivana opiskelutapana ja valtaosa pyrki osallistumaan aktiivisesti käytyihin keskusteluihin ja väittelyihin esittämällä perusteltuja kannanottoja sekä kritiikkiä. Myös sähköpostiopiskelun tutorit olivat sitä mieltä, että opiskelijat esittivät kirjeissään paljon omia mielipiteitään ja kriittisiä kommentteja ja että kirjeiden argumentaation taso parani opiskelun aikana.

Sähköpostiopiskelijat hallitsivat oppisisällöt itsenäisesti opiskelleita heikommin opintojakson jälkeen järjestetyssä tentissä. Tenttimenestys ei kuitenkaan vaikuttanut sähköpostiopiskelijoiden hyväksytyksi tulemiseen opintojaksolla eivätkä he tästä syystä olleet samalla lailla valmistautuneet tenttiin kuin itsenäisesti opiskelleet, joiden arvosana määräytyi tenttituloksen perusteella. Sähköpostiopiskelijoiden heikompi tenttimenestys on tämän takia ymmärrettävää.

Opiskelijoiden vapauteen ja omaan päättävävalttaan perustuva sähköpostiopiskelu keskusteluryhmissä osoittautui seminaariryhmissä toteutettua tutorjohtoista opiskelua paremmaksi harjoiteltaessa argumentoivaatieteellistä keskustelua. Tämän osoitti se, että keskusteluryhmien opiskelijat osasivat tiivistää argumentoivasta tekstistä keskeisen väittämän sähköpostiopiskelun jälkeen paremmin kuin seminaariryhmien opiskelijat. Lisäksi keskusteluryhmissä käydyt keskustelut sisälsivät enemmän ja tasokkaampaa vasta-argumentointia kuin keskustelut seminaariryhmissä. Keskusteluryhmien opiskelijat olivat lisäksi seminaariryhmien opiskelijoita useammin sitä mieltä, että sähköpostin käytön keskeinen etu oli mahdollisuus itseohjautuvaan työskentelyyn. Keskusteluryhmien opiskelijat olivat myös useammin sillä kannalla, että sähköpostiopiskelu ohjasi ajattelemaan oppisisältöjä syvällisesti.

Tutkimus osoitti, että suomalaisessa koulutusjärjestelmässä pitäisi kiinnittää enemmän huomiota perusteltujen mielipiteiden esittämisen harjoittelu-

miseen. Erityisesti suomalaisessa yliopisto-opetuksessa tulisi luoda enemmän opiskelijoiden vuorovaikutukseen perustuvia opiskelukäytänteitä opiskelijoiden argumentointitaitojen ja kriittisen ajattelun kehittämiseksi. Sähköpostiopiskelu tarjosi opiskelijoille motivoivan ja menestyksellisen opiskeluympäristön argumentointitaitojen harjoitteluun ja se osoittautui näin yhdeksi tarkoituksenmukaiseksi vaihtoehdoksi tämän tavoitteen toteuttamiseen.

APPENDICES

APPENDIX 1: Posttest-questions

APPENDIX 2: Student-questionnaire

APPENDIX 3: Structure of the tutor interview

APPENDIX 4: Correlations (r) between the variables measuring argumentation skills and relevant background variables

APPENDIX 1: Posttest questions

A. STUDY CONTENTS

Broady's book

Task 1 (an essay question):

The relationship between an individual and a society - what is education, according to Broady, basically about?

Task 2 (a grounding question):

Broady claims that the school does not treat all children equally. How does he justify his claim?

Takala's book

Task 3 (an essay question):

Describe English subculture research.

Task 4 (a grounding question):

In Takala's book Kivinen and Rinne claim that one of the central tasks of education is reproduction. How do they justify their claim?

B. ARGUMENTATION SKILLS

Commenting on written arguments

Task 5 (a non-provocative argument):

In a seminar on the sociology of education person X has advanced the following statement. Comment on it.

'I think that it's useful to get an education. On the one hand, it's clear that the better one's education the easier it's for one to get a job. And on the other hand, the better educated a person is the better possibilities he/she has to begin to do that kind of work he/she really wants. And besides, highly educated people are most appreciated in society.'

Task 6 (a provocative argument):

In the same seminar person Y has put forward the following statement. Comment on it.

'My position is that a child's social background doesn't influence his status in society when he is an adult. To begin with, intelligence is inherited genetically, not on the basis of the parents' social class. Secondly, financial aid for students makes it possible for everyone to get as much education as they want. Furthermore, it's a known fact that parents' occupation doesn't influence the occupation of a child. And finally, I'd

say that the educational guidance in schools gives everyone the same information of the educational possibilities in society. On the basis of the above it's possible to make the conclusion that everyone has equal possibilities to advance in society.'

Analysis of argumentative text

Task 7 (Broady's book):

An extract from Broady's book (pp. 159-161) is presented in the following. Read it and answer the questions.

'Bernstein has discovered that progressive pedagogy, in a fairly concrete sense, is based on the middle class peoples' conception of time, space and social control. It needs a lot of room, a lot of material, large drawing papers etc. (Bernstein, 1977, p. 133), in contrast to traditional pedagogy, which does not need more than a desk, a textbook, and paper and pencil. Progressive pedagogy is based on the middle class's long-term conception of the time needed in education. "If all children left school when they are 14 there would be no invisible pedagogy (loc. cit.). The new middle classes can afford progressive pedagogy during their own childhood years, when their children have enough time to prepare themselves for real life in secondary education (ibid. 1977, p 127).

Progressive pedagogy is, thus, expensive pedagogy. Teacher education requires resources. According to Bernstein, traditional pedagogy can function even with moderately skilled teachers, while progressive pedagogy requires more developed skills to make syntheses and comparisons. Teachers must be able to balance contrasting views and enjoy them both in terms of knowledge and social relations (Ibid. 1977, p. 108). Bernstein has also stated this in a more open way: "A teacher learns to hide power so that students think that they own it. To be able to display such skill a teacher needs three years' training". (A citation according to Dahlberg, 1977, p. 20).

Progressive pedagogy is expensive, it needs room, materials and time. This means that it accords better with the way of life of middle-class people than with that of working-class people. A middle-class child, who is used to having a room of his/her own, and who is freely given drawing paper to be wasted, has been raised to plan his/her schooling career with a long-term perspective. For him/her it is easier to understand what the ideas of the progressive pedagogy stand for. One example is the assessment of students' performance. In the traditional pedagogy the assessment takes place immediately in the form of the teacher's acceptance or rejection, or perhaps through giving marks. In the practice of progressive pedagogy the assessment is often more vague or more invisible. It appears after longer time periods, perhaps not until the awarding of the certificate.

For the parents of working-class children it is often difficult to perceive the principles behind progressive pedagogy. However, (or perhaps just for that reason) according to Bernstein, the working class children in particular will be taught according to these principles. Then their mothers either have to be re-socialized or kept out of the way'. (Bernstein, Ibid. 1977, p. 139)

QUESTIONS:

1. Summarize the most central claim included in the text and the evidence used to support it.
2. What do you think is the conclusion drawn from the evidence?

Task 8 (Takala's book):

An extract from Takala's book (p. 196) is presented in the following. Read it and answer the questions.

'The historical phases of political socialization are related to so-called nation-building (Bendix 1964). This concept envisages a process, at the beginning of which people identify only with the near community (relatives, village). Gradually people will become aware of their also belonging to a wider national whole and to the state it forms. Education has been seen as having a very essential role in this change.

As for the educational system: this process presupposes that a public education system will be organized in order to socialize the common people, and that higher education based on the national language will be set up in order to bring into being a pool of the required national cultural elite and civil servants. Furthermore, it is important that education controlled by the nation is substituted for education controlled by the church. As regards the content of education, nation-building is manifested in the aspiration to establish a common language above the minority languages and dialects, by teaching national history (in Finland, for example, the stories of Ensign Ståhl) and by using other symbols (a national anthem, the flag) of national unity in schools. If the nation-building process proceeds simultaneously with the democratization of the political system, as has happened in most European countries, this presupposes that education will also undertake the socialization of students to using the rights included in the new political system (Flora 1972; Elo-vainio 1981; Klinge b1985).'

QUESTIONS:

1. Summarize the most central claim included in the text and the evidence used to support it.
2. What do you think is the conclusion drawn from the evidence?

Composing of one's own arguments

Task 9 (Broady's book):

A pervasive theme in Broady's book is *the hidden curriculum in school*. Your task is to identify one central claim relating to the theme and to support it with evidence. The idea is that the claim and the evidence are your own. The only condition is that your claim relates to the hidden curriculum in school. You can, however, select your claim and the evidence on the basis of the book.

Task 10 (Takala's book):

A pervasive theme in Takala's book is *equality between the sexes in school*. Your task is to identify one central claim relating to the theme and to support it with evidence. The idea is that the claim and the evidence are your own. The only condition is that your claim relates to equality between sexes in school. You can, however, select your claim and the evidence on the basis of the book.

APPENDIX 2: Student-questionnaire**A. LIKERT-TYPE QUESTIONS**

1. Estimate the tutors' messages. To what extent did they include the following? (Response categories: A. Very much; B. Quite a lot; C. Only a little; D. Not at all)

ITEMS:

- * Feedback on content
- * Personal feedback
- * Critique
- * Motivating and encouraging material
- * Considerate/empathetic material
- * Inconsiderate material
- * Encouragement to argumentation
- * Material that helps structure the study of the books
- * Material useful in summarizing the issues studied

2. Evaluate the feedback you received from other students. How often did they include the following? (Response categories: A. Often; B. Occasionally; C. Never)

ITEMS:

- * I got positive feedback
- * I got negative feedback
- * I got evil-minded criticism
- * I got constructive critique
- * I was discouraged by others
- * I got encouragement
- * I got positive advice
- * I got negative advice
- * I received considerate treatment

3. Evaluate your own messages. (Response categories: A. Often; B. Occasionally; C. Never)

ITEMS:

- * I hesitated in sending them
- * I cancelled a message I had already completed
- * I formulated them with care
- * I formulated them in a hurry
- * I said things that I would not have said in a face-to-face situation

4. Evaluate the messages in your own group as a whole. Take into account both the students' and the tutors' messages. To what extent did the messages include the following? (Response categories: A. Very much; B. Quite a lot; C. Only a little; D. A little; E. Not at all)

ITEMS:

- * Evil-minded criticism
- * Constructive critique
- * Discouraging of others
- * Encouraging of others
- * Pompous behaviour
- * Constructive advising
- * Negative advising
- * Considerate treatment of others' opinions
- * Putting forward opinions with inadequate support
- * Direct summarizing of the books

5. What did you think was important in mail study. How well do the following items describe your activities during the e-mail study? (Response categories: A. Very well; B. Quite well; C. Cannot say; D. Quite badly; E. Very badly)

ITEMS:

- * I tried to comment actively on others' messages
 - * I tried to participate in the on-going debates
 - * I tried to create a debate by presenting intentionally sharp and provocative opinions
 - * I tried to open discussion by presenting new points of view
 - * I tried to initiate debates by provoking others
 - * I drew on the books when presenting my opinions because I did not find myself competent to present my own views
 - * I avoided presenting matters differently from the way they were presented in the books because I did not want to distort them
 - * I tried to present a lot of my own thoughts and opinions
 - * I tried to take a personal stance on the matters presented in the books
 - * I tried to include my own experiences in my messages
 - * I paid special attention to the grounding of my opinions
 - * I tried to find weaknesses in the groundings of others
6. How often do you think that it would have been necessary to meet the other members of your group during the course of e-mail studies? (Response categories: A. Often; B. Sometimes; C. never)
7. Did there develop any feelings of togetherness in your group during the studies? (Response categories: A. Obviously; B. To some extent; C. Not at all)

58 APPENDIX 2 (continues)

8. How well did this kind of studying suit to you personally? (Response categories: A. Very well; B. Quite Well; C. Cannot say; D. Quite badly; E. Very badly)
9. How good was your study motivation during the e-mail studies? (Response categories: A. Very high; B. Quite high; C. Cannot say; D. Quite low; E. Very low)
10. Would you take another similar course? (Response categories: A. Certainly; B. Probably; C. Maybe; D. No)
11. How much work did e-mail studying require compared to the traditional way of studying (attending the lectures, self-study of the books, examination)? (Response categories: A. Much more; B. Slightly more; C. About the same; D. Slightly less; E. Much less)
12. Was the amount of work e-mail study required suitable in relation to the extent of the course (3 study weeks) (Response categories: A. The amount of work was much too large; B. The amount of work was slightly too large; C. The amount of work was suitable; D. The amount of work was slightly too small; E. The amount of work was much too small)
13. Did you receive support from the group in your studies? (Response categories: A. Very much; B. Quite a lot; C. A little; D. A bit; E. Not at all)
14. How easy/difficult was it to use the mailing program (Elm)? (Response categories: A. Very easy; B. Quite easy; C. Neither easy nor difficult; D. Quite difficult; E. Very difficult)
15. How easy/difficult was it to use the text editor (Emacs)? (Response categories: A. Very easy; B. Quite easy; C. Neither easy nor difficult; D. Quite difficult; E. Very difficult)

B. OPEN-ENDED QUESTIONS

16. What good elements and what bad elements did this new way of studying have?
17. How do you think it should be developed?

APPENDIX 3: Structure of the tutor interview

THE MAIN THEMES OF THE TUTOR INTERVIEW

1. Use of time
 - * amount of time used
 - * division of time used
 - * most time-consuming tasks
 - * comparison of the groups
2. Activities as a tutor
 - * understanding of the tutor's role
 - * personal aspirations
 - * personal ways of working
 - * analysing the assignments
 - * comparison of the groups
3. The realization of e-mail study in terms of its pedagogical rationale
 - * good and bad aspects
 - * development of e-mail study
 - * development of the tutor's role
 - * comparison of the groups
4. E-mail discussions
 - * the relevance of the discussions in terms of practising argumentation and in terms of learning the study contents
 - * developmental trends in the discussions
 - * comparison of the groups

APPENDIX 4: Correlations (r) between the variables measuring argumentation skills and relevant background variables

Variables measuring argumentation skills	Background variables			
	W	S	G	Y
<i>A non-provocative argument</i>				
Degree of analytical approach	.17**	-.10	-.03	.06
Degree of argumentation	.25**	.15	-.14*	.01
<i>A provocative argument</i>				
Degree of analytical approach	.00	.00	-.03	.03
Degree of argumentation	.26**	-.08	-.03	.07
<i>Claims</i>				
Clearness	-.02	.07	.11	.05
Substance	.05	-.16	.06	.08
<i>Grounds</i>				
Accuracy of grounding (BAnal ^a)	.08	-.02	.02	.16*
Accuracy of grounding (BComp ^b)	.15	-.03	.06	-.12
Accuracy of grounding (TAnal ^c)	-.03	-.02	.02	.09
Accuracy of grounding (TComp ^d)	-.09	.13	.05	.06
<i>Conclusions</i>				
Justification	.15	.04	.00	.08
Consistency	.35**	-.00	-.18*	-.07

W: Willingness to participate in e-mail study

S: Length of prior studies

G: Gender

Y: Year of birth

^aVariable related to task 7 (analysis of an argumentative text).

^bVariable related to task 9 (composition of one's own argument).

^cVariable related to task 8 (analysis of an argumentative text).

^dVariable related to task 10 (composition of one's own argument).

* p < .05

** p < .01

I

**Commenting on Written Arguments as a Part of
Argumentation Skills - comparison between students
engaged in traditional vs on-line study**

by Miika Marttunen

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II

**Assessing Argumentation Skills among Finnish
University Students**

by Miika Marttunen

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ASSESSING ARGUMENTATION SKILLS AMONG FINNISH UNIVERSITY STUDENTS

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Abstract

This article reports a study in which the aim was to assess the argumentation skills among Finnish university students and to contribute to the measurement of argumentation. The subjects ($N = 224$) consisted of the students taking an introductory course in the sociology of education at the University of Jyväskylä in autumn 1990. The data are derived from written tasks concerning argumentation. The analysis consisted of separate analyses of the claims, the grounds and the conclusions. The results suggested that argumentation skills can be divided into the skill of analyzing argumentative texts and the skill of composing one's own arguments. Furthermore, the results indicated that the students' argumentation skills were poor.

Introduction

Argumentation plays a fundamental role in scientific activities. The main criterion of the validity of scientific knowledge is the reasoning presented in order to support the knowledge. In addition, argumentation and reasoning are essential characteristics of discussion and interaction in the academic community.

Academic argumentation may be either formal or informal in nature (Voss & Means, 1991). Formal argumentation is based on mathematics and logic and the reasoning process leans on formal rules (Perkins, 1985). In contrast, a characteristic of informal argumentation is that a position is supported by offering relevant reasons that are appropriate in a particular situation (Cerbin, 1988). In this article argumentation refers to informal argumentation.

Informal argumentation has a central role in higher education, especially in human and social sciences. Meiland (1981) stresses that the main tasks in higher education studies are to teach problematization and critical evaluation of topics under consideration. He suggests that these are the main features that distinguish higher level education from

high school work, which is largely based on acceptance of knowledge without questioning its truth.



Gow and Kember (1990) stress that the target of higher education is to educate people who, after graduating, are able to think independently and who possess a critical attitude towards knowledge. Accordingly, ability to think critically (Banta, 1993; Halpern, 1993) and to take into account controversial and opposite views (Collier, 1984) have been defined as desirable outcomes of higher education studies. These goals can be promoted through practising student-to-student interaction and argumentative dialogue which have been found to be positively linked with argumentation and critical thinking skills (Hart, 1990; Marttunen, 1992; Smith, 1977).

In addition, practising of argumentation has been discovered to be pedagogically important in several respects. According to Kosberg and Rancer (1989), an interest in subject matter is provoked and egocentric thinking diminished when topics are addressed in an argumentative way because they have to be examined from various viewpoints. Stein and Miller (1991) point out that an argumentative situation necessitates acquisition of new knowledge by all parties to support their own positions, which at the same time intensifies the learning process. Concerning academic activities an especially important feature in argumentation is that argumentative discussion and debate improve the participants' skills to speak and communicate as well as the skills to examine things from various perspectives and to evaluate the strengths and weaknesses of different standpoints and positions (Colbert & Biggers, 1985).

However, the studying culture in Finnish higher education, in respect of the above, has been characterized as undeveloped (Väliveronen, 1992). The main reason for this is that there exists a scarcity of the learning situations based on discussion and dialogue (*ibid.*), although the need for developing teaching methods aiming at improving the skills in argumentation and scientific thinking is widely recognized (Aittola, 1992; Hakkarainen, 1989; Nuutinen, 1985).

Nature of Argumentation Skills

Argumentation skills are closely related to critical thinking skills. Watson and Glaser (1964) include several factors in skills to think critically: (a) the ability to define the problem, (b) the ability to gather and select relevant information for solving a particular problem, (c) the ability to recognize publicly expressed or not expressed suppositions, (d) the ability to formulate and select relevant and promising hypotheses, and (e) the ability to make justified inferences and to evaluate the validity of reasoning. Norris and Ennis (1989), (see also Olson & Babu, 1992), emphasize the reflective nature of critical thinking. According to them, a person thinking in a reflective way is able to evaluate the reasonableness of his/her own or of other people's thoughts and also, when needed, he/she is able to specify or totally change his/her opinions on the basis of new information.

The views expressed by Watson and Glaser and by Norris and Ennis are closely reminiscent of the features that Voss and Means (1991) associate with the characteristics of a person possessing mature argumentation skills. According to them, a person skilled in argumentation is able to shape and select the grounds that support the stated claim.

In addition, a person can explicate the circumstances in which his/her arguments are not valid as well as evaluate arguments contradictory to his/her own ones. Perkins (1985) characterizes persons possessing poor argumentation skills as individuals who typically present only a few reasons for supporting a claim and who do not take into consideration information that is inconsistent with their own thoughts.

Atwater (1991) points out that critical thinking skills, as outlined by Watson and Glaser earlier, presuppose the skills of recognizing, composing and evaluating arguments. These elements of argumentation are included in the characterization of skilled argumentation outlined by Cerbin (1988). He bases his thoughts on a Toulminian argumentation theory according to which an argument is divided into separate components: a claim, grounds, a warrant, a backing, a qualifier and a rebuttal (see Toulmin, Rieke & Janik, 1984). According to Cerbin, a person skilled in informal argumentation possesses the ability to identify these components of an argument and, furthermore, he/she possesses the ability to evaluate them. When evaluating an argument the focus must be (a) on the clarity of the claims, (b) on the relevance and sufficiency of the grounds, (c) on the relevance of the warrant, and (d) on whether exceptions have been taken into account in making conclusions and whether counter-arguments have been presented. A central point is, according to Cerbin, that when composing one's own arguments the claims are formulated with care and that the grounds presented to support the claim are relevant and sufficient. Perkins (1986) emphasizes grounding as especially significant in informal argumentation. He claims that the most important requirement is that the grounds include all relevant information needed in order to support the claim.

A common interest in many studies concerning argumentation skills has been the tendency to try to specify the factors contributing to the development of argumentation skills. The results have indicated that the skills are linked at least with intelligence (Perkins, 1985), gifts (Voss & Means, 1991), age (McCann, 1989) and the level of education (Voss, Blais, Means, Greene & Ahwesh, 1986). However, it is difficult to find any exact cause-effect relationships since many factors are involved. Furthermore, it is problematical to compare the different results because many of the studies have focused on different levels of education and a variety of measurement methods have been applied to them. A common result in many studies (see Pascarella, 1989; Voss *et al.*, 1986) is that participating in especially higher education studies has been found to be beneficial in terms of promoting students' argumentation skills. However, there are not many studies aimed at determining the level of university students' argumentation skills and the criteria for such evaluation. One reason to investigate the level of these skills is that the resulting knowledge should help to clarify how the aims of university studies might be attained and direct the evaluation and development of university teaching.

In the present study the focus was on measuring the level of university students' argumentation skills. Research tasks were (a) to find out the level of argumentation skills among students in one Finnish university, and (b) to contribute to the development of the measurement of argumentation skills. The argumentation skills were investigated through clarifying how skilled the students were at composing a claim, grounds and a conclusion.

Method

Subjects



The target group of the study consisted of all the students taking an introductory course in the sociology of education at the Department of Education in the University of Jyväskylä in autumn 1990 ($N = 224$). The number of female students was 193 (73%) and of male students 61 (27%).

The subjects of the study were purposefully selected, not randomly sampled. Despite this the results describe, with some caution, the level of argumentation skills among all the students of the target university. This is possible because the number of the subjects is fairly high ($N = 224$) and the students represented all the faculties of the university in question. However, it should be noted that the majority of the students were female, young, represented faculties of Arts and Education and had only limited study experience. Thus, the results represent mostly female students of humanities and education and are representative of students in the early stages of their studies.

An experiment in which 31 (13.8%) students of the course engaged in training in argumentation through computer conference discussions was organized as a part of the course (see Marttunen, 1992). The other 193 (86.2%) students of the course did not have any specific practising or introduction to argumentation during or before the course. Hence, this special practising of argumentation by some, although a small minority, of the students might have influenced the outcomes of the study and it has to be taken into account when discussing the results.

Instrument and Data Collection

The course in question included three set books and 24 hours of lectures. The data of the study are derived from the tasks based on two of the books (Broady, 1986; Takala, 1989). Broady's book was compulsory to everyone while Takala's book might be substituted by the third. Hence, all of the 224 students responded to the tasks concerning Broady's book and a subset of 134 students to the tasks concerning Takala's book. The contents of both of the books were related to sociology of education. However, the books differed from each other in two aspects. First, Broady's book was a monograph while Takala's book was edited. Second, Broady's book dealt with one special issue, *The Hidden Curriculum*, whereas Takala's book contained several articles written by different authors covering a diversity of themes relating to sociology of education.

The tasks in the end-of-course examination were related a) to the mastery of subject contents of the books and lectures, and b) to argumentation skills. However, the data reported in this article were based only on the tasks relating to argumentation. The exam-papers were collected after all the students had responded to them. The students did not know beforehand about the nature of the examination. According to the original plans all the tasks were supposed to have an equal effect on whether the students would pass the course or not. Hence, the students' attitude towards all the tasks while answering them was similar, despite the fact that it was finally decided that only the tasks relating to the subject contents affected their scores.

In developing the tasks measuring argumentation skills Cerbin's (1988) views, in particular, were utilized. According to him, among the essential elements of argumentation skills are the skills of analyzing and composing arguments. Accordingly, the tasks employed consisted of these two approaches. First, the students were asked to analyze texts containing argumentation and, second, to compose arguments of their own based on a given theme. Both approaches have been applied also in many previous studies (see e.g., Oostdam & Eiting, 1990; Ryan & Norris, 1990).

In addition, the Toulminian argumentation theory was utilized in the construction of the tasks. The theory defines a particular function for each of the elements in an argument in which the claim and the grounds are the most important ones. The function of the claim is to determine the standpoint of the writer associated with the issue discussed and the function of the grounds is to support that standpoint (Toulmin *et al.*, 1984). Often an argument contains also a conclusion whose function, like that of the claim, is to reveal the standpoint of the presenter of an argument (Voss *et al.*, 1986). The tasks in the measurement instrument were divided, in accordance with these elements of an argument, into tasks relating to claims, grounds and conclusions.

The tasks relating to the *text analyses* were composed by selecting a text passage from the two books by the researcher. The text selected from the Broady's book dealt with the topic, *Progressive Pedagogy From the Point of View of Different Social Classes*, and the text from Takala's book with the topic, *The Role of Education in the Construction of the Common Feeling of National and Cultural Togetherness*.

The texts represented informal argumentation in which grounds are presented to support some standpoint of the author. The main selection criteria of the texts were that they had to contain, first, some fundamental claim by the author and, second, the grounds the author had stated to support the claim. The students' tasks were to identify from the texts (a) the main claim (task types C 1 and C 2, see Table 1), (b) the grounds that supported the claim (task types G 1 and G 2), and (c) to draw their own conclusion based on the grounds (task types CO 1 and CO 2).

The tasks relating to the *composition of one's own arguments* were constructed by giving the students one central theme from both of the books. The theme given from Broady's book was, *The Hidden Curriculum in School*, and from Takala's book, *Equality Between the Sexes in School*. The students were then asked to compose (a) their own

Table 1
The Classification of the Task Types According to the Focus of the Task, Book and the Element of an Argument

Focus of the task	Book	Element of an argument		
		Claim	Grounds	Conclusion
Analysis of argumentative text	B*	C 1	G 1	CO 1
	T†	C 2	G 2	CO 2
Composition of one's own argument	B*	C 3	G 3	
	T†	C 4	G 4	

*Broady's book.

†Takala's book.

claims relating to the themes (task types C 3 and C 4), and (b) their own grounds for supporting their claims (task types G 3 and G 4).

III

Data Analysis

The analysis covered all the task types consisting of separate analyses of the claims, the grounds and the conclusions.

Analysis of Claims

Cerbin (1988) emphasizes that essential aspects concerning evaluation of claims in general is to focus on whether a claim includes a contention relating to some theme and whether a claim is written clearly. In this study the claims were analyzed by examining (a) whether the claim was formed so that it included a contention (form variables X1-X4, see Table 2), (b) whether the focus of the claim was on one contention (focus variables X5-X8), and (c) whether the content of the claim was clear and understandable (clarity variables X9-X12). In addition, the claims identified from the argumentative texts were analyzed by evaluating whether they corresponded to the most essential claims included in the texts (substance variables X13 and X14). The variables were dichotomous (0 = no; 1 = yes).

Table 2
Formation of Variables

Book	Element of an argument and analysis criteria	Focus of the task	
		Analysis of argumentative text	Composition of one's own argument
	Claims		
B*	Form	X1	X2
	Focus	X5	X6
	Clarity	X9	X10
	Substance	X13	
T†	Form	X3	X4
	Focus	X7	X8
	Clarity	X11	X12
	Substance	X14	
	Grounds		
B*	Accuracy	X15	X16
T†	Accuracy	X17	X18
	Conclusions		
B*	Justification	X19	
	Consistency	X21	
T†	Justification	X20	
	Consistency	X22	

*Broady's book.

†Takala's book.

Variables X1-X12 were summed to form a new variable S1 (clearness) which describes the students' general skill to formulate clear claims in accordance with the following scale: good .76–1.00, moderate .50–.75, poor .00–.49. Similarly, variables X13 and X14 were summed to construct a new variable S2 (substance) which describes the students' general skill to identify a claim from a text corresponding to its essential contents (the same scale as in variable S1). The basis for the composition of variables S1 and S2 was that the item variables were discovered to measure largely the same phenomenon. The procedure used to indicate this was simple matching similarity measure for binary data. The value of the measurement indicates the probability that a randomly chosen data unit achieves the same score on two variables (Anderberg, 1973). This value between the paired variables formed on the basis of variables X1-X12 varied from .57 to .99 and the value between variables X13 and X14 was .52.

In Table 3 the analysis of the claims is illustrated with four examples. The claims of a different level of clearness composed by the students (task type C 3, see Table 1) on the basis of the given theme, *The Hidden Curriculum in School*, from Broady's (1986) book are presented.

Table 3
Examples of Claims

Case	Claim
33	The hidden curriculum cannot be removed from the reality of the school
92	The hidden curriculum teaches children to be patient and to control themselves and their feelings
171	School imparts a conception of time which serves the need of the capitalistic society to get labor force of a particular kind
119	The hidden curriculum out in the open

In cases 33, 92 and 171 the sentence takes a form of a contention. In addition, the focus in case 33 is on one contention and the claim is also clear. In contrast, the claims in cases 92 and 171 have been interpreted as unclear because they include more than one contention. In case 92 the word "and" refers to two contentions, and in case 171 there are the two contentions that school imparts something (cont. 1) which, in turn, serves something (cont. 2). In addition, the weakness of the claim in case 171 is that its content is nonspecific, since one cannot know what is meant with the expression "of a particular kind". The most confusing case of all is case 119 which actually does not include a contention at all.

Analysis of Grounds

The analysis of grounds focused on the quality aspects. The most important criteria in analyzing the quality of the grounds have been truthfulness, relevance regarding the claims, and the scope of support the grounds offer (Bacig, Evans, Larmouth & Risdon, 1990; Perkins, 1986; Voss & Means, 1991). In the analyses of the present study the focus was on theoretical validity. Then, according to Fisher (1988), the essential point is the relevance and the scope of the support, not truthfulness. However, it should be noted

that if reasons in an argument have a low truth-value, the whole argument is most often weak too.

Taking these criteria into account four variables (Accuracy variables X15-X18, see Table 2) were formed on the basis of the accuracy of the grounding in the students' answers. Due to weak intercorrelations no summated variables were formed. Accurate grounding (value 2) manifested a good level of skill in composing the grounds. Accurate grounding was consistent and relevant and it consisted of a wide scope of support to the claim as well as of grounds presented explicitly and separated distinctly from each other. A poor level of skill in composing the grounds was, by contrast, manifested by inaccurate grounding (value 0) in which the grounds were irrelevant or obscure and the scope of the grounds was narrow. The skill classified to the category "moderate" (value 1) was manifested by grounds which included features from both accurate and inaccurate grounding.

In Tables 4 and 5 the analysis of the grounds has been illustrated with two examples. In both of them a student has composed a claim and the grounds which are supposed to support the claim. Students have composed them on the basis of the theme, *Equality Between the Sexes in School*, related to Takala's book (task type G 4, see Table 1).

In case 109 the grounding is accurate, because the grounds support the claim and they are distinctly separated from each other. In addition, several relevant aspects regarding

Table 4
An Example of Accurate Grounding (Case 109)

Claim	Grounds
Boys receive more attention in school	(1) Due to the importance of hierarchy and competition to the boys they eagerly join debates and discussions in school and so receive more attention too (2) Boys tend to be more noisy and they disturb the lessons more than girls do (3) Boys are often asked to answer the most interesting questions because the teacher wants to encourage them to participate (4) The teacher is often interested in boys as individuals while in girls solely as students (5) The activity and skilful performance of boys are more often rewarded by approving words than those of girls

Table 5
An Example of Inaccurate Grounding (Case 183)

Claim	Grounds
School should try to break down gender distinctions instead of promoting them	(1) Boys receive more attention in classrooms than girls (2) Girls participate in discussions concerning factual knowledge, boys in spontaneous discussions (3) The teacher gives boys tasks which may require physical strength while girls tinker with easy jobs (4) Study guidance is bound to gender roles (5) The tidiness of boys' exercise books is more highly esteemed, while in the case of girls it is regarded as a matter of course (6) A stricter line is taken with the loud opposition of girls, the sanctions are stronger than in the case of the boys

the claim have been taken into account. In contrast, in case 183 the grounding has been evaluated as inaccurate since the writer has not pointed out any reasons for the question why students of different sex should not be treated in a different way in school. Rather, the grounds portray the way this different treatment is manifested.



Analysis of Conclusions

The analysis of conclusions was based on the tasks in which the students were asked to identify the claim and the grounds from texts and to draw a conclusion based on the grounds. The focus of the analyses was on the relation of the conclusion (a) to the grounds, and (b) to the claim.

The analysis of the relation of the conclusion to the grounds was dichotomous in nature. The interest was on the question whether the conclusion a person had drawn on the basis of the grounds could be characterized as justified or not (justification variables X19 and X20, see Table 2). A justified conclusion (value 1) was interpreted to manifest developed argumentation skills and its main feature was that the conclusion was supported by the grounds (see Scriven, 1976). In contrast, in the case of a non-justified conclusion (value 0) the grounds did not support the conclusion.

According to Voss *et al.* (1986), the claim consists of a conclusion related to the datum (grounds). Consequently, the tasks of both the claim and the conclusion are similar: to reveal the writer's standpoint. However, there is a difference between them in that a claim is presented before grounds whereas a conclusion after them. Thus, they differ from each other in that a conclusion usually focuses on some possible generalization, as in a process of induction, while the role of a claim is, rather, to include a more accurate contention. In this particular study the students were asked to write the claim, the grounds and the conclusion at the same time and, hence, the roles of the claim and the conclusion are regarded as similar.

According to informal argumentation, the conclusions made on the basis of the grounds are not expected to be logically absolute (Cerbin, 1988). This means that it is possible to make many conclusions on the basis of the same particular grounds, although the conclusions may all be justified, i.e. supported by the grounds. Hence, in the case of this study the students, when analyzing the texts, might have drawn different, although justified, conclusions that may (a) either be identical or parallel with the claim, or (b) differ from it. The arguments composed by students in which the conclusion was accordant with the case "a" above were interpreted as consistent and arguments accordant with the case "b" as inconsistent.

The analyses of the relation of the conclusions to the claims focused on this consistency aspect of an argument (consistency variables X21 and X22). Hence, the conclusions indicating a standpoint that was identical (value 2) or parallel (value 1) to the one included in the claim were interpreted as manifestations of developed argumentation skills and, by contrast, the conclusions indicating a standpoint that diverged (value 0) from that in the claim, were not.

Variables X19 and X20 (simple matching similarity ratio .66) were summated to form a new variable S3 (justification) which describes the students' skill in formulating justified conclusions. Value 1 indicated a good skill, value .50 a moderate skill, and value 0 a poor skill. Similarly, variables X21 and X22 (Pearson Product Moment Correlation .31, $p =$

.000) were summated to construct a new variable S4 (consistency) which was transformed into the same scale as variable S3 and which indicates the students' skill in formulating conclusions manifesting the consistency of an argument.

II

In the following the analysis of the conclusions has been illustrated by four examples (Table 6) in which the contents of the claim and the grounds identified by the students from the text were similar in nature while the conclusion was drawn in a different way. The text (Broady, 1986) concentrated on the applicability of progressive pedagogy to teaching children from different social classes. The claim, "progressive pedagogy is more suitable to children from the middle class than to children from the working class", was formulated clearly by the students and it corresponded to the main claim in the text. The students had also grounded the claim accurately by the following grounds: (a) it is expensive, demands a lot of space, materials and resources, (b) it corresponds to the middle class conception of time, place and social control, (c) a middle class child is able to understand better the ideas and aims of progressive pedagogy, and (d) the parents of working class children find it difficult to figure out the principles underlying progressive pedagogy. Table 6 consists of four examples in which different conclusions (task type CO 1, see Table 1) have been drawn on the basis of the grounds described in the above.

Table 6
Examples of Conclusions

Case	Conclusion
20	Progressive pedagogy is more suitable for the children from the middle class than for the children from the working class
43	The progressive school has been built to fulfil the needs of the middle class
86	Education in this form will not be equal to people from different social classes
219	The pedagogy employed in school should be one located somewhere between these two pedagogies in order to be meaningful to everyone

In cases 20, 43 and 86 the conclusions have been classified as justified because the grounds support all of them. On the contrary, in case 219 the conclusion has been judged to be non-justified because the grounds do not give any reasons for the idea why pedagogy applied in school should be some kind of combination of different pedagogies. In addition, the examples illustrate how different arguments may include the same claim and the same grounds but contain different justified conclusions whose contents may be either identical (case 20) or parallel (case 43) to the claim or divergent (case 86) from it. Hence, the claim and the grounds described in the above together with the conclusions in cases 20 and 43 form consistent arguments and with the conclusion in case 86 an inconsistent argument.

Reliability of Analysis

The reliability of the analysis was examined by having two persons classify 20 cases independently. The agreement between the classifiers in the use of the classification criteria has been used as an indicator of reliability (Bogdan & Biklen, 1992; Winer, 1971).

The reliability coefficient was determined by using simple matching similarity measure (SM ratio) for binary data (Anderberg, 1973) in the cases of those crosstabulated variables that formed a two-by-two table. Variables of this kind were (a) all the dichotomous variables related to the claims (form, focus, clarity and substance variables, X1-X14), (b) dichotomous variables X19 and X20 which describe the justification of the conclusions, as well as (c) trichotomous variable X22 related to the consistency of an argument with cases only in two categories in the analysis. The reliability of the variables related to the accuracy of grounding (X15-X18) as well as another variable describing the consistency of the argument (X21) was determined by using the correlation coefficient (Pearson Product Moment Correlation) between the classifications done by the two classifiers. The correlation coefficients are presented in Table 7, indicating a fairly high level of reliability.

Table 7
Reliability Coefficients of Variables

Variable	SM ratio	Variable	SM ratio	Pearson corr.
X1	1.0	X15		.43
X2	1.0	X16		.76
X3	1.0	X17		.61
X4	1.0	X18		.54
X5	.90			
X6	.95	X19	.75	
X7	1.0	X20	.77	
X8	.81	X21		.55
X9	.84	X22	.50	
X10	.84			
X11	.75			
X12	.88			
X13	.74			
X14	.69			

Note: Variables X1–X14 are related to the claims; Variables X15–X18 are related to the grounds; Variables X19–X22 are related to the conclusions.

Results

Level of Argumentation Skills

The results relating to the students' argumentation skills are presented in Table 8.

According to the results, the great majority (89%) of the students were able to formulate claims in a clear way. The skill of only about a tenth (11%) of the subjects was moderate and none of the students was poor in this respect. The skill to identify the claim corresponding to the essential claim in an argumentative text did not prove as good. This skill was good among less than a half (40%) of the students and the amount of students possessing a poor skill was about a tenth (12%).

Table 8
Students' Argumentation Skills

Variable	Level of the skill								<i>M</i>	<i>SD</i>
	Good		Moderate		Poor		Total			
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%		
Claims										
Clearness S1*	105	89	13	11	0	0	118	100	.90	.09
Substance S2*	51	40	61	48	15	12	127	100	.64	.33
Grounds										
BAnal Accuracy X15†	34	15	84	38	102	46	220	100	.35	.36
BComp Accuracy X16‡	27	13	52	25	132	63	211	100	.25	.36
TAnal Accuracy X17§	21	17	40	31	66	52	127	100	.32	.38
TComp Accuracy X18	40	30	46	35	46	35	132	100	.48	.40
Conclusions										
Justification S3*	17	13	43	34	67	53	127	100	.30	.36
Consistency S4*	9	7	46	38	66	55	121	100	.26	.32

Note: Range of all variables is from 0 to 1.

*A summed variable.

†Variable related to the analysis of an argumentative text passage in Broady's book.

‡Variable related to the composition of one's own argument based on a theme in Broady's book.

§Variable related to the analysis of an argumentative text passage in Takala's book.

||Variable related to the composition of one's own argument based on a theme in Takala's book.

The results related to the grounding show that when the task was to identify the grounds from an argumentative text (variables X15 and X17) about a sixth of the students (Broady's book 15% and Takala's book 17%) were able to compose accurate grounds and about a half of the students (Broady's book 46% and Takala's book 52%) were not proficient in this task. In addition, the students' skills in composing the grounds on their own (variables X16 and X18) proved poor as well, although slightly better in the case of Takala's book. In the task related to Broady's book only about an eighth (13%) of the students were able to compose accurate grounds and about two out of three (63%) of the students possessed a poor skill. In the case of Takala's book the corresponding percentages were 30% (good) and 35% (poor).

Only slightly more than a tenth (13%) of the students were able to compose justified conclusions and among about a half (53%) of the students the skill was poor. The skill in formulating a conclusion manifesting the consistency of an argument was good among only less than a tenth (7%) of the students and poor among more than a half of the subjects (55%).

Measuring of Argumentation Skills

The examination of the results relating to the measuring of argumentation is based on the intercorrelations (Pearson Product Moment Correlation) between the variables relating to the most important skill in argumentation, grounding of claims. The analysis is limited to cover only these variables for two reasons. First, only the results of the

grounding skills of the students differed enough from each other in all the variables (SD varied from .36 to .40) to make this analysis sensible. Second, by focusing on grounding skills it was possible to examine the variables related, on the one hand, to a different focus of the task (i.e. analysis of an argumentative text or composition of one's own arguments) and, on the other hand, to the different books.

Table 9 indicates that between those variables in which the focus of the task was similar (Anal or Comp) there were found to be correlations, ($r^{X15 \times X17} = .15$; $r^{X16 \times X18} = .13$), while no correlations were found between those variables that were either based on the same book but differed on the focus aspect ($r^{X15 \times X16} = .04$; $r^{X17 \times X18} = .06$) or in which both the focus of the task and the book were different ($r^{X17 \times X16} = -.09$; $r^{X18 \times X15} = -.03$).

Table 9
Intercorrelations of the Variables Related to Grounding Skills

	BAnal X15*	BComp X16†	TAnal X17‡	TComp X18§
BAnal X15*	1.0			
BComp X16†	.04	1.0		
TAnal X17‡	.15	-.09	1.0	
TComp X18§	-.03	.13	.06	1.0

*Variable related to the analysis of an argumentative text passage in Broady's book.

†Variable related to the composition of one's own argument based on a theme in Broady's book.

‡Variable related to the analysis of an argumentative text passage in Takala's book.

§Variable related to the composition of one's own argument based on a theme in Takala's book.

Although both the correlations and the differences between them were fairly low, the results are consistent indicating zero correlations between all other variables but those having a similar focus of the task. In addition, the correlations were based on a fairly large number of subjects (N varied from 121 to 210) and, hence, the coefficients' statistical significance varied from .05 to .36. Consequently, the correlations, albeit low, were not based on chance alone.

These findings suggest, first, that there was a certain consistency in the students' answers to the tasks in which the focus was similar while no consistency existed in their answers to the tasks in which either the book was same and the focus different or both of these aspects were dissimilar. Hence, the results highlight the importance of the focus of the tasks when measuring argumentation skills.

Second, this observed consistency suggests that a person skilled in identifying accurate grounds for supporting a claim from one text is likely skilled to do the same from another, although different, text too, but not necessarily skilled in composing accurate grounds of his/her own. By the same token, a person skilled in composing his/her own arguments is not necessarily skilled in identifying the grounds from texts. However, it is important to note that a person highly skilled in argumentation is likely to do well in both kinds of the tasks. Hence, the results suggest that the grounding skills can be divided into separate components: the skill of analyzing argumentative texts and the skill of composing one's

own arguments. However, all the correlations were low and, thus, one has to adopt a qualified attitude towards these results, and the topic needs further research.

II

Discussion

The results indicated that the argumentation skills of the students in the target university can be characterized as poor. Although the claims were composed in a clear way and the skill to identify the most important claim included in an argumentative text was quite good, the most essential skill of argumentation, the grounding of the claims, proved poor on the average. The results were almost consistent in all the four variables indicating a fairly poor level of skill in composing accurate grounds. Only when the students were asked to compose the grounds for support their own claim based on the given theme from Takala's book, their grounding proved somewhat more accurate. A reason for this exception may be the fact that the given theme, *Equality Between the Sexes in School*, was quite general and familiar and, hence, it was easier for the students to formulate their own opinion (claim) relating to the theme and ground it. In addition, further evidence of the relatively poorly developed argumentation skills is given by the finding that the students' ability to compose conclusions was poor. This was indicated, on the one hand, in that the students' conclusions were often unjustified and, on the other hand, in that only a small number of the students had composed a conclusion manifesting a consistency of an argument. In addition, the quite similar way of the two classifiers in applying the analysis criteria of the variables supports the reliability claims of the results.

The students' skills proved poor, although 31 students practised argumentation during the course. Otherwise the average level of the skills would, most probably, have been even lower. However, when examining the results it is important to notice that the measurements were carried out in an end-of-course examination in which the students were under a normal exam-pressure. This might have contributed to the students' relatively poor performance, and a pressure-free situation would, most probably, have led to better outcomes. In addition, the students did not know beforehand that the tasks would be, exceptionally, related to argumentation which might have confused the students and affected their performance too. If they were informed in advance about the measurement of argumentation they might have been more prepared to orientate themselves in answering the tasks which, as well, could have led to better results. Furthermore, it should be noted that these results represent predominantly female and young students in the early stages of their studies. By focusing on more experienced students the results would, obviously, have been better (see Pascarella, 1989).

When interpreting results relating to argumentation skills in a more general level the phenomenon has, *first*, to be connected with the context in case (cf. Perkins & Salomon, 1989). The results of this study have to be related to the context of higher education, since the subjects of the study consisted of university students and the data collection was based on the contents of university set books. *Second*, it is important to examine whether the outcomes are related to oral argumentation (e.g., Prescott, 1987), to text based argumentation (e.g., Black, 1989) or, as in the present study, to the manifestation of argumentation skills when the subjects responded to written tasks

related to argumentation. The relevance of the findings in this study, for example, for textual argumentation (e.g., Applebee, 1991) produced in an informal or spontaneous situation needs further exploration.

In assessing the measurement instrument it is important to pay attention to the intercorrelations of the variables presented in Table 9. On the basis of these fairly low coefficients (-.09-.15) inferences concerning the validity of the measurement can be made. The low coefficients indicate that the variables have not measured the same thing. That may be a sign of either a low validity of the measurement or of a many-dimensional nature of the phenomenon. In addition, the low correlations may refer to the inconsistency of people in their argumentation skill performance. However, the validity of the measurement is supported by experiences gained in several previous studies which have shown that both analysis of argumentative texts (Oostdam & Eiting, 1990; Ryan & Norris, 1990) and composition of one's own arguments (McCann, 1989; Oostdam & Emmelot, 1990) are relevant ways to measure argumentation skills. Thus, due to the complexity of the phenomenon it is not a simple task to determine the level of the validity of the measurement.

Although the results in Table 9 point to the importance of the focus of the task when measuring argumentation skills, they do not suggest that the contents of the tasks do not have any significance in this respect. This qualification is important considering, for instance, the recent findings by Kuhn, Schauble, and Garcia-Mila (1992) which show that the content cannot be ignored when studying scientific reasoning. At all events, the data in this particular study highlight the importance of the focus of the task and, hence, suggest that when further measurements related to argumentation skills will be carried out, special attention should be paid to the *focus* of the tasks used in them. In addition, the results suggest that argumentation skills can be divided into some subskills manifesting, at least to some degree of independence. Hence, this *multidimensionality* should also be taken into account when constructing instruments relating to measurements of argumentation skills. Furthermore, when utilizing the experiences gained in this study one has to remember that the measurements were carried out among university students. Thus, these experiences can be applied best to measurements in which the subjects are undergraduate students or other adults, but in applying them to other contexts, like to lower levels of education, one has to consider their relevance carefully (see Perkins & Salomon, 1989).

The outcomes indicating a poor level of argumentation skills among the students give a reason to examine the studying methods in Finnish higher education. One-way communication based lecture teaching and self-study of the set books, which are still the most common study methods in our universities, cannot be regarded as effective ways in promoting students' skills in argumentation and critical thinking. Rather, teaching methods based more on students' interaction and debate, which have been found to be positively related to skills in argumentation and critical thinking (Hart, 1990; Marttunen, 1992, 1993), should be developed. In addition, a weakness of study aiming at a traditional end-of-course examination is often its instrumental nature: many students read the set books in order to earn credits, not in order to acquire new knowledge (cf. Aittola, 1992).

To conclude, given the crucial role of argumentation in higher education studies, and given the relatively poor outcomes of this study, it would appear that more interaction-

based study methods should be created in Finnish higher education. Such environments would give more possibilities to develop and practise skills important and relevant in academic activities: to practise the problematization of the topics dealt with, to practise the criticism of the ideas presented by other persons and to practise defending one's own statements by relevant grounds. At present the Finnish university students too often resort to a passive and school-like manner of acquiring new knowledge: trusting the authority.

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III

Teaching Argumentation Skills in an Electronic Mail Environment

by Miika Marttunen

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Teaching Argumentation Skills in an Electronic Mail Environment

Miika Marttunen



SUMMARY

This article discusses the qualities of computer-mediated communication (CMC) relevant in terms of argumentation, and describes an electronic mail (e-mail) study experiment carried out in a M.Ed level course in education. The aim of the experiment was to clarify the possibility of CMC to promote the argumentation skills of university students. The experiment ($n = 31$) was based on seminar mode (2 groups) and discussion mode (2 groups) of e-mail study. The students practised argumentation during a six week e-mail study period. The comparison group ($n = 193$) engaged in a traditional self-study. All the students' argumentation skills were measured after the experiment. The results indicated better argumentation skills among the e-mail students compared to those engaged in the self-study, and suggested that it is possible to promote argumentation skills through e-mail. In addition, the results suggested the superiority of the discussion mode of e-mail study over the seminar mode for practising argumentation.



INTRODUCTION

The appropriateness of computer-mediated communication (CMC), (i.e., electronic mail (e-mail), computer conferencing and electronic bulletin boards), for higher education purposes has been widely recognized (D'Souza 1992; Mason 1993; Paulsen 1992). An important feature of CMC is its potential for creating learning environments that promote collaboration and interaction between learners (Alexander 1992). Consequently, it has been applied in education especially when collaborative interaction has been an instructional priority (Wells 1993). This interaction priority is closely related to the knowledge production activities of academics who create, transform, communicate, store and retrieve knowledge (Kaye, Mason & Harasim 1989, 18). The demands of this "knowledge work" can, to a large extent, be met by both time- and location-independent collaborative CMC-interactions with colleagues and peer students sharing common goals and interests.

Although CMC has been used mostly in distance studies at the college and university level in connection with both undergraduate and post-graduate courses (e.g. Mason 1993; Wells 1992) there are experiences concerning its use in on-campus settings too (Leppänen & Kalaja 1995; McConnell 1990; Rekkedal & Paulsen 1989). In the study reported here CMC was used in an on-campus credit course in order to help the students practise and improve their argumentation skills.

Argumentation is defined as a process of presenting reasons to support one's opinions and conclusions (Fisher 1988), and hence, its role in an academic context is fundamental. First, characteristic of academic discussions is an aspiration to present well-considered reasons in order to convince the audience of the justification of the presenter's standpoint. Second, argumentation is a fundamental tool for proving the validity of scientific knowledge (Cronbach 1990, 185-189). In addition, argumentation may also help people cope with the demands of the new information society in which the supply of information is increasing all the time and its means of production are constantly developing.

In order to manage this information flood one has to be able to select which information is relevant and then make critical assessments between the numerous alternatives. Effective selection and choice presuppose developed skills in argumentation and critical thinking. Consequently, the teaching of argumentation skills is an important means when aiming at reaching the objectives of higher education studies: to educate people who are able to supply, select and assess knowledge independently.

Despite the fact that CMC has been found to be well suited to higher education, academic argumentation has received only limited attention in the CMC literature. On the other hand, there is a large number of descriptive studies relating to the students' experiences and perceptions of CMC as a learning environment (Burge 1994; Grabowski 1990; Lauzon 1992; Saunders & Heyl 1988). However, fewer studies have focused on the learning effects of CMC by evaluating students' outputs after engaging in CMC studies. Furthermore, in those studies that have concentrated on students' outputs the focus has mostly been on learning outcomes at a general level (D'Souza 1991; Hiltz 1990; Paulsen 1992) not on learning of skills.

The study reported here will, to some degree, fill this gap of CMC research by examining the learning of the university students' argumentation skills through their engagement in electronic mail discussions. The skills were measured by analysing the students' outputs after the CMC studies.





ARGUMENTATION SKILLS

Argumentation, reasoning and critical thinking are essential elements in the process of critiquing knowledge and developing one's own opinions. Norris and Ennis (1989, 3-5), for example, stress that critical thinking is based on reasoning that aims at reflective evaluation and careful grounding of issues under examination. Reasoning and critical thinking, in turn, are closely related to the process of argumentation in which other peoples' standpoints and opinions are critically examined and one's own conclusions drawn on the basis of reasons presented for their support (Fisher 1988).

In this study the concept of argumentation skills is based on the Toulminian argumentation theory in which an argument is divided into separate components (Toulmin, Rieke & Janik 1984): a claim, grounds, a warrant, a backing, a qualifier, and a rebuttal. In addition, there is often a conclusion included in an argument whose function is similar to that of a claim, to reveal the standpoint of the writer. Perkins (1985) emphasizes that persons possessing weak argumentation skills most often present only a few grounds in order to support their claims or opinions. In the same vein, Voss and Means (1991) stress that persons possessing developed argumentation skills are able to formulate relevant grounds that support the claim and make it believable. In addition, people skilled in argumentation can also formulate clear claims (Cerbin 1988) and construct conclusions supported by the grounds (Scriven 1976).



COMPUTERS FOR TEACHING ARGUMENTATION

Computer-based instruction in general

The possibilities of computer-based instruction in the field of teaching argumentation have already been recognized. Computer games, for example, teach practical reasoning skills (Wood & Steward 1987), and computer programs can give rapid feedback to students who are practising argumentative writing (Bacig, Evans, Larmouth & Risdon 1990). Keith, Weiner and Lesgold (1990) developed a program that used an apprenticeship approach for practising argumentation. The essential characteristics of this approach are that students do the activity, that there are valued tasks for students, and that there is a skilled other who coaches students in the activities relating to argumentation.

In general, Keith et al. (1990) find that computer-based instruction has several features appropriate for teaching argumentation: when using computers it is easy to disseminate learning materials, teaching is flexible in terms of the pace and location of learning, and activities enable students' self reflection on their own performance.

CMC for teaching argumentation

The potential of CMC in practising argumentation, in addition to those features mentioned by Keith et al. (1990), is largely based on its possibility to create effective interactions between the learners. This feature is most beneficial in practising informal argumentation in which arguments are presented in order to assure the audience of the correctness of one's standpoint (Cerbin 1988).

CMC has already been applied in fostering informal argumentation and critical thinking. Clark (1992) organized an electronic debate through electronic mail between two classes at the elementary school level. In a college level experiment carried out by Charlton (1993) critical thinking skills were practised through discussions at electronic bulletin boards, and Pugh (1993) reported on a higher education course in which argumentation was practised through electronic conferencing.

Steinberg (1992) stresses that the key feature of CMC in respect of practising argumentation and critical thinking is the focused discussion of alternative points of view between participants. Many reasons are given to support this use of CMC. *First*, it has been characterized as a democratic medium enabling participation of all the members on an equal basis (Miller 1991). Equality, it is alleged, is promoted because the learning environment is free from some of the features typical of face-to-face settings that may inhibit the discussion, for example, gender, age, ethnicity, occupational status or performance skills. In addition, socially shy persons and those who need time to construct their ideas can, it is claimed, participate in CMC discussions on a democratic basis. Equal and democratic opportunities are important aspects for argumentation as they enable the discussants to concentrate on matters of fact free from many factors that may make it difficult to exchange opinions together. For instance, Boyd (1987) links the equality feature of CMC with argumentation by emphasizing its suitability in providing emancipative educational learning situations in which argumentative dialogues can be carried out free from rhetorical tricks and threats or promises typical in ordinary face-to-face debates. Thus, by electronic discussions it is possible to establish such an equal learning environment in which the responses are rather directed towards the writer's thoughts instead of the writer as a person (cf. Hiltz & Meinke 1989).

Second, studying through CMC consists of text-based contributions to the topics under consideration. As Henri (1992) puts it, written text demands exactness, careful consideration, and explicit expression of thoughts. These criteria play a fundamental role in argumentative dialogues and debates because the goal of the activities is to assess the strengths and weaknesses of others' contributions. In addition, when using CMC there is an opportunity to re-read one's own and other people's texts before any revisions of ideas are carried out. However, CMC may also produce such interaction which does not, necessarily, always act as an advantage when practising argumentation. Tella (1992), for example, found that texts presented during computer conferencing were not always exact and well considered, instead they included a lot of fragmentary and disconnected sentences usually met in colloquial use of language. These features of language do not belong to academic argumentative discussions in which, rather, the content and style of contributions should be carefully considered and formulated. Anyway, it depends largely on the stated aims and tasks of the particular CMC-course whether the interaction is well thought out and argumentative or similar to conversational language.

Third, the asynchronous nature of CMC interaction makes it possible to participate without restrictions of time and place. To have enough time is important, for example, in a debate when a person wants to construct valid reasons in order to support his/her opinions with special care. In addition, when people can log on at any time they want they can make use of resource



materials, books, newspapers, notes etc., in preparing their contributions to discussions. By the same token, the asynchronous mode of interaction may also be a disadvantage, since it is possible that one gets feedback to his/her contribution too late or, as in the worst case, the contribution may never be commented on.

Fourth, perhaps the most unique feature of CMC is the possibility for group communication and many-to-many discussions (Harasim 1990). Through this kind of interaction participants may make use of each other's ideas and thoughts. This is important in argumentative discussions in which the main purpose is to find out many relevant points of view and, thus, create alternative approaches to issues examined.

In the present study electronic mail was applied in the field of university level social studies and education. Typical of these particular disciplines is that only seldom is there one correct answer to the issues confronted. Rather, many social and educational issues most often have several dimensions and many alternative approaches to analysis. This multi-dimensional nature of topics offers many possibilities for argumentation.

Two research questions were asked in this study: 1) To what extent is it possible to promote students' argumentation skills through the use of e-mail? 2) Which is a more appropriate way to practise argumentation in an e-mail environment, a tutor-led seminar mode or a student-led discussion mode?





METHOD

Subjects and design

The subjects of the study consisted of students ($n = 224$) taking an M.Ed level introductory course in the sociology of education at the Department of Education in the University of Jyväskylä, Finland, during the autumn term 1990. The main criterion for the selection of this particular course of sociology of education was that the books included in the course contained issues dividing opinions and, hence, suitable for argumentation and debates. Issues of this kind were, for example, "the hidden curriculum in school (Broady 1986)" and "sex roles in school (Takala 1989)".

Four e-mail groups were established: two groups engaged in the seminar mode and two groups in the discussion mode of e-mail study. Participants in the four groups, eight students in each, were recruited on a voluntary basis. Two tutors were also employed. Since one student dropped out 31 e-mail students completed the course. The remaining 193 students formed a comparison group and they engaged in the traditional self-study at the same time. The e-mail studies consisted of practising argumentation and, thus, acted as an experimental treatment. The students in the e-mail groups and in the self-study group were administered a posttest measuring the level of the argumentation skills after the e-mail experiment. The design employed can be called a quasi-experimental static-group comparison design (Borg & Gall 1989, 688-689).

Answers to the research questions were sought by comparing the posttest results between different groups. The first question was addressed by comparing the results of all the e-mail students with those engaged in the self-study, and question two by comparing the results of the students engaged in the seminar mode of e-mail study with those engaged in the discussion mode.



Because the formation of the research groups was not based on randomization it is necessary to examine the distribution of the subjects in the e-mail groups and in the self-study group in the light of some relevant background variables. This is important because the irregular distribution of relevant variables in different groups may have distorted the results. Variables examined were age and study experience, which Voss and Means (1991) have found to be linked with the argumentation skills, and gender. Table 1 illustrates the distribution of these variables in the compared groups. Study experience is described in the light of earned study weeks (one study week corresponds to about 40 hours of work).

TABLE 1 The distribution of age, study experience and gender in the electronic mail (e-mail) groups and in the self-study group

Variable		E-mail groups		Self-study group		Total	
		n	%	n	%	n	%
Age	23 or less	16	52	118	62	134	60
	Over 23	15	48	73	38	88	40
	Total	31	100	191 ^a	100	222	100
Study weeks	60 or less	15	60	78	73	93	70
	Over 60	10	40	29	27	39	30
	Total	25 ^b	100	107 ^c	100	132	100
Gender	Male	13	42	48	25	61	27
	Female	18	58	145	75	163	73
	Total	31	100	193	100	224	100

^aTwo missing cases.

^bSix missing cases.

^cSome of the students who finally completed the course by self-study were absent from the first lecture where information on this question was collected.

Table 1 indicates that the variables are not distributed regularly in the examined groups: there are proportionally fewer female students, young students and students at their first stages of studies in the e-mail groups than there are in the self-study group. The possible effects of this uneven distribution are examined in the discussion chapter.

Teaching arrangements

General aspects of the e-mail studies

The software used in organizing the e-mail experiment was an ordinary electronic mail (Elm) for Unix including a text editor named Emacs. Elm was equipped with a mailing list containing the addresses of all the participants of the conference. Hence, the program delivered the messages sent in one group

to the other students and the tutor in that particular group, which enabled the students to engage in many-to-many communication within their own study group.

During the six week studies the students wrote texts relating to the topics addressed in the set books and lectures. Studying was interactive in nature: the students' texts consisted of their own ideas and thoughts as well as comments relating to the other students' texts. The participants were supposed to write at least two messages a week in order to pass the course and earn the credit.

The e-mail students did not know each other personally before the experiment, and they also had the possibility to remain anonymous during the studies. Only the organizers knew the students' real names. A single face-to-face session was held prior to the experiment in order to get the students familiar with the use of the computer terminals and the mailing program.

The main contrast between the different modes of e-mail studies was that in the discussion mode the discussion topics were selected by the students together while, in contrast, in the seminar mode by the tutor. In addition, the tutor's general role in the seminar mode resembled that of a teacher and a leader but in the discussion mode, rather, that of a co-worker and a resource person.

Practising argumentation during the e-mail studies

The didactic content of the e-mail studies was argumentation itself. A short literature review on argumentation was posted to students and tutors before the studies in order to acquaint the participants with the concept and procedural structure of argumentation. Hence, the review acted as a helping aid for the students when formulating their messages.

Studying in the experiment consisted of the students' argumentative contributions related to the topics addressed in the set books and lectures. During the studies the students were directed to present in their texts a lot of their own opinions and points of view related to the discussion topics as well as to critique the other students' opinions and standpoints. In addition, the students were directed to defend themselves by presenting counter-arguments when critiqued by other students.

The aim of the studies was to create a collaborative learning environment in which the students are engaged in a constructive dialogue and debate. Hence, they were offered an opportunity to make use of the peer students' opinions and alternative approaches to topics under examination. Furthermore, special attention was paid to grounding by asking the students to present carefully considered reasons in order to support all their opinions and critical comments.

Data collection and analysis

The course in question consisted of three set books and a series of lectures. The data of this study were based on exam tasks relating to two of the books (Broady 1986; Takala 1989). Broady's book was obligatory to everyone while





Takala's book was optional with the third one. Hence, all of the 224 students answered the tasks relating to Broady's book and a subset of 134 subjects the tasks relating to Takala's book. The end-of-course examination included tasks relating to a) subject contents, and b) argumentation skills, from which the latter ones compose the data of this study.

Argumentation skills were measured with four tasks. Two of the tasks focused on the *analysis of argumentative text*. The researcher composed the tasks by selecting two argumentative text passages, one from Broady's book (task 1) and the other from Takala's book (task 2). The students were then asked to identify from both of the texts a) the main claim (claims 1 and 2), b) the grounds that supported the claim (groundings 1 and 2), and c) to draw their own conclusion based on the groundings (conclusions 1 and 2).

The other two of the four tasks focused on the *composition of one's own arguments*. They were composed by giving the students one central theme from both Broady's book (task 3) and Takala's book (task 4). The students were then asked to compose a) their own claims relating to the themes (claims 3 and 4), and b) the grounds to support their claims (groundings 3 and 4). A more detailed description of the data collection is presented in Marttunen (1994).

The analyses focused on the argumentation skills of the students: the students' skills in formulating the claims, the grounds and the conclusions. The reliability of the analysis turned out to be fairly high. It was examined by having two persons classify 20 cases independently. The reliability coefficients of the variables relating to the claims varied from .69 to 1.00, to the grounds from .43 to .76, and to the conclusions from .50 to .77.

Analysis of the data relating to the skills in formulating claims

Two variables were formed on the basis of the analyses of the claims (claims 1 to 4). The first variable, "Clearness" (S1), examined whether the students possessed a skill to formulate clear claims. It was formed by summing the scores of the 12 item variables relating to the four claims. The item variables focused on whether a) a claim included a contention (variables X1 to X4), b) a claim focused on one contention (variables X5 to X8), and c) a claim was understandable (variables X9 to X12). All these item variables were dichotomous in nature and the simple matching similarity ratio (SM ratio) between them varied from .57 to .99 (see Anderberg 1973). The second variable, "Substance" (S2), was formed by summing the scores of item variables X13 and X14 (SM ratio .52), which focused on whether the claims identified by the students from the texts corresponded to the fundamental claims of the authors in the texts.

Analysis of the data relating to the grounding skills

The grounds were analyzed by four variables (X15 to X18) named "Accuracy" indicating the students' skill in formulating accurate grounds. Two of the variables were based on the grounds the students had to identify from the texts (groundings 1 and 2), and two on the grounds they were asked to compose by

themselves to support their claim (groundings 3 to 4). No aggregated variables were formed since the intercorrelations of the variables were low.

A person was considered to have presented accurate grounds when he/she had provided relevant evidence which provided a wide scope of support to the claim. By contrast, when the grounding was deemed inaccurate it included only a few and often irrelevant grounds.



Analysis of the data relating to the skills in formulating conclusions

The analysis of the conclusions was based on tasks 1 and 2, in which the students were asked to examine the two text passages by identifying the claim and the grounds from the texts and to draw a conclusion based on the grounds. The analysis focused on the relation of the conclusion to the grounds and to the claim.

In the analysis of the relation of the conclusion to the grounds the focus was on the justification of the conclusion (i.e., whether it was supported by the grounds). Two item variables (X19, X20), based on conclusions 1 and 2, were formed (SM ratio .66). Their scores were aggregated to form a new variable, "Justification" (S3), which describes the students' skill in drawing justified conclusions.

When the focus of the analysis was on the relation of the conclusion to the claim the consistency of an argument was examined. The argument consisted of the claim, the grounds and the conclusion the students had composed. Since a claim consists of a conclusion (Voss, Blais, Means, Greene & Ahwesh 1986) an argument in which the conclusion was identical or parallel to the claim was interpreted as consistent, and an argument in which the claim and conclusion differed from each other, as inconsistent. Item variables X21 and X22 (Pearson Product Moment Correlation .31, $p = .000$) were aggregated to form a new variable, "Consistency" (S4). It indicated whether the students possessed the skill to compose conclusions manifesting the consistency of an argument. The details of the analyses are described in Marttunen (1994).

RESULTS

The results reported in tables 2, 3 and 4 relate to the students' skills in formulating the claims, the grounds and the conclusions. Two kinds of comparison were made. First, the results were compared between the students engaged in different modes of study, and second between the students engaged in different modes of e-mail study. The differences of the means were examined by a t-test. The general level of the university students' argumentation skills and its implications have been reported elsewhere (Marttunen 1994).

Skills in formulating claims

According to the results in table 2, the means of both variables proved similar among the students engaged in the e-mail study and in the self-study. A comparison between the different modes of e-mail study show that the students engaged in the discussion mode were more skilled in identifying an essential claim from the text (Substance, $p = .050$) than their counterparts engaged in the seminar mode.

TABLE 2 Skills in formulating claims

Variable		Mode of study		Mode of e-mail study			
		E-mail	Self-study	Seminar	Discussion		
S1 (Clearness)	M	0.91	0.89	0.91	0.91		
	SD	0.11	0.10	0.10	0.11		
	n	31	102	15	16		
		t = 1.00	df = 131	p = .320	t = -.09	df = 29	p = .929

(continues)

TABLE 2 (continues)

Variable		Mode of study		Mode of e-mail study				
		E-mail	Self-study	Seminar	Discussion			
S2 (Substance)	M	0.60	0.65	0.46	0.72			
	SD	0.36	0.33	0.37	0.32			
	n	30	97	14	16			
			$t = -0.78$	$df = 125$	$p = .434$	$t = -2.05$	$df = 28$	$p = .050$

Note: Range of both variables is from 0 to 1. Both variables are aggregated variables.

Grounding skills

Table 3 shows that in the case of Broady's book the means of the students in the e-mail study were higher in both variables (X15, X16) than the means of the students engaged in the self-study. When the task was to analyze a text passage (X15) the difference was also statistically significant ($p = .025$). Among the different modes of e-mail study the results show higher scores for the students engaged in the discussion mode in both variables, although the differences were not statistically significant.

TABLE 3 Skills in formulating grounds

	Mode of study		Broady's book	Mode of e-mail study				
	E-mail	Self-study		Seminar	Discussion			
M	0.49	0.33	Variable X15 ^a (Accuracy)	0.43	0.53			
SD	0.43	0.35		0.43	0.43			
n	30	190		14	16			
			$t = 2.26$	$df = 218$	$p = .025$	$t = -.65$	$df = 28$	$p = .519$
M	0.34	0.24	Variable X16 ^b (Accuracy)	0.27	0.40			
SD	0.39	0.35		0.44	0.34			
n	28	183		13	15			
			$t = 1.41$	$df = 209$	$p = .161$	$t = -.89$	$df = 26$	$p = .382$
Takala's book								
M	0.29	0.34	Variable X17 ^a (Accuracy)	0.27	0.32			
SD	0.34	0.39		0.32	0.36			
n	31	96		15	16			
			$t = -.55$	$df = 125$	$p = .581$	$t = -.37$	$df = 29$	$p = .710$

(continues)

TABLE 3 (continues)

	Mode of study		Variable X18 ^b (Accuracy)	Mode of e-mail study	
M	0.34	0.52		0.29	0.38
SD	0.34	0.42		0.33	0.34
n	30	102		14	16
t = -2.25 df = 130 p = .026			t = -.73 df = 28 p = .470		

Note: Range of both variables is from 0 to 1.

^aVariable related to the analysis of an argumentative text passage (Tasks 1 and 2).

^bVariable related to the composition of one's own argument based on a given theme (Tasks 3 and 4).

The results relating to Takala's book show, in contrast to Broady's book, higher means among the students engaged in self-study compared to the e-mail study in both variables (X17, X18). Furthermore, when the task was to compose one's own argument (X18) the difference was statistically significant ($p = .026$). The results relating to the different modes of e-mail study are, however, accordant with the results of Broady's book indicating differences, although not statistically significant ones, in favour of the students engaged in the discussion mode.

Skills in formulating conclusions

The results in table 4 indicate the better skill of the e-mail students in formulating conclusions manifesting the consistency of an argument compared to the students engaged in the self-study mode (S4, $p = .008$). The means of the variable relating to the students' skill in formulating justified conclusions (S3) were almost the same. Among the e-mail students the means of the students in the discussion mode were, again, higher in both variables although not in terms of a statistical significance.

TABLE 4 Skills in formulating conclusions

Variable		Mode of study		Mode of e-mail study	
		E-mail	Self-study	Seminar	Discussion
S3 (Justification)	M	0.32	0.30	0.27	0.38
	SD	0.35	0.36	0.37	0.34
	n	31	96	15	16
t = .35 df=125 p = .729			t=-.85 df=29 p=.405		
S4 (Consistency)	M	0.43	0.21	0.32	0.52
	SD	0.38	0.28	0.37	0.38
	n	30	91	14	16
t=2.81 df=39.97 p=.008			t=1.41 df=28 p=.170		

Note: Range of both variables is from 0 to 1. Both variables are aggregated variables.





DISCUSSION

The results indicate better argumentation skills among the e-mail students compared to the students engaged in the traditional self-study mode. Especially the results showing the e-mail students' better skills in formulating the conclusions in a manner that manifests the consistency of an argument support this conclusion. Hence, the findings suggest that it is possible to promote the students' argumentation skills through e-mail study. This inference is also supported by earlier results related to the same project (Marttunen 1992), as well as by the results suggesting the general suitability of computer software for practising argumentation (Bacig et al. 1990). Although the results show also other differences between the examined groups, the results varied in accordance with the exam book in question, and hence, they do not permit any far-reaching inferences.

In addition, the results suggest that the student-led discussion mode of e-mail study is a more appropriate way for practising argumentation compared to the tutor-led seminar mode. This finding is indicated by the higher means of most of the variables measuring argumentation skills among the students in the discussion mode compared to the students using the seminar mode. The earlier findings of the same project (Marttunen 1992) report the same trend. The results are consistent also with previous studies reporting on CMC's convenience for student-led discussions and self-directed learning (Mason 1988; Seaton 1993).

The limitations of these results can be anchored in two points. The first limitation is related to the design of the study. Although inferences concerning cause-effect relations are made, the design of the study was quasi-experimental, lacking the randomization of the subjects. A threat of this shortage is that the posttest differences between the groups can be attributed to characteristics of the groups as well as to the experimental treatment (Borg & Gall 1989, 689). In this particular study the results may have been affected by variables essential in terms of argumentation due to their uneven distribution in the examined groups. To control this problem the Pearson Product Moment Correlations of age, study experience (see Voss & Means 1991) and gender, with the variables measuring argumentation skills were examined. The correlations varied from

-.18 to .16. Because of the low correlations, the likelihood that the lack of the randomization has distorted the results is low.

In addition, the formation of the e-mail study groups on a voluntary basis may have resulted in differences between the e-mail groups and the self-study group. The correlations between voluntariness and the variables of argumentation skills varied from -.09 to .35. It is possible that the students in the e-mail groups were more motivated for debating and exchanging opinions than their counterparts in the self-study group, and thus, more skilled in argumentation as well. Consequently, it is worth questioning whether the differences existed already before the conference. The question could have been answered by administering a pretest to the students, but there were two reasons for not using this procedure. First, the study was a field study in which the measurements acted as a natural part of studies, and hence, the organization of a pretest would have led to practical problems in gaining student cooperation. Second, since the using of a pretest often lead to a test-wise -problem (Borg & Gall 1989, 644) the advantage of using it may not always be taken for granted. A test-wise problem means that the students may show an improvement simply as an effect of their experience with the pretest. Consequently, using of a pretest might have produced more problems than benefits to the study.

The second limitation of the results lies in the question of whether it is possible to develop any cognitive skills during the short time of six weeks. This question is relevant according to Pascarella (1989) who suggests that rather than any particular experience, it is the students' engagement in the intellectual and social experience of college that promotes critical thinking skills. Nevertheless, short interventions (Leeman 1987; Mier 1984; Zale 1986) and especially CMC ones (Charlton 1993; Harrison & Stephen 1992; Steinberg 1992) have proved feasible when practising argumentation. Hence, it is legitimate to assume that there has been some progress in the students' argumentation skills due to the experiment, although a longer practising period would have been more appropriate in terms of evaluating the possibilities of CMC to promote these skills.

In terms of the reliability and validity of the measurements and analyses, it can be noted, for one, that the data analysis proved reliable, which gives further support to the results. For another, in terms of the external validity of the study it is important to notice that although the study was carried out in an on-campus setting there are no reasons why the teaching arrangements could not be applied also in a distance education setting (see Kaye 1989). Hence, the results as well as the other experiences of the study can be generalized to distance education too.

The examination of the internal validity of the results concerning argumentation is complicated because of the many-dimensional nature of the phenomenon (Marttunen 1994). This complication was shown also by the partial discrepancy of the present results: the findings indicated better grounding skills of the e-mail groups in the tasks on Broadys' book but, in contrast, better results among the self-study group when the tasks were related to Takala's book. Consequently, this discrepancy may be a sign of either the low validity of the study or the complex nature of the phenomenon. In addition, it may be a sign of the inconsistency of the people in their argumentation skill performance. However, the results suggest a consistent superiority of the discussion groups



over the seminar groups. This can be taken as a sign of the good internal validity of the measurement instrument indicating that the questions have been focusing on the same issue. In sum, the high reliability of the analysis as well as the examination of the measurement's validity aspects suggest that the results are reliable.



When studying the findings from a broader educational point of view it is interesting to note the superiority of the student-led mode over the tutor-led mode of e-mail study. In this respect, the results lend support to the current andragogical approach to adult education (Knowles 1990). The results showing higher scores among groups in which the tutor's role was not directive but, rather, supportive favour the andragogical emphasis of the teacher's role as a co-learner and a facilitator of the learning, in contrast to the teachers' traditional role as a deliverer of knowledge (Knowles 1990, 77-87). Moreover, andragogical theory (ibid., 57-63) suggests that the adult students' self-concept includes the need of being responsible for their own decisions, the need to know why they learn, and the need to be self-directing. The better achievements among students engaged in the discussion mode of e-mail highlighted the students' self-direction and their own decision-making. Hence, these findings support the andragogical assumptions of adult learners: the results revealed that students are able to be self-directive and responsible enough to take care of their own studies if only the chance is offered to them.

Finally, the present study indicates the potential of CMC targeting at improving the argumentation and critical thinking skills. In addition, the democratic nature, the text-based interaction, the asynchronous mode of communication and the possibility to many-to-many communication can be assumed as beneficial characteristics of CMC in terms of practising these skills needed in an academic context. In fact, skills of making well-supported choices and assessments between a variety of alternatives as well as of being critical towards knowledge and of being able to select the relevant knowledge one needs are skills of a great importance in managing in the modern information society. Hence, argumentation and critical thinking skills should be practised already among young children, and thus, experiments relating to CMC should be conducted at lower educational levels too. Providing many-sided information on CMC to educators would help them make use of the large potential of e-mail based interaction, especially in the field of argumentation and critical thinking.

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IV

Argumentation Course by Electronic Mail

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V



**Electronic Mail as a Pedagogical Delivery System:
an analysis of the learning of argumentation**

by Miika Marttunen

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