ABSTRACT

LEARNERS' SATISFACTION, SOCIAL PRESENCE, AND ATTITUDE IN A PROJECT BASED COLLABORATIVE LEARNING THROUGH COMPUTER MEDIATED COMMUNICATION: A CASE STUDY

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This study examines elementary school students' project-based learning (PBL) experiences through Computer-Mediated Communication (CMC). The purpose of the study is to explore whether the use of computer-mediated communication tools in a project-based collaborative learning process enhances 5th grade students' attitudes toward computer and computer class within an online supported environment, analyze the level of learners' satisfaction about the project-based collaborative learning through CMC, and examine students' perceptions of their social presence and how effective social presence is as a predictor of overall students' satisfaction.

The sample of this study is included 36 5th grade students of two private schools in Ankara and Niğde, and convenience and purposeful sampling methods were used.

At the beginning of the study, subjects were given the Computer Attitude Scale to measure their attitudes toward computers. At the end of the study, participants were given the CAS again to measure their attitudes toward computers, satisfaction scale and social presence scale.

The results indicated that the students' attitudes toward computer did not change from the beginning to the end of the study. However, evidence suggests a positive response by students to the use of CMC in the project-based collaborative learning environment. Majority of the students were satisfied with the learning experience they had in the project-based collaborative learning environment through CMC. Moreover, although results on perceived social presence were low, students tried to develop an online community throughout the project. This study also showed that social presence was a strong predictor of satisfaction in a PBCL environment.

Keywords: Computer Mediated Communication, Project-Based Collaborative Learning, Social Presence, Satisfaction, Attitude.

ÖZ

BİLGİSAYAR DESTEKLİ İLETİŞİM ARACILIĞIYLA PROJE TABANLI İŞBİRLİĞİNE DAYALI ÖĞRENMEYE İLİŞKİN ÖĞRENCİLERİN TATMİNİ, SOSYAL OLARAK KENDİNİ GÖSTERME ALGILARI VE TUTUMLARI: BİR DURUM ÇALIŞMASI

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Bu çalışma ilköğretim düzeyindeki öğrencilerin Bilgisayar Destekli İletişim araçları aracılığıyla proje tabanlı işbirliğine dayalı öğrenme deneyimlerini incelemektedir. Çalışmanın amacı bilgisayar destekli iletişim araçlarının işbirliğine dayalı ortamlarda kullanımının 5. sınıf öğrencilerinin bilgisayara karşı tutumlarına olan etkisini, sözkonusu öğrenme deneyimleri ile ilgili tatmin düzeylerini, öğrencilerin sosyal olarak kendini gösterme algıları ile bu algıların tatmin ile ilişkisini araştırmaktır.

Bu çalışmanın örneklemini Ankara ve Niğde'de bulunan iki özel okuldaki 36 öğrenci oluşturmaktadır. Öğrenciler uygunluk ve amaca dayalı örnekleme yöntemleri kullanılarak seçilmişlerdir. Çalışmanın başında öğrencilere bilgisayara karşı olan tutumlarını ölçmek amacıyla Bilgisayar Tutum Ölçeği verilmiştir.

Çalışmanın sonunda aynı Bilgisayar Tutum Ölçeği, tatmin ölçeği ve sosyal olarak kendini gösterme ölçekleri uygulanmıştır.

Sonuçlar öğrencilerin bilgisayara karşı olan tutumlarının çalışmanın başından sonuna değişmediğini ve Bilgisayar Destekli İletişim araçları aracılığıyla proje tabanlı işbirliğine dayalı öğrenme ilişkin tutumlarının olumlu olduğunu göstermiştir.. Öğrencilerin büyük bir çoğunluğunun Bilgisayar Destekli İletişim araçları aracılığıyla proje tabanlı işbirliğine dayalı öğrenme deneyimlerinden tatmin oldukları görülmektedir.. Öğrencilerin sosyal olarak kendini göstermeye ilişkin algıları düşük çıkmış, ancak öğrenciler proje süresince başarılı çevrimiçi topluluklar oluşturmuşlardır. Ayrıca sonuçlar sosyal olarak kendini gösterme ile tatmin arasında anlamlı bir ilişki olduğunu göstermiştir..

Anahtar Kelimeler: Bilgisayar Destekli İletişim, Proje Temelli İşbirliğine Dayalı Öğrenme, Sosyal Olarak Kendini Gösterme, Tatmin, Tutum.

To My Father and Mother, Mete and Tülin Örentürk

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CMC	: Computer Mediated Communication
PBCL	: Project-Based Collaborative Learning
PBL	: Project-Based Learning
F2F	: Face-To-Face
CAI	: Computer Aided Instruction
WWW	: World Wide Web
VC	: Virtual Classroom
TC	: Traditional Classroom
BBS	: Bulletin Board System
MEB	: Milli Eğitim Bakanlığı
CSCA	: Computer-Supported Collaborative Argumentation
CSCW	: Computer-Supported Collaborative Work
CSILEs	: Computer-Supported Intentional Learning Environments
CoVis	: Collaborative Visualization
CAS	: Computer Attitude Scale
SPRES	: Social Presence Scale
SAT	: Satisfaction Scale
ALN	: Asynchronous Learning Networks

CHAPTER I

INTRODUCTION

1.1. Background of the Study

What attributes constitute “effective learning”? For decades, more and more researchers seek to find the answer of the extensive question. A good learning in an effective learning environment is in which students can “master new knowledge and skills, critically examine assumptions and beliefs, and engage in an invigorating, collaborative quest for wisdom and personal, holistic development” (Eastmond & Ziegahn, 1995). The idea in an effective learning environment is that students must be meaningfully engaged in learning activities through interactions with others and worthwhile tasks. By engaged learning, all student activities involve active processes such as creating, problem solving, reasoning, decision-making and evaluation (Kearsley & Shreiderman, 1999). In effective learning environment, the learner is involved in constructing knowledge through a process of discussion and interaction with learning peers and experts (Harasim, 1989).

In a quest with answers, literature seems to be supporting a common theme that is social interaction as well as the development of problem solving, decision-making and teamwork skills, and exploration of problems that do not have a single

solution. Meanwhile, many researchers agree on that the integration of communication technologies into the classroom enhance learning and student's ability to apply knowledge and skills to problem solving situations. (Alavi, 1994) Additionally, computer mediated communication (CMC) technologies support social interactions amongst learners, which play an important part in the learning process and also have a significant impact on learning outcomes (Jonassen, 1995; Eastmond & Ziegahn, 1995; Berge, 1995). CMC is becoming a valuable mine for education and its components when we go deep inside.

Developments in computer-mediated communication technologies imply a shift from the domination of computer-aided instruction (CAI) toward more active forms of computer-supported communication environments. As an agent for socialization and collaboration, the networked computer has a greater potential in education than does the stand-alone knowledge-server computer (Berge, 1995). These modern communication technologies reshape the process of education. Accordingly, effective integration of computers into the classroom requires a departure from the traditional instructional mode, so technology-mediated communication in the classroom becomes pedagogically superior to the alternative modes of instruction (Alavi, 1994). Technologically mediated distance learning has more often than not merely replicated the ineffective methods that limit learning in face-to-face classrooms (Turoff, 1995). Computer mediated communications can be the basis for people with shared interests to form and sustain relationships and online communities (Hiltz and Wellman, 1997). A new kind of learning culture is about to be born. The belief in this new culture is that technology would be used to create learner community and facilitate social interactions from a distance between learners.

Using computer-mediated communication as a mode of educational delivery is not a new concept. Until 1997, more than 80 programs worldwide were known to be offering courses partially or completely via CMC (Cagiltay, 1997). The number of such programs has been increased significantly since then.

A field experiment at Penn State supports this evidence by using an asynchronous learning environment consisting of 40 part-time students. The research aimed to get a clear respond whether asynchronous collaboration is an effective replacement for face-to-face collaboration. Findings indicate that CMC collaboration is as effective as face-to-face one in terms of learning, quality solutions, solution content and satisfaction with the solution quality. However, students were significantly less satisfied with the asynchronous learning experience both in terms of group interaction process and the quality of group discussions (Ocker & Yaverbaum 1998).

The study conducted by Hartman, Kiesler, and Sproull (1991) examines the effects of using network technologies on teacher-student and student-student interactions, in a writing course. In this study, two sections used traditional and other two sections used various electronic modes (e-mail, bulletin boards, etc.) of communication. Results indicate that the teachers in the networked sections interacted more with their students than the teachers in the traditional sections. While teachers in the traditional sections marginally increased their use of traditional communication over time, teachers in the networked sections substantially increased their use of electronic communication over time without significantly decreasing their use of traditional modes of teacher-student communication. In addition, they found that teachers communicated more electronically with less able students than

with more able students and that less able students communicate more electronically with other students.

Another research done by Hiltz and Benbunan-Finch (1997) emphasizes online collaboration in Virtual Classroom® (VC), which supports asynchronous learning networks at New Jersey Institute of Technology. Researchers in the project considered the virtual classroom as a teaching and learning environment located within a computer-mediated communication system. Results of the quantitative analyses are inconclusive in determining which is "better" – the traditional classroom (TC) or modes employing the VC. The overall answer is "it depends". Results are superior in the VC for well-motivated and well-prepared students who have adequate access to the necessary equipment and who take advantage of the opportunities provided for increased interaction with their professor and with other students, and for active participation in a course. Students lacking the necessary basic skills and self-discipline may do better in a traditionally delivered course. Whether or not the VC mode is "better" also depends on the extent to which the instructor is able to build and sustain a cooperative, collaborative learning group. Working in groups instead of alone, significantly increases motivation, perception of skill development and solution satisfaction. According to findings, individuals in online perform worse than face-to-face conditions, but groups online do not (Hiltz, 1997). Accordingly, the weaknesses of asynchronous learning networks (ALN) as a mode of communication decrease the feeling of "social presence" of the teacher and the other group members. This can severely decrease feelings of motivation and involvement, and thus negatively affect the learning outcomes. However, an emphasis on collaborative

learning can highlight the advantages and overcome some of the disadvantages of asynchronous computer-mediated communication (Hiltz & Benbunan-Fich, 1997).

Heller and Kearsley (1992) describe their experience on using a combination of instructional television and a computer bulletin board system (BBS) to teach graduate students in computer science and education. The television component provided a medium for lectures, guest interviews, and software demonstrations, whereas the bulletin board was used to stimulate interaction among students and the instructors. Heller and Kearsley used a variety of different strategies to encourage interaction on the BBS, including assignments, discussion questions, and team activities. Based on the evaluations completed by the students in their courses, the authors concluded that the combination of media works very effectively.

Deakin Project held by Deakin University (1996) was developed to adopt the use of CMC in collaborative learning in both teaching and assessment of the first year microeconomics and macroeconomics units to distance education students. First Class conferencing system provides a graphical user interface, which makes it easy to send and receive e-mail, share files and use electronic conferencing to exchange ideas and participate in online chats throughout Deakin Project. Analyses of surveys conduct at the end of each year have shown that performance of students using CMC improved greatly in the second year of the program. For those students connected electronically, access to staff and other students was perceived to be greatest benefit. Participating fully in the tutorial exercises also enhanced many students' understanding of the topic although technical difficulties remained a handicap for some. On the other hand, some students lack self-discipline to work without the pressures of time and place. The asynchronous feature allows the learner more time

to think about his/her contribution but by reducing the pressure to respond, it is easier for student to drop out of the group. Staff has also experienced a loss of control to the extend that technological problems have interfered with course delivery and the submission of assessment yet these difficulties are beyond the staff member's control (Graham & Scarborough, 1999).

Baker and Buller (1995) observe that primary and secondary school systems are so burdened by a lack of funding that they usually cannot afford the tools and connections needed for CMC. Dedicated, wide-area computer network connections offer many features ranging from e-mail to peer discussions and have the potential to revolutionize education, but these dedicated connections are currently too costly for struggling K-12 schools. However, specialized access services such as NGS Kidsnetwork, CompuServe, and Argonne's NEWTON offer teachers and students a chance to experience the "global classroom" free of charge.

Fajen and Christianson (1994) examine the use of Bulletin Board System (BBS) networks as an educational resource, specifically in primary and secondary classrooms. BBS networks are distributed to group conferencing systems (Santoro, 1993) that allow teachers and students around the world to interact with each other electronically in "virtual classrooms," sharing information and collaborating on learning projects. This examination presents a brief history of BBS networks, explains the basic principles of BBS networking, and explores two BBS networks devoted to K-12 education: the Free Education Mail (FrEdMail) network and K12Net (a subdivision of the Fidonet BBS network). The authors also present a short summary of off-line mail readers, electronic mail tools used to decrease online time and costs.

Since 1984, Turkey has also powered pragmatic shifts in education. Technological changes shaped schooling in a different way. More than 120.000 computers are now available and in use in our schools (Goktas, 2002). Although this number seems to be large, the percentage of technology each school has is not enough yet. Also, the formal education system has not been able to respond adequately to broad shifts in occupational structure; nor the need for a specialized informatics profession (Cagiltay, 1995). Turkey initiated a project to set up a computer-mediated communication network among 53 secondary schools in 1995 (Computer Experiential Schools Project-CES). The project was under the control of Ministry of National Education, Directorate of Information Technology in Education (DITE). The project goal consisted of a cooperative project work among national schools and schools abroad, on English as a second language, problem solving in mathematics, science (biology, chemistry, and physics), and social science. (History, geography)

Increased number of research within CMC usage as in educational context is part of a rising technological tide that began with networks, most notably the Internet. Accordingly, the world of education has begun to grapple with the task of integrating CMC tolls into the classroom, to make sure that students are properly prepared to compete in a world that relies upon the use of technology (Carnevale, Gainer & Schultz, 1991). Although there were 120.000 computers being used in schools as of 2002 (MEB), only there were 2367.5 students per computer connected to the Internet. Given the emergent status of school networking, it is no surprise that there is a need to understand how CMC tools are used by students in classroom activities.

1.2. Statement of the Problem

In the area of communications, CMC has already become firmly established. Today, most of the major companies in the United States and Europe either rent or maintain their own data and personal communication networks so that all departments can communicate effectively and efficiently by electronic means. Based on the shifts faculty member of most schools need to recognize that significant changes in schooling have been occurring and that these changes will affect the school system itself. One aspect of increasing importance in this system is the use of electronic mail, computer conferencing, and, increasingly, computer-supported collaborative work between groups of students and teachers who may be scattered in different regions of a country or even different continents. Further, chairs and faculty members of schools should recognize their responsibility for the preparation of students of the communication age. It is time to think seriously about multiplying the opportunities for students to meet challenging problems, teamwork and technology-mediated communication as a whole.

In line with these developments, METU Foundation School staff has been working on integration of CMC into their curriculum in recent years. Staff decided to adapt the CMC systems to their own educational system in 2001. The need of project designs that aims to establish open-ended collaborative projects as a regular part of day-to-day activity within and between communities of classrooms has arisen to enhance the learning process' effectiveness and efficiency at METU Foundation Schools. The structural and organizational background of likewise projects has just been discovered and set in learning communities involving K-12 schools. Further, there are a number of questions to answer how to define and organize cognitive and

behavioral components of CMC to reach the effective collaborative-supported communication environment. Coordination of learning activities, as cross-classroom collaboration between students is still partly in scope within small number of research. There are not many CMC researches in primary level within the field. Therefore, there is a need for more studies that examine students' perceptions, satisfaction and attitudes toward a new technology-based communication system within a well-structured project.

1.3. Purpose of the Study

Studies have shown computer-mediated communication to be a significant enabling technology for the development of effective and flexible learning. If selected and used properly, computer-mediated communication call allow courses to become increasingly interactive and to foster learning environments, which surpass most classroom settings for supporting student participation and interaction (Coombs, 1989). In addition to participation and interaction through CMC, perception and attitudes toward CMC usage and social presence come into existence in research process to reach the effectiveness of computer-mediated collaborative learning environment in terms of students' experiences. The purposes of the study is to explore whether the use of computer-mediated communication tools in a collaborative process enhances 5th grade students' attitudes toward computer and computer class within an online supported environment, investigate the level of learners' satisfaction about the project-based collaborative learning through CMC, examine the students' perceptions of their social presence, and to find out how effective social presence is as a predictor of overall students' satisfaction.

More specifically this study will address the following research questions:

1. What are learners' attitudes toward computers at the beginning and at the end of the study?
2. Is there a difference between genders on pre and post-attitudes of students toward computer?
3. What are the levels of learners' satisfaction about the project-based collaborative learning through CMC?
4. Is there a significant difference between genders on their satisfaction levels?
5. What are learners' perceptions of their social presence during the project-based collaborative learning through CMC?
6. Is there a significant difference between genders on their social presence?
7. Is there a relationship between learners' social presence and satisfaction level of the project-based collaborative learning through CMC?

1.4. Significance of the Study

Educational conditions in Turkey have changed greatly over the last few decades. These changes have resulted in an increased demand for alternative educational environment. A number of courses are given via Internet to the wide range of students. These online applications are successfully held by universities offering graduate programs mostly for working people. Therefore, most research tended to concentrate on the postsecondary levels, both in higher education and business training courses. The "globalization" of business communication has become urgent for staying competitive. To parallel these implications, recent researches are investigating in primary level. However, they have not included enough all applications of CMC in elementary and secondary school settings yet. Are elementary students ready for the new popular type of learning environments? Can

they handle self-directed learning type, which is the major characteristic of adult learning? Can CMC promote effective learning environment for elementary students? This study tries to find answers to these questions and to draw the way of the trip toward ideal learning environment for the children of the communication age. To conclude, this electronic classroom does not only provide an ideal setting for exploring the ways that students employ CMC technologies but also adds to the body of international CMC researches in schooling.

1.5. Definitions

Computer Mediated Communication: It is a generic term commonly used for a variety of systems that enable people to communicate with other people by means of computers and networks. A working definition of CMC is "communication between different parties separated in space and/or time, mediated by interconnected computers" (Romiszowski & Mason, 2001, 439).

Collaborative Learning: Collaborative learning evolved from the work of psychologist such as Johnson and Johnson (1975) and Slavin (1987). It involves social (interpersonal) processes by which a small group of students work together to complete and academic problem-solving task designed to promote learning.

Project-based learning: In project based learning, students work in groups to solve challenging problems that are authentic, curriculum-based, and often interdisciplinary. Project-based learning (PBL) is similar to problem-based learning in that it is organized around a question or problem and seeks to provide the same type of grounded, inquiry-based experience to learners (Blumenfeld et al., 1991) But

project-based learning differs from problem based learning in that the results of the learning are manifested in tangible artifacts or products that address the question.

Constructivism: Constructivism is not a theory about teaching; it is a theory about knowledge of learning (Brooks and Brooks, 1993). Constructivism, first purely throughout the length of learning theory, *what is*, rather than *what should be*. Duffy and Cunningham (1996) point out that "The term "constructivism" has come to serve as an umbrella term for a white diversity of views". Definitions of constructivism under any of these views, however, include a central the idea that knowledge is "constructed", by the learner.

Engagement Theory: The fundamental idea underlying engagement theory is that students must be meaningfully engaged in learning activities through interaction with others and worthwhile tasks. With its emphasis on meaningful learning, it is very consistent with constructivist approaches. Engagement theory is based upon the idea of creating successful collaborative teams that work on ambitious projects that are meaningful to someone outside the classroom (Kearsley & Shneiderman, 1999).

Social Presence: Social presence is the sense of "being together with another" and mental models of other intelligences that help us stimulate "other minds" (Biocca, 1997). Social presence is defined as the degree of awareness of another person in an interaction and the consequent appreciation of an interpersonal relationship (Walter, 1992). Most researchers would agree that social presence is phenomenon that is independent of a specific technology (Biocca, 2001). According

to Savicki & Kelley (2000) social presence is the ability to make one's self-known under conditions of low media richness.

Co-presence: It is the degree to which the observer believes he/she is not alone and secluded, their level of peripherally or focally awareness of the other, and their sense of the degree to which the other is peripherally or focally aware of them. It has two factors, which are isolation/aloneness (sensory awareness of the embodied other) and mutual awareness (Biocca, 2001).

Psychological Involvement: It is the degree to which the observer allocates focal attention to the other, empathically senses or responds to the emotional states of the other, and believes that he/she has insight into the intentions, motivation, and thoughts of the other. It has three factors, which are mutual attention, empathy, and mutual understanding (Biocca, 2001).

Behavioral Engagement: It is the degree to which the observer believes his/her actions are interdependent, connected to, or responsive to the other and the perceived responsiveness of the other at the observer's action (Biocca, 2001).

1.6. Assumptions

For this study, the following assumptions are made:

1. The participants responded accurately to all measures used in this study.
2. Reliability and validity of all measures used in this study are accurate enough to permit accurate assumptions.

1.7. Limitations/Delimitations

The following limitations are relevant to the present study:

1. The sample size in this study is limited by the number of students enrolled in the online supported collaborative project at METU Foundation Schools.
2. In this study different sampling methods were used at Niğde and Ankara METU Foundation Schools. Therefore the sampling methods used in this study are other limitations of this study. However in terms of subjects' characteristics, both Niğde and Ankara groups have similarities.

CHAPTER II

LITERATURE REVIEW

This chapter provides a review of literature related to this study. The literature review is presented under five main sections: Online education and CMC, advantages and limitations of CMC, synchronous and asynchronous communication through computers, types of systems which support CMC, media supported by CMC, models for the educational use of CMC systems, strategies in organizing CMC systems, social perspective of CMC, theoretical basis of CMC, and research studies on CMC.

2.1. Online Education and CMC

Online education refers to any form of learning/teaching that takes place via a computer network, which can be a local or the global Internet. Online distance education has some significant strength over other forms of distance education. It is inexpensive to deliver, can be delivered on demand anywhere in the world where students have access to the Internet and offers the students the chance to collaborate amongst themselves.

Online education is a rapidly expanding field that has enormous potential in both classroom-based learning and in distance education. Atkinson (1997) claimed

that the educational use of the Net is the second biggest growth area of the market, behind home use. CMC term was born with online education. Online interaction, an important component of online education, has been called “computer-mediated communication” (CMC), although this term covers applications beyond instruction (Moore& Kearsley, 1997). CMC refers to computer applications for direct human-to-human communication (Santoro, 1995). A working definition of CMC is “communication between different parties separated in space and/or time, mediated by interconnected computers” (Romiszowski & Mason, 2001, 439). It is a generic term now commonly used for a variety of systems that enable people to communicate with other people by means of computers and networks. The computer network here is considered as a mediator for communication rather that a processor of information. It can provide communication access to persons, resources and information independent of time and distance (Ellsworth, 1995).

Nowadays, CMC has become an important and widely used tool in many organizations, and is being used increasingly as a method for communication within professional and social groups. Several studies in CMC have concluded that this is a technology, which supports several features with respect to participants and interactions among group members. It has a great potential to provide students with meaningful learning, however it requires careful design (Anderson, 1996). Like its potential, it has also great challenges because of its reliance on interaction or the successful development of interaction between teacher and student, and student to student. Not just any kinds of interaction, but meaningful, educationally sound forms of communication are required to develop high levels of knowledge (Hatch, 2001). Computer technologies that support human intellectual activity as well as mediate

communications should be given appropriate attention in the realm of CMC as their power and usefulness increases (Levinson, 1990). Therefore, the world of virtual education needs to establish systems to properly monitor what happens inside these environments so that effective educational strategies can be developed (Benigno & Trentin, 2000)

2.2. Advantages and Limitations of CMC

With respect to much of the opportunities of educational CMC environments, they need to provide an engaging setting for learners. To be able to provide this setting first of all, the benefits from the uses of CMC and difficulties of it should be examined.

Enormous research from the literature shows that the use of CMC offers many advantages for the student learning at a distance in particular the ability of CMC to provide a means for students to connect socially and to provide means for constructive interaction and collaborative learning (Hatch, 2001). Educational CMC offers unique communicative and collaborative opportunities to its users. Researches in online education indicate that CMC with a capacity to support collaboration, reflection, interaction, and communication has the ability to provide useful and cost effective learning (Anderson, 1996). If designed well, CMC applications can be used effectively to facilitate collaboration among students, teachers and guests or experts from outside the classroom (Berge, 1995).

Another potential benefit of CMC is in promoting multicultural awareness. With the demographic structure of many countries changing so rapidly, it is becoming important to develop communication skills for a cultural diverse

community and world (Berge, 1995). CMC provides opportunities for students to learn about distance cultures through direct communication with people living there. Given the opportunity to collaborate with diverse sources of information outside the walls of traditional classroom, students will be more able to acquire new viewpoints. On the other hand, because the bulk of CMC is conducted in English, it may continue some cultural hegemony (Berge, 1995).

Students will also have to learn to think about and judge information for themselves. Students who have such control over their learning and topics of inquiry are more motivated because education takes on a much more intense meaning for them (Garner & Gillingham, 1996). However, there is a problem of “loss of control” within CMC experiences. The students would tend to pick up on recently circulated message and respond that of context, often leading the discussion into a completely new area. It was found that the task of bringing discussion back to the original topic was much more difficult in the CMC environment than would normally be the case in face-to-face discussion (Romiszowski & Mason, 1995). There is also the problem of knowing who is and is not participating. The main question here is that who is “lurking” in the system. This calls into handling of the stimulation of unregulated and impulsive behavior during the CMC tools usage (Kiesler e*t al.*, 1985). Nevertheless, CMC can promote self-discipline and requires students to take more responsibility for their own learning. The course’s instructional design can be altered from structured to open where students are free to work on “messy” but authentic problem solving (Berge, 1995). According to Mason (1988), CMC is an excellent medium for self-directed learning as a defining characteristic of adult learning. In self-directed learning, students choose to take a CMC-based course, determine how,

when and where they will study, and negotiate the learning activities and focus content they will pursue during the course, since CMC allows students to participate at a time and at a pace convenient to them and appropriate to any CMC application. Robinson (1990) found that, convenience of access at the students' own time schedule was more important than the separation in proximity of distance learners. Students can respond immediately or they may choose to respond after taking time to reflect and compose a response thoughtfully. As a result, the quality of participation of students can be greatly improved online.

On the other hand, depersonalization occurs, and so individuals are less likely to know the position, background, and expertise of those with whom they communicate (Romiszowski & Mason, 1995). Some researchers argue on the concern that CMC will build global networks while reducing proximate neighborhood and family ties, that CMC may alter peoples' work and communication patterns significantly and may dehumanize interpersonal interaction (Eastmond, 1992). On the other hand, Boshier (1988) found that friendly relationships developed in spite of reduced cues, that participants become more causal and humorous over time, and that this medium invites more equitable participation. According to Philips (1990), students who participated in an electronic "student lounge" maintained their attitude of positive potential for this medium after direct experience with it. They enjoyed chatting, and making friends and professional contacts, and felt less isolated (cited in Romiszowski & Mason, 2001).

Some researchers argue that CMC provides improved communications when compared to face-to-face education (Harasim, Hitz, Teles & Turoff, 1995). It also may provide the perfect place for discussion, for students who may not participate in

discussions in a traditional classroom. Absence of the established cues of authority and stature in text-based CMC exchanges allow greater participation among those who feel diminished in the face-to-face setting by reason of gender or any one of the many superficial constraints imposed on social interaction (Sweet, Anderson & Halenda, 1991). Similarly, Boyd (1987) indicates that CMC provides the ideal conditions for this rational and liberative discourse because of its potential for reducing dominance factors and for filtering of verbal distractions and rhetorical tricks. According to Berge (1995), the lack of cues and the asynchronous nature of the medium afford those with physical limitations or personal reticence the possibility of participating fully and equally in communicative activities within a mainstream environment. It provides more equal participation and task-oriented study at least as good as of face-to-face groups (Kiesler e*t al.*, 1984). The students often find the online environment less threatening (Horton, 2000). CMC seems to equalize the learning process according to those arguments, others, however, counterargue that computer usage in general is accessible to wealthier, high-achieving male European-American students who live in urban areas (Romiszowski & Mason, 2001**).** On the other hand, Eastmond (1993) argue that CMC usage often depends on adults' occupational status and socialization as to whether they value this sort of experience.

According to Mason (1994), there are number of disadvantages as not being any pressure on participants, being time-consuming of the act of writing and using on-line text based applications (Berge, 1995), some students' dominations on the discussions. Additionally, some students prefer the social aspects of the classroom

and are unsettled by the lack of the face-to-face interaction in CMC, or the lack of a charismatic lecturer during presentation (Berge, 1995).

One of the problems identified in the educational use of computer conferencing is that of teacher workload. Some reports indicate that teachers spend up twice as long to deliver a course via computer conferencing as they do to give a course by traditional means (Romiszowski & Mason, 2001). According to Hiltz (1988, 31), teaching online looks like doing parenthood. “You are ‘on duty’ all the time, and there seems to be no end to the demands on your time and energy”. While teachers’ role is particularly time consuming in the initial phase of a computer conferencing course, it usually reduces as students takeover the discussions (Romiszowski & Mason, 2001).

The cost of buying and supporting systems, or accessing other networks is a significant “overhead” item in schools and colleges today, as is the cost and inconvenience of repairing or replacing hardware. Educational researchers admit that there are problems with using CMC in the classrooms. Most of these problems are centered around the teachers and administration of the schools, not on the children. Students, on the other hand, are the cause of very few problems when it comes to the use of CMC in the classroom. The problems include:

1. Technology is often delivered to the classroom haphazardly with little match between the technology can do and what the children are meant to learn.
2. Teachers are often ill prepared or untrained to use the technology or to incorporate it into lessons.

3. There is usually a lack of computing support, that is there is no IT trouble-shooter to help things such as software installation run smoothly.
4. There is a great deal of bureaucracy facing teachers wishing to use Internet technology in the classroom.
5. Teachers must usually be the ones who take the initiative to learn about, suggest, and implement the use of these technologies in the classroom (Garner & Gillingham, 1996, 11-12).

Harasim (1987) conducted a research on how students perceive CMC medium. She found that students spent longer on-line than they were required in the course, and they felt that this medium was effective. Students listed the advantages of computer conferencing as increased interaction, access to a group, the democratic environment it fostered, the convenience of access, their control over instructional process, the motivation they had to participate, and the textual nature of the computer conferencing medium. The disadvantages they mentioned were the information overload, the medium's asynchronicity, which caused delayed responses, the loss of visual cues with this communication, increased access inconvenience and health concerns about computer radiation.

2.3. Synchronous and Asynchronous Communication through Computers

The synchronity or asynchronity of the communication is an important factor in the learning process. They have both positive and negative influences on this process. Which form of communication is most suitable depends on for which activities it will be used. Meanwhile, one of the interesting aspect is that using computer as a means of communication medium makes it possible to use it both as a synchronous communication medium like a telephone or an asynchronous

communication medium like a letter-writing or fax system, depending on what is ideally required by the particular situation (cited in Romiszowski & Mason, 2001)

Synchronous communication (also known as real-time communication) usually occurs with two or more people communicating with each other at the same time and in the same place with the help of telephones, videoconferences, and computer conferences via computer networks. Synchronous conferences occur when two or more computers are connected to each other over a network to share data, enabling people to communicate with each other at the same time. Even before the development of the World Wide Web (WWW) in the early 1990s, many of people were meeting, chatting via the Internet (Jonassen, 2000). There were hundreds of servers that provided such capabilities as Internet Relay Chat and multi-user domains as MUDs, MOOs, MUSEs and MUSHs, each of which served thousands of users (Bartel, 1990). A newer and ever more sophisticated mode of synchronous communication through networked computers is desktop videoconferencing. Desktop conferencing may include the transmition of “live” data between computers over a network, including audio, video, text files, screens, pictures, and shared applications. As an example, Microsoft’s Netmeeting and CU_SeeMe software support these kinds of interactions. There are several forms of synchronous communication (see Table 2.1).

Table 2.1: Synchronous Communication (Jonassen, 2000)

Synchronous Communication Forms	Desktop Video Conferences
	Internet Relay Chat
	MUDs, MOOs, MUSHs, WOOs

The benefits of communication synchronously using these applications include low cost, cross-platform compatibility, and distance compatibility. In synchronous communication, the student is considered having understood the whole discussions, presentations as they happen, and having good memory to remember whatever he/she needs. It allows students to test and refine what they are learning in a community that offers immediate feedback for their thinking and writing processes (Jonassen, 2000). At the same time, contributions of both teacher and students into the process are spontaneous (Mason, 1994). Keypals, global classrooms, electronic mentoring, and impersonations are the interpersonal exchanges taking place within synchronous communication (Harris, 1995). They may also focus on collaborative construction of databases, electronic publishing, electronic field trips, and pooled data analysis.

Synchronous conferencing may support critical, creative and complex thinking. It is, however, important for the success of synchronous conferences to pose interesting, engaging questions, problems, or projects for the students to resolve in synchronous discussions.

According to Jonassen (2000), evaluating the ideas being discussed and connecting those ideas with others is the most difficult part of synchronous conferences.

> Participants must determine criteria for what students must prioritize the messages that they will respond to, recognize fallacies in those messages, and verify the accuracy of the information provided. With synchronous conferences, these activities must be accomplished “on the fly” while more

messages are constantly being added. This is what makes synchronous conferences harder than asynchronous (Jonassen, 2000, 242)

One of the limitations of using synchronous conference is handling with the problems within evaluation process. In order to overcome the problem of evaluating students within synchronous conferences, whether students' messages are on-task and relevant, whether students' ideas are original and whether conversation between students are organized or threaded should be taken into consideration (Jonassen, 2000). Another disadvantage of synchronous conference is that it is easy to lose focus or purpose and track of conversation discussed. Additionally, synchronous conferences are often social in nature. Therefore, it is difficult to avoid having the conferences devolve into a social discussion.

Asynchronous communication, on the other hand, is often more structured and reflective than synchronous communication. It also focuses an activity more than synchronous discussions. Kwon (1998) found that conferencing groups who were making decisions and solving problems made fewer social and off-task comments during several sessions when compared with face-to-face groups (cited in Jonassen, 2000). As Turoff (1989) points out asynchronity is not just a matter of convenience. Its real value lies in a structure that allows each individual to work on problems after his or her own fashion before joining an on-line group where the problem-solving processes employed may be very different.

It occurs when only one person can communicate at a time. User leaves notes, papers, pictures, or any other type of communication for each other that is encoded into digital form, transmitted, and later decoded. Most forms of computer-mediated

communication are asynchronous. There are several forms of asynchronous communication (see Table 2.2).

Table 2.2: Asynchronous Communication Forms (Jonassen, 2000)

CMC Modes	Asynchronous Communication Forms
One-to-one	Electronic mail (e-mail)
One-to-many	Bulletin boards, UseNets, NetNews, Learning Circles
Many-to-many	LISTSERV; Scaffolded Conferences: CeMILE, Collaborative Notebook, CSCA

Kaye (1992) claims that although the para-linguistic cues of face-to-face communication are missing, the asynchronous medium creates greater communication richness than other forms of textual communication used by groups. The cumulative record of message contributions provides a greater potential for reflective and thoughtful analysis and review of earlier contributions than would in face-to-face seminars. Asynchronous conferencing more predictably engages in reflective thinking than synchronous. The interaction develops written communication skills, enhances in-depth processing and recall of course material, and prepares students for examinations demanding written responses. Hiltz (1986) found that classroom interchanges produced more interaction and involved more exchanges between students than did face-to-face interchanges. This is probably because of anonymity, which reduce personal fears occurring almost in all face-to-face classrooms. According to Berge and Collins (1993), one of the most important

advantages of asynchronous conferences is its independence of time. Unlike other forms, it is open 24 hours a day, 7 days a week.

Asynchronous conferencing is an effective means for collaborative problem solving. Aynchronity, which may at first seem to be a disadvantage, is the single most important factor in creating a collaborative teaching and learning environment (Hiltz, 1990). It supports collaborative learning through improving the access to other group participants, eliminating social distinctions and barriers between those participants, contributing to sense of informality, and fostering a stronger group identity (Jonassen, 2000).

In asynchronous communication, learner has time to think about his/her contributions but there is less pressure on him/her to respond in a quick manner. The lack of control over turn taking, and the frequent development of multiple threads of discussion within the same message space, can provide obstacle to effective collaboration. Some students lack the self-discipline to work without the pressure of time and place. The asynchronous feature allows the learner more time to think about his/her contribution but by reducing the pressure to respond, it is easier for the students to drop out of the group. Decision-making takes longer and may result in the use of stronger, more inflammatory, and more personalized expressions (Jonassen, 2000). In addition, the text formatting is very time consuming when collating answers and needs to be made simpler to avoid students having to put in so much time in the future. The user interfaces in much of the software are unfriendly and difficult to use. Meanwhile, the handling of the problem of lurkers, the timing of intervention in-group discussion, and the size and formation of groups has to be debated. Technophobia or communications anxieties can prevent number of

individuals from participating fully. People can become “lurkers” when they post an idea and nobody responds or even acknowledges it, or when they are harshly or rudely treated (Jonassen, 2000). Hardware and communications lines and equipment are not much reliable, which may cause a loss of work or delays in communications. Such problems tend to frustrate users and may reduce participation.

2.4. Types of Systems which Support CMC

Systems which support CMC differ enormously from product to product, both in the way appearance as communicative tools, and in the degree of freedom they allow for user modification, control and access. Various modes and medias can be combined to facilitate the communication process. Well-known examples of such systems include computer conferencing, electronic mail, discussion lists, and bulletin boards. However, there are yet other possible applications of CMC. Virtual classrooms, computer-mediated seminars and case study discussions and computer-mediated job “performance support system” are the alternative modalities. Some of the features of the “virtual” or electronic workplaces are:

- Tasks are optimally grouped and not differentiated, requiring a repertoire of general skills rather than specialization.
- Individuals can better regulate their own time.
- A participative management style is possible.
- Collegiality is possible.
- Innovative and risk-taking behavior is possible (Sweet, Anderson & Halenda, 1991).

The power of communication tools lies in their capabilities to support conversation and collaboration (Jonassen et al., 1995). All of them allow learners to generate questions, summarize content, clarify points, and predict upcoming events. They support the discourse communities, groups of individuals who share and discuss common interests and goals. Some of the well-known functions supported by CMC systems are as follows:

E-mail (One-to-One Communication): The most common function used in online education is electronic mail (e-mail) that allows students and teachers to send messages to each other. Messages are sent through networks of computers from your host computer to another computer, anywhere in the world (Jonassen, 2000). Usually the message contains text, but it makes possible to attach files to the messages. E-mail supports a number of learning techniques as learning contracts, mentorship and apprenticeship, and correspondence study (Paulsen, 1994). Kuehn (1988) suggests that electronic mail can extend classroom discussions, increase the ease of evaluating student assignments, increase the connectedness of students and faculty, and increase both the social as well as an intellectual impact from this means of communication (cited in Romiszowski & Mason, 2001). On the other hand, e-mail is perceived to possess the highest level of social presence, followed by the real-time discussion and bulletin board.

Discussion Lists and Bulletin Board Systems (One-to-Many Communication): It is used for access to announcements and discussions of general or particular interests. There are public discussion list on more than 10,000 different topics and more than 3,000 groups, which provide information about these topics on the Internet. Moreover, more than 2,000 news networks are available for providing

news and announcements (Jonassen, 2000). These services enable you to post a question to be answered, express your opinion about a topic, or make friends with like-minded individuals. Users can read what others have written, respond publicly or privately to the author, and post new ideas, questions or requests to the others. Moreover, they have several functions, including conferencing, questionnaires or polling, file access, news, lectures, and access to databases. The most common application is news services. They also are used for more social functions, beginning with introductions and moving on to general chat. It is possible to get a transcript of all messages posted to the groups.

Conferences (One-to-One, One-to-Many, Many-to-Many Communications): It is used for group discussions with a permanent record of the interaction. Members of the group can use the system to post messages to whole group, and discussions can thus take place over a period of time. These systems have also possibilities for real time interaction. Conferencing systems include synchronous, one-to-one communication, which is similar to “chat” or “talk” rooms, but only for two persons. The persons are both online at the same time and can communicate with one another with each typing on their half of the screen. Another system is synchronous, one-to-many communication, which is the “chat” room where many can log on at the same time and type their contributions and responses to on-going conversations. Conferencing operates much like the well-known E-mail networks. Conferencing also allows much more extensive dialogue among participants: “many-to-many” exchanges as compared to simple dialogue. Romiszowski and Haas (1989) point out that conferencing interactions are more democratic than that of face-to-face class, because individuals can reflect on and

think over ideas before responding. It promotes cooperative interaction in dealing with the practical problems that characterize much of the work in an educational organization (Dunn & Hamilton, 1985). It also supports debates, simulations, role-playing, and collaborative construction of knowledge. The interactive and asynchronous nature of conferencing system constructs the "collective intelligence" (Sweet, Anderson & Halenda, 1991). It is commonly used to create virtual classrooms. In primary and secondary schools, e-mail and computer conferencing are used for language arts, local and global linking of classrooms, and group problem solving (Hamman, 1997).

Table 2.3: Synchronity/Asynhcronity of Functions

CMC/Media	Synchronous	Asynchronous
E-mail		√
Discussion Lists and Bulletin Board Systems		√
Computer Conferencing	√	√
Audio Conferencing	√	
Video Conferencing	√	

2.5. Media Supported by CMC

These different CMC systems support different kinds of media. Five kinds of media (Agnew & Kellerman, 1996) are as follows:

- text; letters, number punctuation, special characters, and controls,
- graphics; lines, circles, boxes, shading, fill colors etc,

- images; still pictures, expressed as the colors of many small individual picture elements,
- audio; sound including voice, music, and special effects,
- video; successive pictures presented sufficiently rapidly to give the appearance of smooth motion.

The kind of media that the CMC system supports are very important for the learning process, because it defines which information can be communicated. Table 2.3.2 gives an overview of the kinds of media that can be transmitted by each system.

Table 2.4: Kinds of Media Transmitted by Each System

CMC/Media	Text	Graphics	Image	Video	Audio
E-mail	√	√	√	√	√
Discussion Lists and Bulletin Board Systems	√				
Computer Conferencing	√				
Audio Conferencing					√
Video Conferencing	√	√	√	√	√

2.6. Models for the Educational Use of CMC Systems

There are a large number of different theoretical and practical models for the educational exploitation of CMC systems. Here are some models suggested.

Query & Response: Using a computer conferencing system, questions and the responses can be stored in permanent way. In this way, a database, which concerns learners' encountering the issues that they see problematic, can be built. It

is a permanent record of different perspectives and viewpoints. This database of queries and responses becomes a valuable resource for learners to reflect upon, reuse and revisit. The articulation of the query also encourages the development of writing skills and clear expression of the problem. It can also be used for future students and be used as a teaching resource.

Electronic Seminar: Seminars provide the opportunity to clarify ambiguities, compare interpretations, and offer alternative perspectives that aid the construction of logical and reasoned arguments. Offered electronically, the seminar can transcend the boundaries of time and space, opening up opportunities to participate who are currently marginalized in higher education: e.g. part-time learners, learners with economic or family constraints or caring responsibilities. The environment can also be supportive to students who has disabilities (such as hearing impairment), lack of confidence to speak, or whose first language is not English.

Learning Circles: Through the use of CMC it is possible to link learners and tutors all over the world. This opens up possibilities for international collaborations and sharing of different cultural perspectives in learning activities. Circle offers several dimensions of learning support: support from international tutors and international students, support from global services and from globally held resources (Riel, 1993).

Developers of the Global Learning Circles Project, in which classrooms in the United States are connected to classrooms around the world via the AT&T Learning Network, believe that when students write for a larger, networked audience of peers, they are more motivated to perform. Cohen and Riel (1989) found that papers written to communicate with peers were more fluent, better organized, and

clearer than those written merely for grade (cited in Jonassen, 2000). The Learning Circles project facilitated collaboration among small groups of classrooms. The project staff worked with elementary, middle, and high school students by outlining group tasks and time lines, with each school managing one project around its curriculum for the group, which as a whole produces a publication. Classes in each learning circle agreed on a project, and the students became authors, reporters, poets, and researchers, responding regularly to requests from the other classes in the circle via e-mail. According to Riel (1993), Learning Circles are designed to expose students to different points of view, enhance multicultural awareness on a global scale, and develop cooperative skills for dealing with people in different cultures.

Computer Supported Collaborative Learning: CMC allows flexible ways to support and sustain collaborative problem-based learning. Students are given time to work at their own pace, time to seek out solutions to a problem, to consult other resources and with the opportunity to inspect each others interpretations of the problem. This can encourage students to critically assess viewpoints they have taken for granted, reveal misconceptions and so aid the “deeper” processing of information. The flexibility that CMC offers may also open opportunities for team-working on learning projects.

Collaboratory Notebook, which is a scaffolded computer conference, is one of the examples of computer supported collaborative learning. It is developed in order to support The Learning Through Collaborative Visualization (CoVis) Project. In this example computer conferencing has been used effectively by the CoVis project to connect learners from around the country in dialogues about science (Edelson, Pea, & Gomez, 1996). The CoVis project aims to establish open-ended

collaborative science projects as a regular part of day-to-day activity within a community of science classrooms. During a project, the teacher or any student can pose a question or a conjecture, which can be addressed by participants from around the country. A key part of this effort is to enable projects where learners in classrooms around the country work together and with outside experts on shared scientific and technical goals.

Another method for structuring collaboration through communication is computer-supported collaborative argumentation (CSCA). CSCA is the process of using technology to support argumentation during problem solving. To support this process, a CSCA tool was developed to provide a hierarchical framework to help structure the communications. At first, a problem statement is defined and in order to elaborate on the problem, students submit proposals with supporting arguments. The CSCA tool is meant to provide students with means to help organize and represent their knowledge so they can make informed decisions toward resolving a particular problem (Jonassen, 2000).

Shared Workspaces: For more than decade, the computer science field has focused much research on computer-supported collaborative work (CSCW) and there is a growing body of research on the role of computer-mediated systems in the education organized around the CSCW. Engelbart & Lehtman (1988) defined CSCW as the study and development of systems to encourage organizational collaboration (Sweet, Anderson, and Halenda, 1991). Johansen (1988) used the term “groupware” in order to describe the computer tools designed for the collaborative works. CSCW as a research field will still be addressing the larger questions of how to design and refine good groupware that will allow people to work together with the best help they

can get from the computer (cited in Higgins, 1991). CSCW projects provide users with a suite of tools that help them to perform work. It combines communications and computer technologies to support various group activities across a distributed environment (Jonassen, et al., 1995). CSCW tools help groups structure work through group decision support system, project management tools, electronic conferencing systems, and shared editors. These environments help collaborative groups construct a common understanding of the problem being solved and negotiate the most appropriate solution to that problem (Jonassen et al., 1995).

Table 2.5: Taxanomy of CSCW technology developed by Baecker (1991).

Space and time in CSCW systems	One group site	Multiple individual or group sites
Synchronous Communication	Electronic meeting and decision rooms	Synchronous groupware, media spaces
Asynchronous Communication	-	Asynchronous groupware

Computer-supported intentional learning environments (CSILEs) are another distance education technology that can assist learners in knowledge construction. CSILEs are educational knowledge media systems that allow different types of information (text, drawings, graphs, time lines, etc.) to be entered into a common database where they are available for retrieval, review, and contribution (Scardamalia et al. 1989). They promote knowledge construction through the procedural facilitation process and the building of a collective database that provides

open access to the learning context, facts, and information needed for solving specific problems (Jonassen et al., 1995).

Hybrid Distance Learning Program: It is based around a set of modules, introductory face-to-face residential sessions and exchange of knowledge and experience between tutors and learners using computer-mediated communications. The core of the learner's activity is based around a practical assignment tasks.

2.7. Strategies in Organizing CMC Systems

Well-developed virtual environments can "create a stimulating and supportive learning environment without forcing participants to congregate at a particular location or time" (Anderson, 1996). It is necessary to identify and explain the elements of online teaching system and how they are related. Within the environment, teaching methods, teaching devices, teaching techniques, and teacher functions should be explained together with learners, teachers, course content, and leaning resources (Paulsen, 1998).

Teaching takes place in a system environment where choices define the teaching context. According to Donaldson (1991), program administrators should seek to push back constraints, and work to have demand relaxed, thereby increasing the quantity, improving the quality, and expanding the types of choices available to them. The choices define the context in which the teaching takes place and set the premises for instructional design and teaching techniques. According to Paulsen's choices to be made in teaching systems, which are based on both Baath's (1983) five factors to be considered in a distance education course and Harasim's (1995) design issue within an online education environment, there are seven choices crucial to

teaching context. These are choices of target group (age and educational level), subject nature (subject area and accreditation type), enrollment scale (small scale or large scale), study location (home, school, work), communication mode (synchronous, asynchronous or both) scheduling (start-up and pacing flexibility), and media (single mode or mixed mode) (Paulsen, 1998).

2.8. Social Perspective of CMC

Several theories and experimental researches, likely, argue that traditional CMC, which is text-based, negatively influences the way students communicate and interact. There is a common consensus on the lacking of nonverbal cues within CMC and that, therefore, the relational tone of communication tends to be impersonal, less friendly, less emotional and more task-oriented or businesslike. Gunawardena (1994) conclude that failure in computer mediated communications occur far more often on the social level, rather than technical level.

Spears and Lea (1992) discussed three approaches to analyzing the social psychological dimension of mediated communication: 1) the social presence model developed by Short, Williams and Christie (1976); 2) Rutter's (1987) cluesness model; 3) the reduced social cues approach put forward by Kiesler, Siegel, and McGuire (1984). Among these three, the most influential theoretical framework is the social presence model (cited in Gunawardena, 1997). The model is recognized as, from a social psychological perspective, a sense of community, which encompasses adequate group cohesion and a setting favorable to other elements of group dynamics can only be achieved if the communication media allows for the development of the necessary social context. The need for a theory of social presence is more pressing as the Internet and virtual environments become more social. Theories of presence have

arisen to understand, explain, predict, and control the phenomenal qualities of mediated experience and their cognitive correlates (Biocca, 2001). Presence is frequently presented as consisting of two interrelated phenomena (Biocca, 1997):

- telepresence, the phenomenal sense of "being there" and mental models of mediated spaces that create the illusion,
- social presence, the sense of "being together with another" and mental models of other intelligences that help us stimulate "other minds".

There are several definitions of social presence varying to each researcher. Social presence is defined as the degree of awareness of another person in an interaction and the consequent appreciation of an interpersonal relationship (Walter, 1992). On the other hand, Short, Williams and Christie (1976, 65) defined presence as "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships…". They define social presence as a quality of the medium itself and hypothesize the communication media vary in their degree of social presence (cited in Gunawardena, 1997). Most researchers, however, would agree that social presence is phenomenon that is independent of a specific technology and that one can experience some level of social presence with most media (Biocca, 2001). According to Biocca (1997) the amount of social presence is the degree to which a user feels access to the intelligence, intentions, and sensory impressions of another. According to Savicki & Kelley (2000) social presence is the ability to make one's self-known under conditions of low media richness.

Factors that contribute to social presence are social context, online communication, and interactivity. "Social context" is constructed from the CMC users' characteristics and their perceptions of the CMC environment. Social contexts

are task orientation, users' characteristics and their perception of online environments, recipients' social relationships, trust, availability of CMC, CMC access locations, social process (Tu, 2002). "Online communication" means the language used online and the applications of online language, attributes of CMC, computer literacy skills, online immediacy, and online language skills. Lastly, "interactivity" includes the active communication and learning activities in which CMC users engage and the communication styles they use, such as response time, communication styles, task types, immediate response, topics, and size of groups (Tu, 2002). Although the interactivity and social presence concepts are being used together, they should be differentiated. Social presence requires users to add one step to awareness of interactivity (Gunawardena, 1995). Interactivity is the "design" and strategies to stimulate social presence (Tu, 2002). Examining the concepts of "social presence" and "interactivity", Rafaeli (1988) observes that social presence is a subjective measure of the presence of others, while "interactivity" is the actual quality of a communication sequence or context (cited in Gunawardena, 1997). Based on a review of the existing theories of social presence, social presence is distilled into three dimensions (Biocca, 2001):

Co-presence: It is the degree to which the observer believes he/she is not alone and secluded, their level of peripherally or focally awareness of the other, and their sense of the degree to which the other is peripherally or focally aware of them. It has two factors, which are isolation/aloneness (sensory awareness of the embodied other) and mutual awareness. The concept of co-presence is grounded on the basic of sensory awareness of other and it involves some level of mutual awareness: co-presence persons uniquely accessible, available, and subject to one another (Biocca,

2001). In mediated interactions the senses of the user are extended to some degree by the technology so that a representation of the other makes some minimal level of sensory impression.

Psychological Involvement: It is the degree to which the observer allocates focal attention to the other, empathically senses or responds to the emotional states of the other, and believes that he/she has insight into the intentions, motivation, and thoughts of the other. It has three factors, which are mutual attention, empathy, and mutual understanding (Biocca, 2001). Short, Williams and Christie (1976, 65) suggest some attentional requirements by emphasizing social presence as the degree of "salience of the interpersonal relationship" (cited in Biocca, 2001). This suggests a definitional need that gets at the degree of psychological involvement with the other. Tu (2002) stated that social presence is fundamentally related to two social psychology concepts; intimacy and immediacy. Intimacy is a function of eye contact, physical proximity, topic of conversation, etc. A communication with maintained eye contact, close proximity, body leaning forward, and smiling conveys greater intimacy. On the other hand, according to Short et al., (1976) immediacy is the psychological distance communicators place between themselves and their recipients (cited in Tu, 2002). It includes eye contact, smiling, vocal expressiveness, physical proximity, appropriate touching, leaning toward a person, gesturing, using overall body movements, being relaxed, and spending time. Online immediacy becomes difficult to deliver because CMC lacks social nonverbal cues; however, this does not negate online immediacy or its importance. Immediacy is necessary for social contact among online learners and is even more critical than in face-to-face learning environments. Because, CMC, with its lack of nonverbal communication cues, is said

to be extremely low in social presence in comparison to face-to-face communication. Hiltz (1994) stated that researches indicate that CMC users develop an ability to express missing cues in written form by “emoticons” (icons that express emotion), the contrived sideways faces that can be made by combinations of punctuation marks, and parenthetical metalinguistic cues such as “hmmm” or “yuk” (cited in Gunawardena, 1997). Such cues add affective information, contextualize the message, and indicate informality. Gunawardena (1997, 21) found that “at low levels of social presence, the use of emoticons has no effect on satisfaction, while at higher levels of social presence, there is an improvement on satisfaction as emoticon use increases”.

Behavioral Engagement: It is the degree to which the observer believes his/her actions are interdependent, connected to, or responsive to the other and the perceived responsiveness of the other at the observer’s action (Biocca, 2001). It has three factors, which are behavioral interaction, mutual assistance, and dependent action.

Besides, CMC is described as a medium with potential educational ability, which low in non-verbal cues and social context cues; therefore, low social presence is established when compared to classroom education. Social presence is a critical influence on learners’ online social interaction in an online learning environment via computer- mediated communication systems (McIsaac & Gunawardena, 1996; Tu, 2002). Social presence impacts online interaction, user satisfaction, on depth of online discussions, online language learning and critical thinking (cited in Tu, 2002). Gunawardena (1995) argues that social presence is necessary to improve effective instruction in traditional and technology-based classrooms. When the level of social

presence is low, interaction is also low (Garramone, Harris, & Anderson, 1986). A lack of social presence may lead of frustration, a critical attitude toward the instructor's effectiveness, and a lower level of affective learning (Tu, 2002).

Gunawardena (1995) found that in spite of the low social context cues of the medium, student perceptions of the social and human qualities of the medium would depend upon the social presence created by the instructors/moderators and the online community. The degree of social presence, social context or the relational qualities associated with CMC may be affected by the expectations and perceptions of the teachers and the students who are using it.

2.9. Theoretical Basis of CMC

The goal of many educational reforms over the years has been the development of self-regulation skills in learners. Rather than functioning passively in classrooms, learners should be able to determine their goals for learning, plan for learning, and prepare themselves to learn, engage in learning activities, and monitor what and how they best learn, regulate the learning activities in light of that monitoring, and maintain motivation and a purpose for learning. While these activities seem to be intrinsically appropriate learning skills, they contrast sharply with most classroom routines, where teachers determine what the students will learn (or apply a mandated curriculum), seek the students' attention, deliver everything the students need to do or know, quiz them to be sure they are completing assignments, and assess whether they understand what were told. New technologies have contributed to a movement away from the duplication of traditional instructional methods, both in the classroom and at a distance (Turoff, 1995), toward a more resource-based approach to instruction that no longer emphasizes the teacher as the

main source of knowledge (Gunawardena, 1992). Following new theories of learning support the usage of new technologies in a collaborative context and conceive of learning as a social process.

2.9.1. Constructivist Perspective

Constructivism is not a theory about teaching; it is a theory about knowledge of learning (Brooks and Brooks, 1993). Constructivism, first purely throughout the length of learning theory, what is, rather than what should be. Duffy and Cunningham (1996) point out that “The term “constructivism” has come to serve as an umbrella term for a white diversity of views”. Some authors distinguish between cognitive constructivism, which focus on the individual learner, and social constructivism, which emphasize learning as occurring within the context of dialog and social interaction. (Duffy and Cunningham, 1996). Definitions of constructivism under any of these views, however, include a central the idea that knowledge is “constructed”, by the learner. Constructivist learning theory emphasizes:

- learning as an adaptive activity
- learning as situated in the context where it occurs
- knowledge as constructed by the learner
- the role of experience and prior understanding
- resistance to change the role of social interaction in learning

Constructivism begins with a different set of assumptions about learning. Constructivists believe that or personal word is constructed in our minds and that these personal constructions define our personal realities. The important epistemological assumption of constructivism is that knowledge is a function of how

to individual creates meaning from his or her experiences; its not a function of what someone else says is true. (Jonassen et al., 1995). Crotty (1994, 31) stated that constructivist educators strive to create environments where learners "are required to examine thinking and learning processes; collect record, and analyze data; formulate and test hypotheses; reflect on previous understandings; and construct their own meanings (cited in Jonassen et al., 1995). The constructivist sense of "active" learning is participating in interactive with the surrounding environment in order to create a personal view of the world. Meaning making, according to constructivist, is the goal of learning processes; it requires articulation and reflection on what we know (Jonassen et al., 1995). The processes of articulation and reflection involve both internal negotiation and social negotiation.

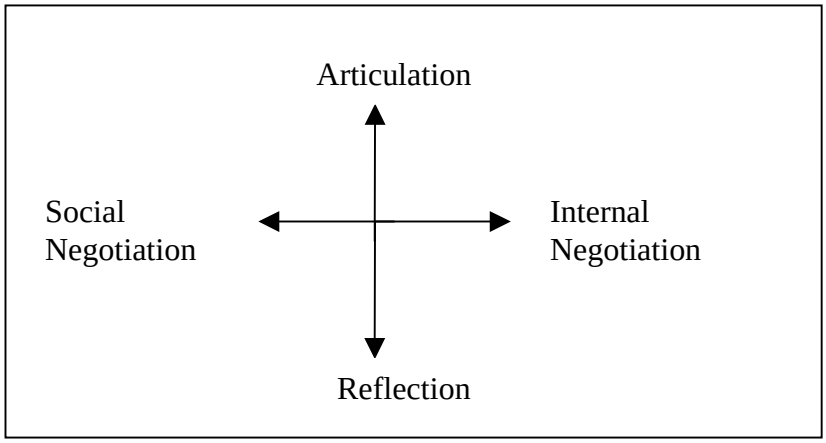


Figure 2.1: The Processes of Meaning Making (Jonassen et al., 1995)

Learning can be best facilitated through the design and implementation of constructivist tools and learning environments that foster personal meaning-making and discourse among communities of learners. The principles by which those learning environments may be built focus on four general system attributes: *context, construction, collaboration, and conversation* (Jonassen et al., 1995). Constructivist

environments engage learners in knowledge construction through collaborative activities that embed learning in a meaningful context and through reflection on what has been learned through conversation with other learners.

Context includes features of the “real world” setting in which the task to be learned might naturally be accomplished. Construction of knowledge is the result of an active process of articulation and reflection within a context. The knowledge that is created is a product of the mind and results from the individual’s experiences with and interpretations of the context (Jonassen, 1991). Collaboration aids in developing, testing, and evaluating different beliefs and hypotheses within learning contexts. Conversation is an essential part of the meaning-making process because knowledge, for most of us, is language mediated.

Many researches propose that technology can become as essential piece of a new type of K-12 learning environment based on constructivist learning theory. However, few studies have focused specifically on the relationship between the creation of constructivist learning environments in K-12 classrooms and the role of technology in supporting those environments. Studies have examined the impact on student learning of communication tools or particular strategies for using them. In addition, several researchers have published theoretical perspectives and approach to the use of technology that reflects elements of constructivism. Some of these perspectives call as learning from the technology (such as CAI) technology as the object of instruction (such as computer classes) and learning with technology. Developments in computer communication technologies have changed the shift from the domination of first perspective, which has an example as CAI toward computer supported a communication environment, which is last perspective.

According second perspective when technology becomes an integral part of the classroom-learning environment it provides a tool for both teacher and students that can facilitate new roles and new instructional strategies. Because of the interactive nature of technology and the power of its information-processing capabilities, Jonassen (1996) proposed that when students learn with technology, it becomes a “Mindtools”. He defines Mindtools as “computer based tools and learning environment that have been adapted or developed to function as intellectual partners with the learner in order to engage and facilitate critical thinking and higher-order learning. This environment can provide students with a complex laboratory in which to observe, question, practice and validate knowledge.

Means and Olson (1997) found that technology gave teachers additional impetus to take on a coaching and advisory role where students learn to use the technology faster than teachers. Therefore, there is a demand changing the traditional role of teachers from information transmitters to guides who arrange meaningful learner-centered experiences (Salomon, 1992). A capable teacher knows where he or she going (goal-oriented) and the wise teacher seeks to guide his/her students toward greater maturity, preparing them to effectively adapt to a rapidly changing world (Cantor, 1996). The facilitator model is based on rigorous academic standards and expectations, requiring educators who are capable of equipping students to be independent. Teachers are still considered knowledge experts who have a clear understanding of their subject matter. However, their new role involves promoting more self-directed learning activities that cultivate achieving knowledge objectives through personal study. Teachers are challenged to carefully design instructional activities that guide their students into online learning situations that promote

personal acquisition of knowledge. Teachers strive to encourage positive learning habits that foster both self-directed learning styles and genuine collaboration with other classmates (Muirhead, 2001). Mason (1991) identified three role functions that computer conferencing moderators must possess: to set the agenda for the conference, to create a friendly environment for learning, and to focus discussion on crucial points.

A constructivist approach to knowledge construction and learning can be well supported in distance education settings through a variety of technologies. Technology-supported environments as computer-mediated communication, computer-supported collaborative work, case-based learning environments, and computer-based cognitive tools can offer the field of distance education alternative approaches to facilitating learning (Jonassen et al., 1995). These constructivist environments and tools can replace the deterministic, teacher-controlled model of distance instruction with contextualized work environments, thinking tools, and conversation media that support the knowledge construction process in different settings.

Within constructivist views, the power of computer-mediated communication tools lies in their capabilities to support conversation and collaboration (Jonassen et al., 1995). Groups work together to solve any problem, make arguments, negotiate meaning, and engage in coaching, modeling and scaffolding activities. For instance, while conferencing, the learner engaged in discussion and interaction with peers and experts in a process of negotiation (Jonassen et al., 1995). Knowledge construction also occurs when students explore issues, take positions, discuss positions in an argument and reevaluate their position. Harasim (1990) stated that these activities

contribute to a higher level of learning through cognitive restructuring or conflict resolution, leading to new ways of understanding the material (cited in Jonassen et al., 1995). Sharing knowledge through these mediums also aids to overt exchange of naturally covert process and strategies with other on-line learners in order to solve collective or individual problems. These mediums also allow learners to generate questions, summarize content, clarify points and predict upcoming events. Some mediums as e-mail, news group and computer conferencing support the development of discourse communities, groups of individuals who share and discuss common interests and goals. Brown and Campione (1990) stated that these discourse communities can become more purposive "communities of learners and thinkers" when focused on learning outcomes (cited in Jonassen et al., 1995).

2.9.2 Social Psychologist Perspective

Social constructivists believe that learning is the dynamic interplay between the activities that people engage in and the sense of that activity they socially negotiate (Jonassen, 2000). Knowledge in this view is viewed as a social construct, and therefore the educational process is facilitated by social interaction in an environment that facilitates peer interaction, evaluation and cooperation (Hiltz, 1995). Dewey (1916) characterized education as a social process by which groups transmit and renew the meanings of shared experiences. A number of influential educational philosophers and theorists, such as Dewey, Vygotsky, and Piaget pointed out early on the benefits of social and collaborative processes on learning. Therefore, using collaboration as an instructional approach is not new. A variety of collaborative approaches have been used in classrooms since the early 1900s. Collaborative learning evolved from the work of psychologist such as Johnson and

Johnson (1975) and Slavin (1987). It involves social (interpersonal) processes by which a small group of students work together to complete and academic problem-solving task designed to promote learning. Thus, the collaborative learning concept is based on the three premises of effective learning as (Alavi, 1994):

- active reaming and construction of knowledge,
- cooperation and teamwork in learning,
- learning via problem solving.

The benefits of collaboration can include the opportunity to view a problem from multiple perspectives which may be vastly different from our own, the opportunity to develop better interpersonal skills, and the challenge to critically think through a problem and present our ideas in a cogent manner to others. Collaborative activities enhance learning by allowing individuals to exercise, verify, solidify, and improve their mental models through discussion and information haring during problem solving process (Alavi, 1994). In addition, the solution or product of our collaborative work can be superior to what any one person could have created alone. Often there is greater creativity in numbers. This is reflected in the notion that the whole is more than the sum of its parts. Hiltz, (1994) claims that student involvement increase in courses as result of collaborative learning procedures. Thigh (1972) stated that students who interact with other students and are engaged in discussion of their ideas are less likely to have irrelevant or distracting thoughts and spend more time in synthesizing and integrating ideas and concepts compared with students who listen to lectures. Slavin (1985) found that compared to individual and/or competitive instructional methods, collaborative instructional methods involving cooperative procedures are more effective in promoting student learning and achievement. It also

enhance students satisfaction with learning and classroom experience (Alavi, 1994; Hiltz, 1997)

Nipper (1997) claims that there are basically three generations of distance teaching. The first generation being the traditional correspondence teaching, the second can be described as “multi-media” teaching and the third generation focuses on collaboration between the learners in on-line conferencing, assisted by a tutor. In order to enable the communication in learner networks, systems allow group communication as in CMC have come into increasingly wider use. Collaborative learning is crucial to the effectiveness of online learning environment. CMC and collaborative learning promote active student involvement in the learning process. Emphasis on collaborative learning can emphasize the advantage and overcome some of the disadvantages of computer-mediated communication which has a weakness of CMC decrease the feeling of “social presence” of the learners and teachers, which can severely decrease feelings of motivation and involvement and thus negatively affect the learning outcomes (Hiltz, 1997). Thus most studies have confounded the use of computer-mediated communication as a mode of course delivery, with the use of collaborative learning as a pedagogical technique.

According to the implications in CMC, putting individuals online to interact with course materials is not as effective as the traditional classroom, but that using collaborative learning approaches can make online learning at lest as effective as the traditional classroom (Hiltz, 1997). Students taking the course via CMC were much more likely to report a better learning experience via CMC than face-to-face courses if the CMC allowed for “group learning” (Hiltz, 1993, 95). Similarly, Cheng, Lehman, and Armstrong (1991) reported that a higher completion rate for those

computer-mediated learners who worked collaboratively (90%) than for those who worked independently (22 %) (cited in Moore, 2002). The dynamics of the virtual group pulled as the participants toward various forms of compromise and negotiation on the way to socially constructing a commonly acceptable form of knowledge (Moore, 2002, 64).

Web-based collaborative learning systems can be divided into two categories: asynchronous and synchronous, which many practical systems were developed. The influential asynchronous systems include First Class, CSILE/Knowledge Forum, Learning Space, WebBoard, and WebCT; synchronous system includes Conference MOOs, WebChat Broadcasting System, and Microsoft NetMeeting.

2.9.3. Engagement Theory Perspective

The fundamental idea underlying engagement theory, which is the closest approach to the study motioned here, is that students must be meaningfully engaged in learning activities through interaction with others and worthwhile tasks. Although not directly derived from other theoretical frameworks for learning, it has much in common with many such frameworks. With its emphasis on meaningful learning, it is very consistent with constructivist approaches. Because it emphasizes collaboration among peers and a community of learners, it can be aligned with situated learning theories. By engaged learning, it is meant that all student activities involve active cognitive processes such as creating, problem-solving, reasoning, decision-making, and evaluation (Kearsley & Shneiderman, 1999).

Engagement theory is based upon the idea of creating successful collaborative teams that work on ambitious projects that are meaningful to someone

outside the classroom. These three components, summarized by Relate-Create-Donate, imply that learning activities (Kearsley & Shneiderman, 1999):

1. occur in a group context (i.e., collaborative teams),
2. are project-based,
3. have an outside (authentic) focus.

Relate: The first principle (the "Relate" component) emphasizes team efforts that involve communication, planning, management and social skills. Research on collaborative learning suggests that in the process of collaboration students are forced to clarify and verbalize their problems, thereby facilitating solutions. Collaboration also increases the motivitaion of students to learn, a significant consideration in settings with high dtop-out rates (e.g, teen-agers, distance learners). Furthermore, when students work in teams, they often have the opportunity to work with others from quite different backgrounds and this facilitates and understanding and multiple perspectives (Kearsley & Shneiderman, 1999).

Create: The second principle (the "Create" component) makes learning a creative, purposeful activity. Students have to define the project (problem domain) and focus their efforts on application of ideas to a specific context. Conducting their own projects is much more interesting to students that answering ordinary problems. And because they get to define the nature of the project, they have a sense of control over their learning (Kearsley & Shneiderman, 1999).

Engagement Theory's "Create" principle strongly related with project-based learning approach. Project-based learning (PBL) is similar to problem-based learning

in that it is organized around a question or problem and seeks to provide the same type of grounded, inquiry-based experience to learners (Blumenfeld et al., 1991) But project-based learning differs from problem based learning in that the results of the learning are manifested in tangible artifacts or products that address the question. In problem-based learning the results are solutions, not necessarily products. However, it should be noted that problem-based learning, project-based learning, and case-based learning have many commonalties and are considered by some theorists to be within the same general family of approaches. The label “problem-based learning” often acts as an umbrella term for the other instructional approaches.

In project based learning, students work in groups to solve challenging problems that are authentic, curriculum-based, and often interdisciplinary. In project-based learning, students gather information from a variety of sources and synthesize, analyze and derive knowledge from it. At the end, students demonstrate their newly acquired knowledge. Technology enables PBL. Students use tools such as word processors, spreadsheets, and databases to perform tasks like outlining, drafting essays, analyzing numerical data, and keeping track of collected information. E-mail, electronic mailing list, forums, and other online applications facilitate communication and collaboration with the world outside the classroom.

Donate: The third principle (the "Donate" component) stresses the value of making a useful contribution while learning. Ideally each project has an outside “customer” that the project is being conducted for. The costumer could be a campus group, community organization, school, library, museum, government agency, local business or needy individual. In many cases, the projects are work-related. The

authentic learning context of the project increases student motivation and satisfaction (Kearsley & Shneiderman, 1999).

Engagement theory is different from many older models of computer-based learning in which the emphasis was on individualized instruction and interactivity. Engagement theory does promote interaction, but human interaction in the context of group activities, not individual interaction with an instructional program. The difference between engagement and interactivity reflects the shift in thinking about computers in education as communication tools rather than some form of media delivery devices. Furthermore, engagement theory places a great deal of emphasis on providing an authentic (i.e., meaningful) setting for learning, something not present in previous models (Kearsley & Shneiderman, 1999).

2.10. Researches Studies on CMC

2.10.1. Learners' Attitudes toward Computers in Online Environment

A small number of studies have focused on the attitudes of students in online environment. There are mixed results about the attitudes of students who participate in computerized environment. However, there are few studies focused specifically on the CMC based applications in K12 education because most of the studies have conducted at undergraduate and graduate levels.

Basile and D'aquila (2002) conduct a research on the study to explore the relationship between student attitudes toward course management software (WebCT) and computer mediated communication. They also obtained information to explore possible relationship between computer and Internet use and student attitudes. In the study, authors surveyed 128 accounting students who were exposed to either

computer-mediated instruction using WebCT or to only traditional instructional methods. The authors found the most students were comfortable with the computer and the Internet and those in the computer-mediated instructional setting reported fairly positive attitudes. Computer users also were more positive about course delivery and course management tools. However, survey results revealed no significant differences between two groups in attitudes about course. The findings also show that students who used computer daily had more positive attitudes about course delivery, regardless of the treatment or the instructor. Authors claimed that daily use of the computer is characteristic of a more motivated and diligent student who has more positive attitudes regardless of treatment. Similarly, they indicated that more frequent use of the computer might result in higher levels of comfort and satisfaction with using the computer as an instructional tool.

A study done by Yu and Yu (2002) investigated the impacts of incorporating e-mail, one of the most accessible, convenient, and easy to use computer-mediated communications, into a classroom setting on student attitudes. Two classes form a "Computer in Education" course participated in the study and were randomly assigned to different conditions, the e-mail diffusion group and the non-e-mail diffusion group. Two criteria-referenced performance-type posttests were used for individual student computer capabilities assessment. "Prospective Teacher Computer Attitude Scale" was adopted to assess e-mail's effects on student attitudes toward computers. Authors found no significant difference in student attitudes toward computers. Similarly, Wilkinson and Echternacht (1998) found no significant differences in perceptions regarding the subject matter between students who

completed Internet-based homework and students who did traditional homework in their study.

Another study that investigated attitudes toward computer conducted by Huang (2000) explored both the effects of learning WWW and computer on technology education programs for elementary students in fifth and sixth grade in Sir-Ko elementary school at Taichung Country. The students were continuously exposed to WWW based instruction for 8 weeks and totally 320 teaching minutes. The author also explored the differences in computer attitudes among students of different gender. He found that students who had high computer attitude demonstrated more favorable computer attitudes before the WWW instruction than those had low computer attitude. He also found that there is no significant difference between males and females attitudes, however, female students and students of low computer attitude demonstrated more positive computer attitudes after the WWW instruction.

Gal-Ezer and Lupo (2002) conducted a study on the attitudes of students toward the integration of the Web as a channel of communication and a study tool in traditional distance teaching of Computer Science (CS) at the Open University of Israel (OUI). The findings showed that when the use of the Web is voluntary, students do not take full advantage of it, even those who are advanced in their studies and have rich experience in using computers and the Internet. The results, however, did show that the use o the Web increases as students advance in their studies, although the Web was not used as much as either as a communication channel or a study tool. Authors also found that Web cannot substitute entirely for face-to-face learning, but it can serve as a reasonable alternative when the latter is unavailable.

They concluded that using the Web to its full pedagogical potential requires a high level of self-study ability and the more distance-based the learning is the more the Web is used and accepted by the students, and the more it serves them as a communication channel and as a study tool.

2.10.2 Learners' Satisfaction in Online Environment

The term satisfaction has been used in an inconsistent manner, sometimes interchangeably with effectiveness when the two concepts are distinct. Some researchers used the terminology of satisfaction as "system usage", "system acceptance", "perceived usefulness" and others. When the group context is considered, the definition of satisfaction is changing to as a socio-emotional behavior or an affective component of a group process (Marston & Hecht, 1988). Keyton (1991) classified satisfaction literature into three aspect of the variable: identification of satisfaction in a "group" context, "dyadic" context, and "individual" group context. From these different lines, Wanous and Lawler (1972) stated that a comprehensive view of satisfaction evolves as an aggregate of users' weighted reactions to a set of situational variable (cited in Olaniran, 1996). Bailey and Pearson (1983) said satisfaction is the "sum" of an individual's negative and positive "feelings" to a set of variables (cited in Olaniran, 1996). Marston and Hecht (1988) identified six group variables associated with group member satisfaction: participation, type of message, feedback, interaction management (turn-taking), status hierarchy, and motivation. Other studies identify cohesiveness, perceived equity, quality of outcome, and other general performance measures (cited in Olaniran, 1996).

Dispositional and situational characteristics, for example, lack of confidence, fear of failure, lack of access and/or time, and lack of experience with learning in groups when learning activities are group based, all have been found to translate into learner dissatisfaction (Moore, 2002). Lack of prompt feedback, feeling of loneliness, perceived difficulty communication with those one does not known well, fear of expressing opposing views in discussion forums, and resentment at perceived cliques are all reported reasons for learner satisfaction (Moore, 2002).

Overall satisfaction with using CMC systems in the workplace was defined empirically by Hlitz et al. (1985, 58) as comprising four dimensions:

- difficulties in acquiring technical skill,
- difficulties in operating the system,
- increasing work productivity,
- the development of a sense of social cohesion among participants.

There are huge numbers of studies that focused on the satisfactions of students in online environment. However, like researches on attitudes toward computers in K12, researches on satisfaction in K12 were also in small number.

Thomson and Stringer (1998) conducted a research on the development and evaluation of a World Wide Web based component for a required seminar at the Pennsylvania State University Collage of Agricultural Sciences. A summative evaluation was given at the end of the semester to ascertain students' perception of web-based assignments and needed changes for future courses. Authors concluded that using a computer-based asynchronous teaching model is quite different from the more traditional model and requires special considerations; practitioners should

incorporate formative and summative evaluations to enhance learner satisfaction, to ensure goal attainment, and to demonstrate accountability.

Like Thomson and Stringer, Swan (2001) studied to explore the relationships between student perceptions and course design factors in 73 SUNY Learning Network courses in the spring 1999 semester. He founded that clarity of design, interaction with instructors, and active discussion among course participants significantly influenced students' satisfaction and perceived learning. Similarly, according to the study done by Arbaugh (2000), the flexibility of the medium and an interactive course environment influenced satisfaction more than ease ore frequency of access.

Another study conducted by Gunawardena and Duphorne (2000) tested the Adult Distance Study through Computer Conferencing (ADSCC) model to determine learner readiness, online features, and computer mediated communication learning approaches are associated with learner satisfaction in an academic computer conference. All three variable were correlated with learner satisfaction, with online features the best predictor of satisfaction.

Smith (1994) investigated the effectiveness of a computer-mediated communication system in supplementing traditional instruction in a media law course. He found mixed results on measures of satisfaction and no significant improvement on exam scores. He also noted that the system required more time from the instructor and students.

Card (2000) conducted a study to examine whether CMC is an effective method of delivering graduate courses in educational administration courses in

comparison to face-to-face classroom (F2F). Students taking course via CMC achieved the course learning objectives and where as satisfied with courses delivered method as student taking the course F2F. There were no significant differences in students' level of satisfaction between the two delivery modes. The qualitative analysis in the study suggested that the CMC students enjoyed the convenience of taking the course via the internet, even though, they missed the face-to-face contact they would typically have had in an a F2F course. This finding is parallel with the finding of Dietz-Uhler and Bishop-Clark (2001). They found that face-to-face discussions preceded by computer-mediated communication were perceived to be more enjoyable. However, Karen (2000) founded that the only difference between the two delivery methods what the extent of interaction between students. Face-to-face classroom fostered more interaction then the CMC environment.

Another study examine CMC and F2F communication like Card and Horton conducted by Olaniran et al. (1992) used a system as Quickmail to compare the effects of F2F and CMC among 144 undergraduate participants on communication variables in two-stage (idea generation and idea evaluation) design. Results indicated that more ideas were generated within CMC than in F2F, and participants engaged in more off-task comments in F2F than in CMC. Author didn't find any differences on process satisfaction, decision outcome satisfaction, and consensus.

Card and Horton (1998) conduct study on the use of computer-mediated communication (CMC) in distance learning courses in higher education administration. The study compared differences between students in F2F classroom and students taking the same course using CMC. Authors analyzed differences in interaction within groups, achievement of course learning objectives, and satisfaction

with the course. Authors found in the study that interactions between CMC group members were not as satisfactory as in the F2F group, participation was more uniform in CMC group discussions than in the F2F setting, and CMC students achieved course objectives as well as F2F.

Baltes et al. (2002) studied on a meta-analysis of research comparing decision-making in face-to-face versus computer-mediated communication groups. The findings shows that computer mediated communication leads to decrease in group effectiveness, increase in time required to complete tasks, decrease in member satisfaction.

Some evidence suggests that male and female college students experience the online environment differently. Similarly, Sullivan (2001) found differences between the way male and female students identified the strengths and weakness of the online environment on a range of questions regarding flexibility, face-to-face interaction, shy and quite students, self-discipline, and self-motivation. Female students appear to respond more strongly than their male counterparts both to the communication advantages offered by an online learning environment and also to more negative impersonal aspects of the online classroom. According to his study, he claimed that online courses are of a great value to nontraditional students, particularly female adult learners with children or family responsibilities.

2.10.3 Learners' Perceptions of Social Presence in Online Environment

Studies conducted indicate that social presence is significant factor in improving instructional effectiveness. A small number of studies, however, have focused on the social presence of students in online environment.

Garrison, Anderson and Archer (2001) presented empirical findings related to an attempt to create an efficient and reliable instrument to assess the nature and quality of critical discourse and thinking in a text-based educational context. Authors suggest that cognitive presence (critical, practical inquiry) can be crated and supported in a computer-conference environment with appropriate teaching and social presence.

Tu (2001) studied on issues of social presence within cultural perspective. He found that three dimensions of social presence, social context, online communication and interactivity affected Chinese students' perceptions of CMC. He claimed that when integrating CMC into an online learning environment, it is necessary to consider the student's local culture, language skills, keyboarding skills, format of CMC, face saving, computer literacy, use of paralanguage and emoticons, responsiveness of asynchronous communication, use of stylistic communication styles, and feelings of private/public.

Newberry (2001) claims that social presence may be important to the satisfaction of students in online classes. He explored the issues related to social presence in online classes and suggested ways to increase student's social presence in online classes. Similarly, Gunawardena (1997) conducted a research on whether social presence is a predictor of learner satisfaction within a computer-mediated conferencing environment and how effective it is. She studied on GlobalEd inter-university computer conference and did stepwise regression analysis converged on a three-predictor model revealing that social presence, student perception of having equal opportunity to participate and technical skills. Social presence contributes about 60 % of the explained variance. At low levels of social presence students who

rated equal low indeed appear to rate satisfaction higher than students who perceived themselves to have a higher sense of equal opportunity to participate in GlobalEd. However, at higher levels of social presence that difference disappears. The result also indicated that participants who felt a higher sense of social presence enhanced their socioemotional experience by using emoticons to express missing nonverbal cues in written form. She also suggested that social presence should be measured from a group perspective - participants' reactions to other participants and activities within the group, rather than a classroom's reaction to the teacher's social presence.

According to Svicki's (2000) research, the variable with the strongest relationship to communication style was the gender composition of the groups within which the communication took place. Women using CMC with other women in small task groups developed a significantly different style of communication than did men using CMC with other men. Women in female-only (FO) groups were able to overcome the limitations of the text-only format of CMC, they established an online presence through use of self-disclosure, use of "I" statements and through directly addressing their messages to other group members. FO groups also were able to compensate for the lack of nonverbal cues by using linguistic cues under various task conditions and they took longer to reach decisions than did MO groups. On the other hand, men in male-only (MO) ignored the socioemotional aspects of group functioning and were more likely to engage in a collective monologue approach to discussion with the addition of mild flaming.

Studies discussed above show that attitude, satisfaction, and social presence concepts have a critical roles in online environment. As research on CMC continues to develop, more attributes of CMC will be revealed.

CHAPTER III

METHOD

3.1. Introduction

In this chapter, research questions, design of the study, instruments of the study, and procedures of the study, participants and sampling, and analysis of data are presented.

3.2. Research Questions

The purposes of the study is to explore whether the use of computer-mediated communication tools in a collaborative process enhances 5th grade students' attitudes toward computer and computer class within an online supported environment, to describe and analyze the level of learners' satisfaction about the project-based collaborative learning through CMC, to examine the students' perceptions of their social presence, and to investigate how social presence was effective as a predictor of overall students' satisfactions.

More specifically this study attempted to answer the following research questions:

1. What are learners' attitudes toward computers at the beginning and at the end of the study?

2. Is there a difference between genders on pre and post-attitudes of students toward computer?
3. What are the levels of learners' satisfactions about the project-based collaborative learning through CMC?
4. Is there a significant difference between genders on their satisfaction levels?
5. What are learners' perceptions of their social presence during the project-based collaborative learning through CMC?
6. Is there a significant difference between genders on their social presence?
7. Is there a relationship between learners' social presence and satisfaction levels of the project-based collaborative learning through CMC?

3.3. Design of the Study

In this study, a case study design was used. Thirty-six 5th grade students from METU Niğde and Ankara Foundation Schools participated in this study. At the beginning of the study, subjects were given the Computer Attitude Scale (CAS) to measure their attitude toward computers. At the end, participants were given the CAS again to measure their attitudes toward computers after project-based collaborative learning (PBCL) through CMC.

In addition, social presence scale to determine the learners' perceptions of their social presence during the PBCL through CMC, satisfaction scale to measure the

level of learners' satisfaction about PBCL through CMC are given to the subjects at the end of the treatment.

Table 3.1: Design of the Study

Subjects	Pre-Test	Treatment	Post-Test
Ankara and Niğde METU Foundation Schools' 5th Grade Students	CAS (Computer Attitude Scale)	PBCL (Project-Based Collaborative Learning) through CMC (Computer Mediated Communication)	CAS (Computer Attitude Scale) SPRES (Social Presence Scale) SAT (Satisfaction Scale)
		⟷ Facilitation	

3.4. Instruments of the Study

In this study three instruments, Computer Attitude Scale (CAS), Social Presence Scale (SPRES), and Satisfaction Scale (SAT) were used to collect the data.

3.4.1. Computer Attitude Scale (CAS)

The Computer Attitude Scale used in this study was adapted from the Computer Attitude Scale that was developed originally by Gressard & Loyd (1986). CAS contains four sub-scales: computer anxiety, confidence, liking and usefulness (See Appendix A). Gressard and Loyd (1986) reported a high reliability for the overall scale (α = .95). Berberoğlu and Çalıkoğlu (1992) translated the scale into Turkish and calculated the reliability coefficient of the scale. The reliability of the scale was found to be .90. For the purpose of this study, relevant items from the scale

were selected from the scale adapted by Berberoğlu and Çalıkoğlu (1992) and modified according to the grade level.

The scale consisted of 21 Likert-type items, in which six of the items from computer anxiety (Items 1, 4, 13, 14, 18 and 19), five of the items from confidence (Items 2, 8, 9 11 and 17), four of the items from liking (Items 3, 5, 15, and 16) and six of the items from usefulness (Items 6, 7, 10, 12, 20, and 21) sub-scales were adapted. There are also categorical variables with two levels: gender (1= Male and 2=Female), possession of home computer (1= Yes and 2=No), and Internet connection (1= Yes and 2=No). The items are rated on a Likert-type scale with 1 equaling strongly disagree to 5 equaling strongly agree. Negative items were coded reversely, namely from 1 to 5. Furthermore, negative items were in bold in order to prevent misunderstanding. After translating and adapting, two experts examined the scale and based on the feedback gathered from the experts, the scale was revised. A Turkish teacher checked the grammar usage, language level of the items and the internal consistencies of the items in terms of the structure. Additionally, additional facial expressions were used in the scale in order to clarify the choices to the students.

A pilot study was conducted in late November 2002 with the 30 students randomly selected from the list of the entire population of 180 students in 5th grade at METU Foundation Schools. This study was done to verify the correctness and usefulness of the items that was translated into Turkish. Krathwohl (1998) states that questionnaire must always be subjected to a pilot study before being used, to allow each question to be tested to ensure that it conveys what you intended it to, and so that any uninterruptible, confusing and ambiguous questions are discovered before

the main survey is conducted. Reliability of the subscales reported as .40 for anxiety, .73 for confidence, .70 for liking, .73 for usefulness. High reliability was reported for the overall scale ($\alpha = 0.90$).

3.4.2. Social Presence Scale (SPRES)

This test was adapted by the researcher and contains three sub-scales: co-presence, psychological involvement, and behavioral engagement (See Appendix B). The scale is based on the measure of social presence called Networked Minds conceptualization of social presence (Biocca, Harms, & Gregg, 2001). Based on a review of the existing theories of social presence and the theoretical analysis of the concept, social presence was distilled into three dimensions: co-presence (isolation/aloneness, mutual awareness, attentional allocation), psychological involvement (empathy, mutual understanding) and behavioral engagement (behavioral interdependence, mutual assistance, dependent action) (Biocca, Harms, & Gregg, 2001). According to Factor analysis of the Networked Minds Scale, items were tested of internal consistency and reliability. The sub-scales appear to be reliable. The average Cronbach alpha reliability of the subscales is .77. The range is between .69 and .87.

Items from each sub-scale of Networked Minds Scale were chosen, adapted according to the grade level and translated into the native languages of the students. Four items from co-presence (Items 1, 2, 3, and 4), four items from psychological involvement (Items 5, 6, 7 and 8), and three items from behavioral engagement (Items 9, 10 and 11), totally 11 items, were adapted. The items are rated on a Likert-type scale with 1 equaling strongly disagree to 5 equaling strongly agree. Moreover, additional facial expressions were used in the scale in order to clarify the choices to students. After translating by English language experts and adapting, three experts checked the items'

correctness according to the CMC terminology. According to experts' feedbacks, the scale was revised. Additionally, a Turkish teacher checked the grammar usage, language level of the items and the internal consistencies of the items in terms of the structure**.** Reliability of the subscales reported as .51 for co-presence, .77 for psychological involvement, .36 for behavioral engagement. Reliability of the social presence scale used in this study was ($\alpha = 0.79$).

3.4.3. Satisfaction Scale (SAT)

Overall satisfaction was measured by a fourteen-likert-type-item scale that sought student perspectives on their ability to learn through the medium of CMC, the value of the computer conference as a learning experience, motivation to do project on topics discussed and motivation to participate in similar projects in the future (See Appendix C). The scale was adapted by the researcher from the measure of overall satisfaction scale developed by Gunawerdana and Zittle (1997). In their study Cronbach alpha reliability was .87. Related items from the scale were chosen, adapted according to the grade level and translated into the native language of the students. The items are rated on a Likert-type scale with 1 equaling strongly disagree to 5 equaling strongly agree. After translating by English language experts and adapting, based on the feedback gathered from three experts the items were checked according to the CMC terminology and revised. A Turkish teacher checked the grammar usage, language level of the items and the internal consistencies of the items in terms of the structure. Additionally, additional facial expressions were used in the scale in order to clarify the choices to students. Reliability of the satisfaction scale used in this study was ($\alpha = 0.75$).

3.5. Participants and Sampling

This study focused on students who enrolled online supported collaborative project applied at METU Foundation Schools in the first semester of 2002-2003 educational periods. The study used data from 36 (20 male, 16 female) students attending METU Foundation Schools (18 from Ankara, 18 from Niğde). While choosing the students from Niğde, convenience sampling was used. Because there were only 18 5th-grade students available for the study at Niğde METU Foundation School. On the other hand, at Ankara METU Foundation School, purposeful sampling was used, because there were 180 5th grade students available.

In Niğde there were no problems about the user selection, because the number of 5th grade students exactly met the number of students needed for the project. However, in Ankara, it was not as easy as Niğde selections, because there were six 5th-grade classes and 180 students at Ankara METU Foundation School. Therefore, purposeful sampling was used in Ankara. While choosing the students for the study, willingness of the students (volunteers), computer skills and project proposals of the students were taken into consideration. The students who proposed most interesting subjects for their projects were considered firstly. Then, students' computer and group skills were taken into consideration within the selection. Three students were chosen from each class, and those students within the same class formed the sub-groups in Ankara.

Table 3.2: Participants of the Study-Gender

METU Foundation Schools	Ankara	Niğde	Total
Female	6	10	16
Male	12	8	20
Total	18	18	36

Table 3.3: Participants of the Study-Home Computer Possession

METU Foundation Schools	Ankara	Niğde	Total
Yes	18	14	32
No	-	4	4
Total	18	18	36

Table 3.4: Participants of the Study-Internet Connected Home Computer Possession

METU Foundation Schools	Ankara	Niğde	Total
Yes	16	7	23
No	2	7	9
Total	18	14	32

3.6. Procedures of the Study

The eight-week project was applied after searching contemporary changes in the field and getting the academic support from the pioneering universities' Computer Education and Instructional Education departments. Project's organizational framework was designed and applied in 2002-2003 fall semester at two METU Foundation Schools, which were chosen according to appropriateness of their technical infrastructures and sufficiency of the working staff who fulfils the emergent theories of distance education. After defining the two schools, needed permissions were obtained from the directors of METU Foundations Schools. The project proposals were distributed to the directors to check whether the project goals met the goals of the organization. In eight-week study, all participants enrolled to the project worked in a PBCL environment through CMC to communicate with each other.

3.6.1. Aims of the Project

The project started with the idea of bringing together the METU Foundation Schools' students and teachers in a virtual environment to increase the communication and sharing. The aim is to develop the situation, which sees the technology as a means of communication and as a modern type of meditation between students. The study has gone beyond the traditional classroom activities because of intending to provide a computer-supported collaborative learning environment. In short, the project aimed, in short term, to create technical and

organizational framework, to introduce CMC and to learn how to use CMC in educational context, in long term, to use CMC tools in widely designed projects.

3.6.2 Organization of the Project

In the organization of the project, students, instructors, computer center staff, Turkish language teachers, subject matter teachers, and administrators took place.

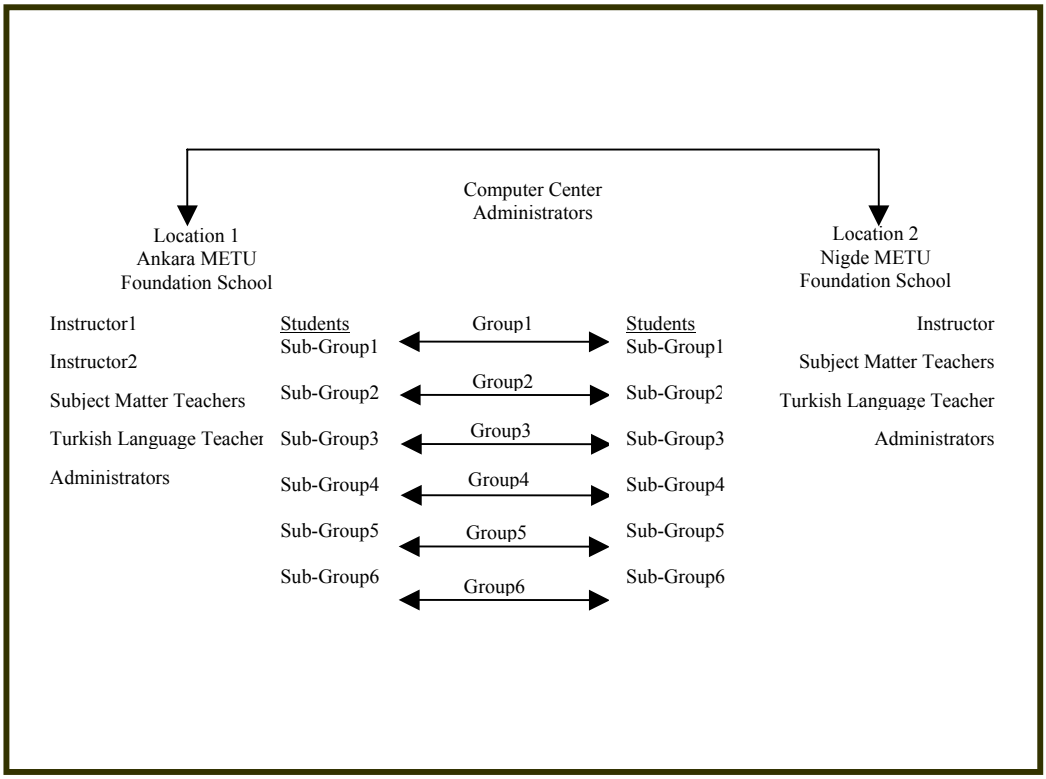


Figure 3.1: The Project Environment

Students: The student participants of the project consisted of 36 5th grade students in Ankara and Niğde METU Foundation Schools. Students had basic computer skills, such as keyboarding, file operations, usage of e-mail and NetMeeting functions, and programs of Microsoft PowerPoint, Microsoft Word, and Internet Explorer. Social skills such as working cooperatively, using time efficiently, doing works on time, and attending completely during the project, were the most important constraints of the students.

Throughout the project, students improved their ability to investigate specific topics, analyze and synthesize the findings as well as improve their basic computer skills. In addition, students worked cooperatively in groups to attain academic as well as affective and social goals. According to the objectives, at the end of the study students would be able to:

- conduct an investigation to gain knowledge about specific topics,
- use scientific principles, facts, information or data to support their design of projects,
- take into account the social, cultural, economic and environmental areas,
- review and summarize the findings about a specific area,
- use computer mediated communication tools effectively,
- improve their computer skills,
- work cooperatively within subgroup and group,
- design findings in a reasonable order and in an artistic manner,
- present the final product in front of the audience and answer the questions about the owned subject area.

In the study, all 5th grade students participated in Niğde location and sub-groups were formed. On the other hand, three students were chosen from each class in the Ankara location, and those students within the same class formed the sub-groups. There were six sub-groups in each location. Each sub-group had a peer on the other location to create a whole group. As a result, each group included two sub-groups and six students. In each location, there were sub-groups writer, speaker and timekeeper. The definitions of the roles were as follows:

Writer: They took notes of information and ideas that group thinking, coordinated ideas for the presentation, and recorded the names of all the group members on any group products

Speaker: They coordinated the talking on the NetMeeting, presented the final product, interacted with the instructors to ask questions and gather answers.

Timekeeper: They noted starting and ending times, checked the time periodically and informed the group, encouraged all sub-group members to participate, encouraged all group members to remain on the topic and complete the projects.

Instructors: The instructor participants of the project consisted of three instructor, and their fields of specialization were computer education. Two of them were studying on distance education at METU Computer Education and Instructional Technology Department Master Program. They all had gathered the theories of Distance Education and practiced in many ways for one-and-half year. Throughout the project they were all expected to:

- be a guide and facilitator in all learning environments for successful integration of distance education to schooling,
- motivate students during students' project developments,
- create more effective learning environments and experiences,
- guide students to related information sources,
- provide students with the needed technical knowledge and skills,
- answer the questions of students throughout the project development duration,

- be a bridge between students and administrators.

Computer Center Staff: Only one expert focused on the project. Expertise of the participant was on various technologies and the combinations of them used in distance education environments. He was expected to gather and organize technologies which are used in the project and to handle the technical problems which would arise during the project in both location.

Turkish Language Teachers: She controlled student projects' grammar usage, language levels and the internal consistencies according to the Turkish language rules.

Subject Matter Teachers: They controlled students' projects whether the contents were valid or not.

Administrators: They were all expected to reserve all laboratory, instructors' and students' time, to coordinate all participants in the project, and to provide the unlimited school's opportunities. Reserving Cultural Congress Center for final presentations was among the responsibilities of the administrators.

3.6.3. Subject Areas

The content pool was formed according to the students' content proposals and the suggestions of the subject-matter teachers. While choosing the subject areas from the pool, the subjects' weighing cultural, social economic concepts, their rising responsibility, their being interesting, open to discussion and solution, available in terms of reaching the resources, and currently popular were considered. The subject

areas were opened to discussion and selection to the sub-groups. Lastly, sub-groups in Niğde were peered with those in Ankara according to their subject areas.

3.6.4. Schedule

There were 5 phases students entered throughout the project; communication, investgation, design, development, presentation. Each phase except development, lasted one week. Development phase lasted four weeks.

Communication: Communication interconnected in each phase. Students contacted with their sub-group peers by using computer mediated communication tools. They introduced themselves and tried to get to know other group members in the other location. Group roles were distributed and group logo, color, name and jingles were discussed. Discussions were noted by the writer of each sub-group and documented on their files.

Investigation: Sub-groups started their investigations and continued for a week. They communicated with each other via e-mail group lists and Microsoft Netmeeting chat tools. They shared the findings as texts, images, and animations and shared them within both sub-group and the whole group. The individual and group workings and communication activities were facilitated by the instructors. Needed sources were supplied by instructors to students when they were necessary.

Design: Findings were documented and distributed to group members. Group members decided on the design template and design layouts within Power-Point program and collected related data afterwards.

Development: It lasted four weeks; students developed their Power-Point presentations. They combined the slides of the sub-groups and created one unique product, which belonged to the whole group at the end of the four-week period. Last products were controlled by the Turkish language teacher and subject-matter teachers. In order to create best application, teachers were always ready to help students to improve their abilities on Power-Point applications.

Presentation: Students presented their products in a communicative manner at METU Ankara Cultural Congress Center. Students in Niğde participated in the presentation via Netmeeting. Ankara Sub-groups' speakers presented the products. The applied schedule was presented at the Table 3.3:

Table 3.5: Schedule of the Project

Week	Date	Phases	Objectives
1. Week	9 -13 December Tuesday - Friday 12:15- 13:05	Communication	o Defining the groups o Defining the subject o Explaining the way of communication takes place between the group members o Meeting the group members o Defining/Choosing the roles of group members o Distributing the CAS survey
2. Week	16–20 December Tuesday - Friday 12:15- 13:0513:05	Investigation	o Review of the investigations strategies o Guiding students to related Web-sites o Facilitating students to investigate their subjects individually or in groups on the internet o Preparing the reports on Microsoft Word o Sharing reports via e-groups

Table 3.5: Schedule of the Project (Continue)

Week	Date	Phases	Objectives
3. Week	23–27 December Tuesday - Friday 12:15- 13:05	Design	o Checking the rules of a successful Power-Point presentation o Designing the presentations o Sharing the ideas within groups via Netmeeting
4. Week	30 December – 3 January Tuesday - Friday 12:15- 13:05	Development	o Communication via Netmeeting o Developing the projects o Sharing the ideas and files within groups via e-groups
5. Week	6 - 10 January Tuesday - Friday 12:15- 13:05	Development	o Communication via Netmeeting o Developing the projects o Sharing the ideas and files within groups via e-groups
6. Week	13 – 17 January Tuesday - Friday 12:15- 13:05	Development	o Communication via Netmeeting o Developing the projects o Sharing the ideas and files within groups via e-groups
7. Week	20 – 24 January Tuesday - Friday 12:15- 13:05	Development	o Communication via Netmeeting o Developing the projects o Sharing the ideas and files within groups via e-groups
8. Week	27 – 31 January Tuesday - Friday 12:15- 13:05	Presentation	o Presentations o Evaluations o Distributing the CAS, SAT, SPRES surveys

3.6.5. Technical Framework

Internet Connection: In the project, Internet connection was as follows;

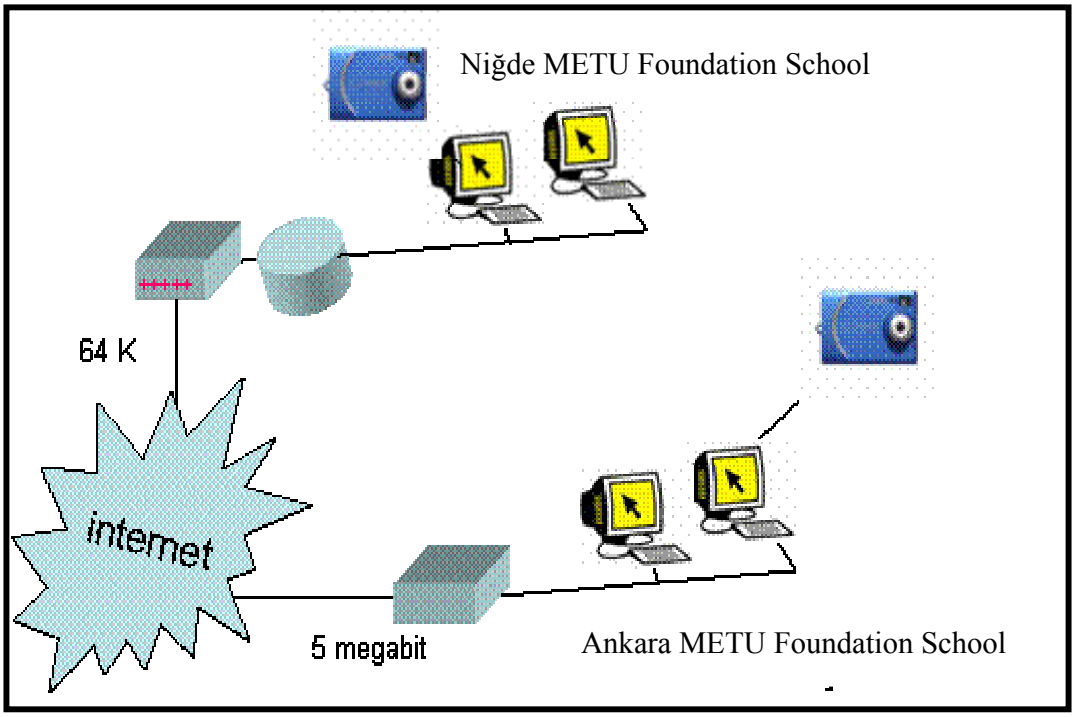


Figure 3.2: Internet Connection

Working Areas: Students and teachers worked collaboratively at METU Foundation Primary Schools' computer laboratories. The technical backgrounds of both schools were as follows:

Table 3.6: Computer Characteristics

Ankara	Niğde
P3 550 mhz CPU 64 mb RAM 100 mbit Ethernet Card Windows 98 Operating System	amd k6 CPU 32 mb RAM 100 mbit Ethernet Card Windows 98 Operating System

Table 3.7: Internet Connection in the Laboratories

Ankara	Niğde
5 mbit atm connection via fiber	64 k connection via

Communication Types (Synchronous/Asynchronous): The communication process had both *synchronous* and *asynchronous* characteristics. By synchronous communication, we understand communication between two or more people in real time, such as classroom-based, face-to-face discussion, or a telephone conversation. We used Microsoft Netmeeting program in the project as a synchronous communication tool. In asynchronous communication, the participants are not on-line at one and the same time, as in the case of correspondence by letter or fax. E-mail groups and e-mails as asynchronous communication tools were used in this study. The interesting and useful aspect of using the computer in the system as a communication medium is that it is possible to use it both as a synchronous communication medium like a telephone and as an asynchronous communication medium like a letter-writing or fax system, depending on what is ideally required by the particular situation (Rawson, 1990).

Communication Modes: In the project, one-to one and one-to-many modes were used. As one-to-one communication mode, e-mail tools and Microsoft Netmeeting were used. E-groups were also formed to enable one-to-many communication mode.

Table 3.8: Communication Techniques, Modes and Tools

Communication Modes	*Communication Techniques*	**Communication Tools**
One-to-one	E-mail based individual correspondence, question-answer activities Discussion, idea exchange, groupthinks	E-mail Microsoft Netmeeting
One-to-many	Sharing ideas and files, e-mail based correspondence within the group, discussion, suggestions, idea exchange	E-group

Medias: Medias used in the project is seen in Figure 3.3:

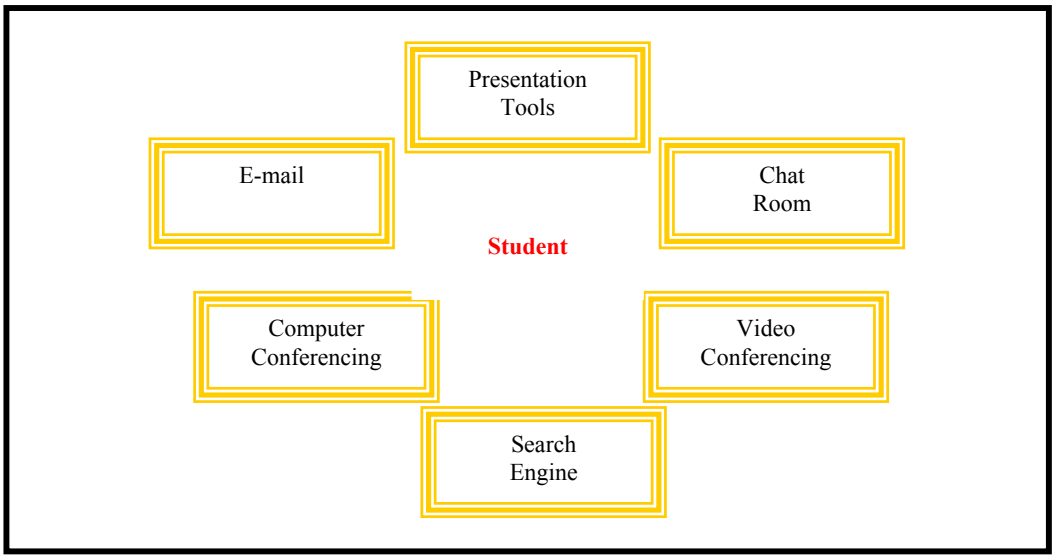


Figure 3.3: Medias Used by Students

3.6.6. Surveying Students

The data from the subjects were collected in the following manner. At the first meeting in the project, after a brief introduction to the project by the instructors, students were asked to participate in the study and were given time to complete the CAS as pre-test. At the end of the study, CAS was administrated as post-test. In addition social presence and satisfaction scales were given to be filled out by

students at the end of the study. The students were informed that all their responses would be kept completely confidential.

3.6.7. Observing the Students

During the 8-week studying period, students were observed and information about their project development process was noted on observation reports, to make sure the project's groups were following the project stages. Observation report consisted of number of the report, location, date, beginning and ending times of the observation, name of the observer, objectives that were planned to be achieved in that working hour within each group, descriptions. The observation format was based on the direct observation format developed by Weber (2003). Computer conference logs were also kept after the conference hours. E-mail lists were controlled and listed in detail during the project.

3.7. Analysis of Data

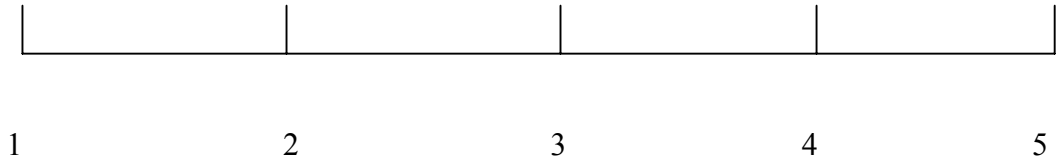
In this study descriptive and inferential statistics were used to analyze the data gathered from the attitude, satisfaction and social presence scales. Total scores of each subject for computer pre and post attitudes were calculated first, and using descriptive statistics pre and post attitude scores were interpreted. By using descriptive statistics, mean scores of data gathered from the social presence and satisfaction scales were calculated. Pre and post computer attitude scores, satisfaction and social presence scores were also analyzed in terms of gender through Independent T-test. Pearson correlation was used to find out the relationship between social presence and satisfaction scores.

CHAPTER IV

RESULTS

This chapter presents results regarding research questions stated in the method chapter. The focus of the study has four basic analyses. First one is serving to explore whether the use of computer-mediated communication tools in a collaborative process enhances 5th grade students' attitudes toward computer and computer class within online supported collaborative learning environment. Second one is describing and analyzing the level of learners' satisfaction about the project-based collaborative learning through CMC. Further, the third one is examining what are students 'perceptions of their social presence and how effective social presence is as a predictor of overall students' satisfactions.

The below scale indicates the criteria to analyze mean scores of both pre and post attitude scale.



Intervals	Attitude
1.00-1.80	SD
1.81-2.60	D
2.61-3.40	U
3.41-4.20	A
4.21-5.00	SA

4.1. Students Pre and Post Attitudes toward Computers (R. Q. 1)

In this part in order to find the answer for the research question about students' attitudes toward computers at the beginning and at the end of the study, computer attitude scale, which had anxiety, confidence, liking and usefulness parts, was administrated at the beginning and at the end of the study (See Apendix A). As indicated in Table 4.1, majority of the students agreed or strongly agreed with the statements both at the begenning and at the end of the study. Even though there is a slight difference between pre-attitude overall mean score (M= 4.41) and post-attitude overall mean score (M=4.42), both scores take place between 4.20 and 5 representing that these mean scores are in the SA interval. We can conclude that students' attitudes toward computers were highly positive both at the beginning and at the end of the study.

Anxiety: As it is shown in Table 4.1, post-attitude computer anxiety overall mean score (M= 4.44) of the subjects is higher than pre-attitude computer anxiety overall mean (M= 4.32) score indicating that students attitudes were more positive toward computers in the stated category after PBCL through CMC. We can also say that students' attitude toward computers in anxiety category were highly positive both at the beginning and at the end of the study. The difference between the pre and post attitude anxiety overall mean scores of the students is the highest with respect to other categories. However, mean score of item 19 was low with respect to other

attitude items. On the other hand, most of the students agreed and strongly agreed that they do not feel uncomfortable with the use computers both before and after the study (Item 4).

Confidence: Even though there is a slight difference between pre-attitude computer confidence overall mean score (M= 4.34) and post-attitude computer confidence overall mean score (M=4.35), both scores take place between 4.20 and 5 representing that these mean scores are in the SA interval. We can conclude that students' attitudes toward computers in confidence category were highly positive both at the beginning and at the end of the study. However, at the end of the study 36.1 % of the students were undecided with the statement that they don't think that they would do advanced computer work (Item 8).

Liking: Like anxiety results, post-attitude computer liking overall mean score (M= 4.45) of the subjects is higher than pre attitude computer liking overall mean (M= 4.37) score indicating that students attitudes were more positive toward computers in the stated category after PBCL through CMC. However, mean score of item of 5 was low with respect to other attitude items. In the item, 30.6 % of the students were undecided at the end of the study that figuring out computer problems.

Usefulness: On the other hand, post-attitude computer usefulness overall mean score (M= 4.45) of the subjects is lower than pre-attitude computer usefulness overall mean (M= 4.59) score indicating that students attitudes were less positive toward computers in the stated category after PBCL through CMC. However usefulness sub-scores have the highest mean scores among both post and pre attitude sub-scores. 94.4 % of the students are agreed and strongly agreed before and after the study with the statement that learning about computers is not a waste of time.

Table 4.1: Students' Pre and Post Attitude toward Computers - Computer Attitude Scores

Subject Attitudes Toward Computers Item No		Before PBCL through CMC							After PBCL through CMC						
		M	SD*	Percentages					M	SD	Percentages				
				SD	D	U	A	SA			SD	D	U	A	SA
Anxiety	1	4,47	.94	2.8	-	13.9	13.9	69.4	4.36	1.22	8.3	-	11.1	8.3	72.2
	4	4.50	1.03	5.6	-	5.6	16.7	72.2	4.56	1.03	5.6	-	5.6	11.1	77.8
	13	4.86	.35	-	-	-	13.9	86.1	4.83	.56	-	2.8	-	8.3	88.9
	18	4.31	1.33	8.3	5.6	8.3	2.8	75.0	4.61	.90	2.8	-	11.1	5.6	80.6
	19	3.47	1.73	27.8	2.8	11.1	11.1	47.2	3.86	1.46	16.7	-	11.1	25.0	47.2
Overall mean for anxiety		**4.32**							**4.44**						
Confidence	2	4.56	.77	-	2.8	8.3	19.4	69.4	4.69	.58	-	-	5.6	19.4	75.0
	8	4.06	1.19	5.6	2.8	25.0	13.9	52.8	3.89	1.28	8.3	-	36.1	5.6	50.0
	9	4.75	.55	-	-	5.6	13.9	80.6	4.64	.49	-	-	-	36.1	63.9
	11	4.47	.94	2.8	2.8	5.6	22.2	66.7	4.56	.77	-	2.8	8.3	19.4	69.4
	14	4.22	.99	2.8	-	22.2	22.2	52.8	4.11	.98	-	5.6	25.0	22.2	47.2
	17	4.00	1.29	8.3	2.8	22.2	13.9	52.8	4.19	.86	-	-	27.8	25.0	47.2
Overall mean for confidence		**4.34**							**4.35**						
Liking	3	4.72	.51	-	-	2.8	22.2	75.0	4.75	.50	-	-	2.8	19.4	77.8
	5	3.56	1.44	13.9	11.1	16.7	22.2	36.1	3.86	1.15	5.6	2.8	30.6	22.2	38.9
	15	4.47	.88	-	5.6	8.3	19.4	66.7	4.50	.74	-	-	13.9	22.2	63.9
	16	4.72	.66	-	2.8	2.8	13.9	80.6	4.67	.68	-	2.8	2.8	19.4	75.0
Overall mean for liking		**4.37**							**4.45**						
Usefulness	6	4.86	.59	-	2.8	2.8	-	94.4	4.81	.52	-	-	5.6	8.3	86.1

	7	4.83	.45	-	2.8	-	11.1	86.1	4.72	.51	-	-	2.8	22.2	75.0
	10	4.14	1.29	11.1	-	8.3	25.0	55.6	4.00	1.22	8.3	-	22.2	22.2	47.2
	12	4.47	.94	2.8	-	13.9	13.9	69.4	4.44	1.08	5.6	-	11.1	11.1	72.2
	20	4.25	1.34	11.1	-	11.1	8.3	69.4	3.97	1.21	8.3	-	22.2	25.0	44.4
	21	4.97	.17	-	-	-	2.8	97.2	4.75	.50	-	-	2.8	19.4	77.8
Overall mean for this usefulness		**4.59**							**4.45**						
Overall mean for the attitudes toward computer		**4.41**							**4.42**						

Note: For this table SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

SD* : Standard Deviation

4.2. Students' Pre and Post Attitudes toward Computers in terms of Gender (R. Q. 2)

In this part, independent t-test was used to find out if there is a significant difference in students' attitudes toward computers in terms of gender. Pre and post attitude scores of students were compared in terms of gender to see if there is a significant difference in students' attitudes toward computers. As Table 4.2 shows, pre and post computer attitude mean scores of males in all catagagories are higher than that of the females, showing that the males' attitude scores were higher than the females' attitude scores both at the beginning and at the end of the study.

In computer anxiety sub-scale, while there is a slight difference between males' pre and post mean scores, the difference between females' pre and post mean scores is higher with respect to that of males'. Both males and females' anxiety mean scores were increased slightly from pre to post attitudes.

As it is shown in Table 4.2, in confidence sub-scale, while males' post attitude mean score is lower than the pre attitude mean score, it is reverse in females' mean scores showing that females became more confident toward computers after PBCL through CMC.

In the computer liking sub-scale the mean score difference between females and males in both pre and post attitude scales are higher than that of computer anxiety, confidence and usefulness. In this category, both males and females' mean scores were increased from pre to post attitudes as indicated in Table 4.2.

Lastly, there is a decrease in both males' and females' means from pre to post attitude usefulness scores. However the difference between females' pre and post usefulness sub-scale scores is more than that of males in this category.

Table 4.2: Students' Pre and Post Attitude toward Computers in terms of Gender – Computer Attitude Scores

Subject Gender		Male			Female			Overall		
		N	M	SD	N	M	SD	N	M	SD
Anxiety	Pre-test	20	22.00	2.64	16	21.13	3.70	36	21.61	3.14
	Post-test	20	22.25	3.04	16	22.19	2.56	36	22.22	2.80
Confidence	Pre-test	20	27.25	4.25	16	24.56	4.32	36	26.06	4.43
	Post-test	20	26.75	3.86	16	25.25	3.55	36	26.08	3.75
Like	Pre-test	20	18.25	1.74	16	16.50	2.28	36	17.47	2.16
	Post-test	20	18.45	1.76	16	16.94	2.14	36	17.78	2.06
Usefulness	Pre-test	20	27.60	2.93	16	27.44	2.06	36	27.53	2.55
	Post-test	20	27.05	3.86	16	26.25	3.38	36	26.69	3.27

As it is presented in Table 4.3, the outcome of the pre-test indicated no significant differences on computer anxiety between males (M = 22.00, SD = 2.64) and females (M = 21.13, SD = 3.70), t(34) = .293, p> .05. There is also no significant differences on computer confidence between males (M = 27.25, SD = 4.25) and females (M = 24.56, SD = 4.32), t(34) = 1.210, p> .05. Likely, there is no significant differences on computer usefulness between males (M = 27.60, SD = 2.93) and females (M = 27.53, SD = 2.55), t(34) = .580, p> .05. However, there is a significant difference on computer liking between males (M = 18.25, SD = 1.74) and females (M = 16.50, SD = 2.28), t(34) = 3.492, p> .05 in favor of males.

Table 4.3 shows that, the outcome of the post-test indicated no significant differences on computer anxiety between males (M = 22.25, SD = 3.04) and females

(M = 22.19, SD = 2.56), t(34) = .066, p> .05. There is also no significant differences on computer confidence between males (M = 26.75, SD = 3.86) and females (M = 22.25, SD = 3.55), t(34) = 1.199, p> .05. Likely, there is no significant differences on computer usefulness between males (M = 27.05, SD = 3.86) and females (M = 26.25, SD = 3.38), t(34) = .725, p> .05. However, there is a significant difference on computer liking between males (M = 18.45, SD = 1.76) and females (M = 16.94, SD = 2.14), t(34) = 2.325, p> .05 in favor of males.

According to table 4.3, the differences between males and females on all of the sub-scales except usefulness of pre-attitude test were more than that of post-attitude test. This shows that attitude toward computers became less influenced by gender after the PBCL through CMC. On the other hand, the difference between males and females on usefulness subscale of pre test were less than that of post attitude test.

Table 4.3: Students' Pre and Post Attitude toward Computers in terms of Gender – Independent T-test Table

Computer Attitude Scale / Gender	Pre Attitude Scores			Post Attitude Scores		
	df	t	Sig.	df	t	Sig.
Anxiety	34	.293	.771	34	.066	.948
Confidence	34	1.210	.235	34	1.199	.239
Like	34	3.492	.001	34	2.325	.026
Usefulness	34	.580	.566	34	.725	.473

4.3. Satisfaction of Students Participated in PBCL through CMC (R. Q. 3, 4)

In this part, the levels of students' satisfactions about the project-based collaborative learning through CMC within E-class environment were examined and analyzed. In the questionnaire, items from 12 to 25 (total of 14 items) were related to describe satisfaction levels.

As it is indicated in Table 4.4 overall mean score of the participants' satisfaction was 3.82 showing that it is in the agree interval (between 3.41 and 4.20). Mean scores of items from 12 to 15, which are related to the comparison of sub groups' works (Niğde- Ankara groups) within the PBCL through CMC, were low (from M=2.61 to M= 3.40) with respect to other satisfaction items. On the other hand, all of the students agreed or strongly agreed to participate likewise projects in the future after the PBCL through CMC (Item 19). 91.6 % of the students are agreed or strongly agreed with the statement that they became talented in using Power-Point program after the PBCL through CMC (Item 20). Additionally 88.8 % of the students were agreed or strongly agreed with the statement that they realized the importance of computer course after the project (Item 21). 80.6 % of the students are also agreed and strongly agreed that they became more creative and productive after the PBCL through CMC (Item 22). However, only 72.2 % of the students are agreed or strongly agreed with the adequacy of the variety of communication mediums (Item 25).

Table 4.4: Satisfaction levels of Students Participated in PBCL through CMC

Subject N = 36	Item No	M	SD*	Percentages				
				SD	D	U	A	SA
	12	3.00	1.43	22.2	13.9	25.0	19.4	19.4
	13	2.61	1.32	25.0	25.0	25.0	13.9	11.1
	14	3.36	1.42	13.9	13.9	25.0	16.7	30.6
	15	2.94	1.26	13.9	25.0	27.8	19.4	13.9
	16	3.97	1.28	8.3	5.6	13.9	25.0	47.2
	17	3.69	1.17	8.3	-	36.1	25.0	30.6
	18	4.25	.87	-	5.6	11.1	36.1	47.2
	19	4.75	.44	-	-	-	25.0	75.0
	20	4.56	.91	2.8	2.8	2.8	19.4	72.2
	21	4.58	.69	-	-	11.1	19.4	69.4
	22	4.42	.87	-	2.8	16.7	16.7	63.9
	23	3.72	1.30	11.1	5.6	16.7	33.3	33.3
	24	3.81	1.21	8.3	2.8	25.0	27.8	36.1
	25	3.83	1.25	8.3	8.3	11.1	36.1	36.1
Overall mean for the satisfaction		**3.82**						

Note: For this table SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree, SD* : Standard Deviation

In this part, independent t-test was used to evaluate differences in students' satisfaction about PBCL through CMC in terms of gender. As Table 4.5 shows,

overall mean score of males at satisfaction scales are higher than that of the females, showing that the males were more satisfied that females about PBCL through CMC.

Table 4.5: Satisfaction of Students in terms of Gender – Satisfaction Mean Scores

Subject Gender	N	M	SD
Male	20	55.05	7.44
Female	16	51.56	7.51

However, the outcome of the satisfaction indicated no significant differences between males (M = 55.05, SD = 7.44) and females (M = 51.56, SD = 7.51), $t(34) = 1.392$, $p > .05$, as it presented Table 4.6.

Table 4.6: Satisfaction of Students in terms of Gender – Independent T-test Table

Satisfaction Scale Gender	df	t	Sig.
	34	1.392	.173

4.4. Social Presence of Students Participated in PBCL through CMC (R. Q. 5, 6)

In this part, the levels of students' perceptions of their social presence during the project-based collaborative learning through CMC were examined. In the questionnaire, items from 1 to 11 (total of 11), which had co-presence, psychological involvement and behavioral engagement parts, were related to describe social presence levels. The Table 4.7 shows that overall social presences mean score of subjects is 3.26 (between 2.61 and 3.40). We can conclude that students were unsure of their statements on the PBCL through CMC.

Co-presence: Table 4.7 indicated that, the overall mean of co-presence is 3.65, which is the highest mean score in social presence categories. It takes place between 3.40 and 4.20, which shows that students feel themselves agreed with the co-presence statements on the PBCL through CMC. 80.5 % of the students agreed or strongly agreed with the statement (Item 1) that they do not feel alone during the conversations. 75 % of the students also agreed or strongly agreed with the statement that they feel being a group with others (Item 2). On the other hand, 36.1 % of the students are strongly agreed that they were easily distracted when other things going around them while conversing with their group mates (Item 3). Additionally, 38.9 % of the students were undecided with the statement that their group mates paid close attention to his/her (Item 4).

Psychological Involvement: As presented in Table 4.7, overall mean of psychological involvement is 2.97. It is the lowest mean score in social presence categories. It takes place between 2.60 and 3.40 showing that students feel themselves undecided with the psychological involvement statements on the PBCL through CMC. 43.6 % of the students disagreed or strongly disagreed with the statement that they influenced by their group mates moods during the conversations (Item 6). However 50 % of the students agreed or strongly agreed with the statement that they shared their thoughts with their group mates during the conversations (Item7).

Behavioral Engagement: As presented in Table 4.7, the overall mean of behavioral engagement is 3.21, which takes place between 2.60 and 3.40 indicating that students feel themselves undecided with the behavioral engagement statements on the PBCL through CMC. 55.6 % of the students agreed or strongly agreed with

the statement that they worked with their group mates in harmony to complete the task (Item10).

Table 4.7: Students' Perception of their Social Presence – Social Presence Mean Scores

Social Presence of Students Participated in PBCL through CMC N = 36	Item No	M	SD*	Percentages				
				SD	D	U	A	SA
Co-presence	1	4.19	1.26	5.6	11.1	2.8	19.4	61.1
	2	4.19	1.09	2.8	5.6	16.7	19.4	55.6
	3	3.42	1.46	36.1	11.1	25.0	13.9	13.9
	4	2.81	1.24	16.7	22.2	38.9	8.3	13.9
Overall mean for the co-presence		**3.65**						
Psychological Involvement	5	2.89	1.49	25.0	16.7	25.0	11.1	22.2
	6	2.36	1.46	41.7	16.7	19.4	8.3	13.9
	7	3.31	1.56	22.2	8.3	19.4	16.7	33.3
	8	3.33	1.35	11.1	19.4	19.4	25.0	25.0
Overall mean for the Psychological Involvement		**2.97**						
Behavioral Engagement	9	3.11	1.43	22.2	5.6	33.3	16.7	22.2
	10	3.31	1.47	19.4	11.1	13.9	30.6	25.0
	11	3.22	1.46	16.7	16.7	22.2	16.7	27.8
Overall mean for the Behavioral Engagement		**3.21**						
Overall mean for the Social Presence		**3.29**						

Note: For this table SD = Strongly Disagree, D = Disagree, DK = Don't Know, A = Agree, SA = Strongly Agree, SD* : Standard Deviation

In this part, independent t-test was also used to evaluate differences in students' perceptions of their social presence during the PBCL in terms of gender. As Table 4.8 shows, overall mean score of males at both co-presence (M= 15.05) and psychological involvement (M=12.20) sub-scales are higher than that of the females (co-presence, M= 14.06 and psychological involvement, M=11.50), however, overall mean score of females at behavioral engagement (M=10.06) sub-scale is higher than that of males (M=9.30).

Table 4.8: Students' Perception of their Social Presence in terms of Gender – Social Presence Mean Scores

Subject Gender		N	M	SD
Co-presence	Male	20	15.05	3.19
	Female	16	14.06	3.32
Psychological Involvement	Male	20	12.20	4.61
	Female	16	11.50	4.49
Behavioral Engagement	Male	20	9.30	3.10
	Female	16	10.06	2.64

Even though there was a mean difference, the outcome of the co-presence sub-scale indicated no significant differences between males (M = 15.05, SD = 3.19) and females (M = 14.06, SD = 3.32), $t(34) = .907$, $p > .05$, as presented in Table 4.9. The outcome of the psychological involvement sub-scale indicated no significant differences between males (M = 12.20, SD = 4.61) and females (M = 11.50, SD = 4.49), $t(34) = .458$, $p > .05$. Like the first two, the outcome of the behavioral

engagement also indicated no significant differences between males (M = 9.30, SD = 3.10) and females (M = 10.06, SD = 2.64), t(34) = -.782, p> .05.

Table 4.9: Students' Perception of their Social Presence in terms of Gender – Independent T-test Table

Social Presence Scale Gender	df	t	Sig.
Co-presence	34	.907	.371
Psychological Involvement	34	.458	.650
Behavioral Engagement	34	-.782	.439

4.5. Relationship Between Subjects' Social Presence and Satisfaction in PBCL through CMC with their Satisfaction (R. Q 7)

In this part, Pearson correlation test was conducted to evaluate how effective social presence is as a predictor of overall students' satisfactions in E-class environment. As Table 4.9 shows, a correlation analysis of data revealed that co-presence and satisfaction were significantly related, r = + .580, n = 36, p < .01, two tails. Psychological involvement and satisfaction were also significantly related, r = + .394, n = 36, p < .05, two tails. However there is no significant relationship between behavioral engagement and satisfaction, r = + .284, n = 36, p > .05, two tails.

Table 4.10: Correlation Matrix for Co-presence, Psychological Involvement, Behavioral Engagement and Satisfaction

Pearson Correlation Table	Co-presence	Psychological Involvement	Behavioral Engagement
Satisfaction	.580**	.394*	.284
Behavioral Engagement	.357*	.491**	
Psychological Involvement	.615**		

N = 36
*p < .01, two tails, **p>.05, two tails

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

5.1. Conclusions

The study reports on the use of CMC on a project-based collaborative learning environment among distant students in the 5th grade at METU Foundation Schools. Through out the study, the 5th grade students used CMC tools to discuss their project subjects with their group mates at a distance and to complete a project together at the end of the eight-week study. The students worked cooperatively in groups to attain academic as well as affective and social goals. The overall purpose of this research serves to draw an example for the practice of using computer-mediated communication technologies in a collaborative, project-based school environment. One of the purposes of the research was to determine whether there is a difference in computer attitudes of the students who were exposed to the project-based collaborative learning through computer-mediated communication. This study also analyzed the level of learners' satisfaction on PBCL through CMC environment. In addition, this study examined what the students' perceptions of their social presence are and how effective social presence is as a predictor of overall students' satisfaction.

CMC provided the participants with a good environment for friendship, learning and communication. The students who participated in the study were in favor of the use of CMC tools. The students had a strong desire to use CMC not only while the research study was conducted but also after the study was completed. This research will be able to shed some light on attitudinal changes toward CMC technology. Evidence also shows a positive response by students to the use of CMC in the project using a collaborative approach. This supports the findings of previous studies that students' learning experiences are improved with the use of CMC through collaboration. This study also adds to the body of international research being conducted on CMC based collaborative learning projects at the elementary level.

The findings from this study may not be generalized beyond this study's population because of the small sample size and the fact that the students were volunteers to participate in the study. However, the study does provide suggestions on how PBCL through CMC can be designed to provide a better intercultural learning environment.

5.1.1. Students' Attitudes towards the Computer after PBCL through CMC

The study was carried out over eight weeks and at the end of the study a statistical analysis was conducted. According to the results gathered on the difference between the perceived attitude from the students at the beginning and at the end of the study was not significant. This is because sometimes such effects emerge over a

relatively larger period of time. However, the results of the study revealed the consistent positive attitudes of the students towards computers after the use of CMC.

According to the results, after the project the students' anxiety toward the use of the computer became lesser. This is because the students got familiar with the use of CMC tools and anxieties towards the use of the computer changed accordingly. Students' liking towards the computer changed positively, either. While there is no difference on their attitudes about their feelings of confidence with the computer, their thoughts on the usefulness of the computer, however, changed negatively over time. This is because their expectations of using the computer in a project may be different with the use of it as a communication medium within the project. Additionally, for students who have come across these technologies for the first time, this experience might lead them into some misconceptions. Related to these assumptions, Hiltz and Johnson (1990) stated that ideas for enhancing positive attitudes toward CMC should include adequate training and inclusion of users in a medium selection process (cited in Olaniran, 1996).

After the use of CMC in the PBCL environment, the female students became more confident toward computers. This finding is parallel with the statement of Wolfe (2000) indicating that females benefit more from CMC. On the other hand, there was a significant difference between male and female students on computer liking. Female students were less fond of computers with respect to males. However, results showed that not only their likes but also the other attitudes towards computers became less influenced by gender after the PBCL through CMC. It is parallel with Huang's (2000) finding indicating that female students and students of low computer attitude demonstrate more positive computer attitudes after the WWW application.

The use of communication technologies within a well-designed learning environment may decrease "gendered" use of technology and increase the positive attitudes towards technology.

5.1.2. Students' Perceived Satisfaction after PBCL through CMC

In the study it was considered that it might be useful to investigate what mechanism enhances higher levels of satisfaction. According to the results, the majority of the students were satisfied with the experience they had through the project. However the ents seemed to be less satisfied with the group work of the e group. This might be because they experienced the group work at a distance for the first time and they might not have been facilitated enough by the instructors. As Gunawardena (1997, p.23) stated, in spite of the characteristics of the medium, student perceptions of the social and human qualities of CMC depend on the social presence created by the instructors and the online community. Another reason for this could be the limitation of the study time and the lack of the warm-up activities with other group members at distance. A different Internet connection speed in the Niğde and Ankara locations during the study may also cause the students not to communicate with each other effectively.

At the end of the study, the students were eager to participate in similar projects in the future. They also thought that they became talented in using the Power-Point program and they realized the importance of using a computer. Almost all of the students realized that they became more creative and productive after the PBCL through CMC. However, they did not agree that the variety of communication mediums was adequate. They mostly liked the media, which has both auditory and

visual attributes. They may prefer to have more chances in communicating with their group mates through videoconference tools.

Smith (1994) found mixed results on the measure of satisfaction when he considered the gender issue. However, Pareitz (2001) found that only in rare instances the gender was a significant factor in the level of satisfaction. Similarly, findings of satisfaction in this study with respect to gender indicated that although there was no significant difference between females and males, male students were satisfied more than females. This shows a contrast with Savicki and Kelly's (2000) finding that males were less satisfied with the CMC experience. In this study, however, male students might have had better computer skills and were more motivated before the project.

5.1.3. Students' Levels of Social Presence after PBCL through CMC

Although the results on perceived social presence was low, the students tried to develop an online community throughout their communication to build the project. According to the findings, the students believed that they were not alone and secluded over the time of the project and they were aware of the others. However, they were confused about whether the others were peripherally or focally aware of them. Additionally, the students were confused on whether they allocated focal attention to each other, had an empathy on others emotions, and had insight into the intentions, motivation, and thoughts of the others. Almost half of the students were not influenced by their group mates' moods during the conversations. However, they claimed that they shared their thoughts with their group mates during the conversations. Although most of them seemed undecided on their actions whether

they were interdependent, connected to, or responsive to the others, half of them strongly agreed that they worked with their group mates to complete the task in harmony. It would not be wrong when we consider how they succeeded in developing high quality products at the end of the study.

According to Savicki's and Kelly's (2000) findings, gender has an effect within groups as a norm for communication development. These results are consistant with Herring's description of "gendered" group interaction (cited in Savicki and Kelly, 2000). Although social presence was expected to "be gendered" according to these statements, there was no significant difference in this study on the social presence with respect to gender. However it is interesting that while co-presence and psychological involvement results of males were higher than that of females, in behavioral engagement this was vice versa. Females thought that they are more interdependent, connected to, or responsive to their group mates than males. This finding parallels with Savicki and Kelly's (2000) statement that females show higher levels of group development in the CMC environment. These results may be consistent with the results in other areas which needs collaboration and production. Female students may continue their well-developed collaboration behavior within technology-based projects.

Gunawardena (1997) claimed that social presence alone is a strong predictor of satisfaction in a text-based computer conference. In line with Gunawardena's statement, this study also showed that social presence was a strong predictor of satisfaction in a PBCL environment. Especially students' feelings on their co-presence and psychological involvement had strong impact on their satisfactions with the use of CMC in a project-based collaborative learning environment. There was no

significant relationship between the students' sense of their behavioral engagement and their satisfaction. Such kind of relationship between social presence and satisfaction may be explained with the idea of that students are more satisfied if they feel someone is aware of them in a communication process in spite of the distance.

5.2. Implications for Further Practice

The result of this study shows that there is a significant relationship between social presence and satisfaction in a PBCL experience through CMC. These results imply that to be able to have satisfied students from learning experience through CMC and have an effective online learning environment, the practitioners should pay more attention to social presence issues. Instructors need to learn to adapt to the CMC medium by developing skills that create a sense of social presence. This study may provide useful information to the practitioners in this aspect.

According to Smith's (1994) findings, the CMC system required more time from the instructor and students. Similarly, Lee (1996) stated that although there was a positive response to the use of electronic communications or computer mediated delivery of courses; students had not enough time for familiarization with the medium. Facilitating the CMC medium acceptance among potential users is not a goal that can be accomplished overnight, so patience should be exercised to allow users practice and experience with the CMC medium. Adequate time and effort by the teachers should be allocated for successful implementation of this method. It is believed that the positive educational outcomes of computer-mediated collaborative learning make for high returns on investment of instructor's time and effort (Alavi, 1994).

This study was conducted during the lunch breaks. Since there was a limited duration of time to practice PBCL through CMC the results of the study might have been affected in a negative way. In future implementation of such a study, enough time should be provided to the students to practice.

The students participated in the study from Ankara were the ones who were volunteer for such study, however, students from Niğde were not asked about the participation and all of the 5th grade students participated in the study. At the beginning of the study it was considered that there would be a problem about the participation of to the study hours. The students at each location were joined all of the the study hours throughout the project and they studied eagerly in each step. Even though students were eager to complete the each step of the study, it is better to consider the same type of sampling method at two sides in future studies.

Another result of the study is that even though there was not a significant difference between male and female students in regard to social presence's sub categories, males got higher scores from co-presence and psychological involvement while females got higher scores from behavioral engagement. Since social presence affect satisfaction from learning experience through CMC, in new applications it is important to guide and facilitate both genders in different dimensions of social presence to have them become socially present in such a kind of environment.

This research also brings about the question of "Can this project be seen as a basis for likewise projects which will be applied in multicultural areas and at lower grade levels? The results of this study showed that such kinds of projects could be applied effectively at lower grade levels.

5.3. Implications for Further Research

Gunawardena (1994) concluded that failure in computer mediated communications occurs far more often on the social level rather than the technical level. Therefore, future research should continue to examine CMC from a relational, socio-psychological perspective and explore individual, group and gender differences using a variety of different methodologies. The findings, which showed a low level of social presence, had implications for designing PBCL where equal attention must be paid to designing techniques that enhance social presence. This is due to the fact that the text-based CMC communication medium was seriously absent of visual and auditory nonverbal cues that carry the rich and differentiated emotional information available in face-to-face situations. It is necessary to concentrate on this absence and develop the strategies in order to get rid of the problems emerging from the lack of nonverbal cues. Additionally, the ability of social presence to predict affective outcomes in CMC should be explored.

As the type of computer-mediated pedagogy used in the classroom evolves, researchers should continue to study the most current applications to determine what effect computer-mediated applications have on student attitudes and achievements.

Practitioners need to look at the attempts to facilitate student's satisfaction in CMC not as a waste of resources but rather as an investment in a potentially promising future. It stands as the reason that facilitating student's satisfaction may subsequently lead to CMC adoption and may also help overcome some concerns associated with communication technology. Therefore, there should be more research

on the satisfaction levels of students after the applications of different combinations of communication technologies.

In this study, the projects that students worked on were related with the subject areas that students were interested in. In future studies the projects should be related with the courses and should be applied at different grade levels to examine the social presence and satisfaction levels.

Following studies should also concentrate on the same variables within different group formations like male only, female only or mixed groups. They should also explore the relationships between computer competence, social presence and satisfaction. During the study, the relationships of the frequency of computer usage and social presence and satisfaction should also be considered.

Future research should conduct multinational comparisons addressing the possible affects of culture-specific differences of social presence on CMC satisfaction and objective measures of learning outcomes. It is because Johansen, Vallee and Splanger (1988) suggest that social presence can "be cultured" among teleconferencing participants (cited in Gunawardena, 1997, p.23). Multicultural applications may raise the type of questions which can be applicable to search for the answers. The creative use of CMC in educational settings will help the students of today and tomorrow be multi-culturally aware.

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APPENDIX A

COMPUTER ATTITUDE SCALE (CAS)

BİLGİSAYARLARA YÖNELİK TUTUM ÖLÇEĞİ

Projenin Adı: "Duvarların Ötesinde İletişim"

Projenin Amacı: Bu çalışmanın amacı sizlerin bilgisayar konusundaki düşüncelerinizi öğrenmektir.

Hedef Kitle: ODTÜ Geliştirme Vakfı Özel İlköğretim Okulu 5. Sınıf Öğrencileri

LÜTFEN CEVAPSIZ SORU BIRAKMAYINIZ.

Cinsiyetin : Kız ..... Erkek .....
Evde bilgisayarın var mı? : Var ..... Yok .....
Varsa internet bağlantısı var mı? : Var ..... Yok .....

LÜTFEN AŞAĞIDAKİ SORULARI DİKKATLİCE OKU
UYGUN SEÇENEKTEN SADECE BİRİNİ İŞARETLE

		 Kesinlikle Katılmıyorum	 Katılmıyorum	 Fikrim Yok	 Katılıyorum	 Kesinlikle Katılıyorum
1	Bilgisayar beni hiç korkutmaz.					

2	Bilgisayar kullanma konusunda hiç **iyi değilim**.					
3	Bilgisayarla çalışmayı severim.					
4	Bilgisayarla çalışmak beni **tedirgin eder**.					
5	Bilgisayarla ilgili problemleri çözmek ilgimi **çekmiyor**.					
6	Bilgisayarlar hakkında bir şeyler öğrenmek **zaman kaybıdır**.					
7	Bilgisayarlar hakkında bilgi edinmeye değer.					
8	Bilgisayarla ilgili zor işleri yapabileceğimi **düşünmüyorum.**					
9	Bilgisayarda çalışabileceğimden eminim.					
10	Okul çalışmalarım için bilgisayarı çok iyi öğrenmeye ihtiyacım var.					
11	Bilgisayarda başarılı biri **değilim**.					
12	Okul hayatımda bilgisayarı **çok az** kullanacağımı tahmin ediyorum.					
13	Bilgisayarlar kendimi **rahatsız** hissetmeme neden oluyor.					
14	Bilgisayar derslerini kolaylıkla başardığımı hissederim.					
15	Bilgisayarla çalışmaya bir kez başlayınca bir türlü bırakamam.					
16	Bilgisayarla çalışmanın eğlenceli ve özendirici olduğunu düşünüyorum.					
17	Bilgisayarla çalışma konusunda kendime çok fazla güveniyorum.					
18	Bilgisayara karşı **saldırgan** duygular besliyorum.					
19	Başkaları bilgisayardan söz ettiğinde rahatsızlık duymuyorum.					

20	Bilgisayar öğrenmenin derslerimi olumlu yönde etkileyeceğini düşünüyorum.					
21	Bilgisayarı okul ve okul dışında bir çok alanda kullanırım.					

APPENDIX B

SOCIAL PRESENCE SCALE (SPRES)

E-SINIF PROJESİ DEĞERLENDİRME ÖLÇEĞİ

Projenin Adı: "Duvarların Ötesinde İletişim"

Projenin Amacı: Bu çalışmanın amacı sizlerin bilgisayar konusundaki düşüncelerinizi öğrenmektir.

Hedef Kitle: ODTÜ Geliştirme Vakfı Özel İlköğretim Okulu 5. Sınıf Öğrencileri

LÜTFEN CEVAPSIZ SORU BIRAKMAYINIZ.

LÜTFEN AŞAĞIDAKİ SORULARI DİKKATLİCE OKU
UYGUN SEÇENEKTEN SADECE BİRİNİ İŞARETLE

		 Kesinlikle Katılmıyorum	 Katılmıyorum	 Fikrim Yok	 Katılıyorum	 Kesinlikle Katılıyorum
1	Grup arkadaşlarımla Internet aracılığıyla sohbet ederken kendimi yalnız hissettim.					
2	Bilgisayar konferansı aracılığı ile yaptığımız konuşmalar sırasında karşı taraftaki arkadaşlarımla bir grup olduğumuzu fark ettim.					

3	Etrafımda olanlar Internet aracılığı ile konuşurken dikkatimi dağıttı ve tartışılan konudan uzaklaştım.					
4	Proje hakkında yazdıklarımı karşı taraftaki grup arkadaşlarımın ilgi ile incelediklerini fark ettim.					
5	Karşı taraftaki grup arkadaşlarımla duygularımızı paylaştık.					
6	Karşı gruptaki arkadaşlarımın duyguları beni de etkiledi.					
7	Karşı gruptaki arkadaşlarımla düşüncelerimizi açık bir şekilde paylaştık.					
8	Karşıdaki grup arkadaşlarımın konuşmalar sırasında ne demek istediğini çok rahat anladım.					
9	Çalışmalarımı karşıdaki grup arkadaşımın çalışmalarına bağlı olarak gerçekleştirdim.					
10	Proje süresince karşıdaki grup arkadaşlarımla birlikte uyum içinde çalıştık.					
11	Birbirimiz olmadan bu projeyi başarıyla tamamlayamayacağımı düşündüm.					

APPENDIX C

SATISFACTION SCALE (SAT)

E-SINIF PROJESİ DEĞERLENDİRME ÖLÇEĞİ

Projenin Adı: "Duvarların Ötesinde İletişim"

Projenin Amacı: Bu çalışmanın amacı sizlerin bilgisayar konusundaki düşüncelerinizi öğrenmektir.

Hedef Kitle: ODTÜ Geliştirme Vakfı Özel İlköğretim Okulu 5. Sınıf Öğrencileri

LÜTFEN CEVAPSIZ SORU BIRAKMAYINIZ.
LÜTFEN AŞAĞIDAKİ SORULARI DİKKATLİCE OKU
UYGUN SEÇENEKTEN SADECE BİRİNİ İŞARETLE

		 Kesinlikle Katılmıyorum	 Katılmıyorum	 Fikrim Yok	 Katılıyorum	 Kesinlikle Katılıyorum
12	Karşı taraftaki grup arkadaşlarımla buradaki grup arkadaşlarımla olduğu kadar uyumlu çalıştık.					
13	Karşı taraftaki grup arkadaşlarımı buradaki grup arkadaşlarım kadar iyi tanıdım.					
14	Proje süresince karşı taraftaki grup arkadaşlarımla iletişimim olumlu yönde bir gelişim gösterdi.					

15	Proje sonunda buradaki grup arkadaşlarım için duyduğum yakınlığı, karşı taraftaki grup arkadaşlarım için de duydum.					
16	Grup arkadaşlarımla internet tabanlı araçlar (e-mail grupları ve Netmeeting) yardımıyla yaptığımız tartışmalar sunumumuzu hazırlamamıza yardımcı oldu.					
17	Öğretmenlerim tarafından konum hakkında araştırma yapmaya ve ilgili kaynakları okumaya teşvik edildim.					
18	Grup arkadaşlarımın fikirlerine değer vermeyi öğrendim.					
19	Bu projedeki çalışmalarımdan sonra, ileride Internet aracılığıyla yapılacak diğer projelere katılmak isterim.					
20	Bu proje Power-Point programını kullanmayı öğrenmemde çok faydalı oldu.					
21	Bu projeden sonra bilgisayar dersinin yararını farkettim.					
22	Bu projeden sonra bilgisayar dersinde daha fazla yaratıcı ve üretici olabileceğimi düşündüm.					
23	Bu projedeki çalışmalarımdan sonra, Internet aracılığıyla yeni arkadaşlar edinme isteği duydum.					
24	Konuların çeşitliliği sayesinde bu projede oluşan tartışmalara etkin ve aktif olarak katıldım.					
25	Proje süresince kullandığımız Internet tabanlı araçlar (e-mail grupları ve Netmeeting) iletişim kurmamız için yeterliydi.					