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James Gregory Jones

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A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts

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A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts

by

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A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts

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This study examines the nature of exchanges between subject matter experts and individual students when using electronic mail for educational discourse on specific curriculum-related topics. Teams were selected from those that communicated using the Electronic Emissary between February 1993 and December 1999. A team is defined as a group of people who exchanged at least ten messages about a curriculum-related topic, and is comprised of a subject matter expert, a teacher, a student, and an on-line facilitator. A collaborative process based on qualitative analysis of message functions/speech acts was conducted on exchanged electronic mail. Frequency of occurrence of each type of exchange was calculated, and patterns of exchanges by participants, according to their participant roles and over time, were charted. After message function/speech acts were determined, informant-centered, semi-structured interviews of all team members who could be contacted were conducted. This added participants’ perspectives of the process of Emissary-facilitated interchange to the previously identified patterns of flow and functions, thus creating a richer understanding of one-to-one telementoring.
Themes that emerged included the effects participants’ schedules can have on their communication habits, how different age groups have different priorities and schedules, how technical circumstances influences communications, and how participants’ roles shifted during discourse. The younger students were more available for open-ended discourse and had the time to sustain the communications. These sustained exchanges evolved into substantial mentoring relationships. The project-based matches remained question-and-answer dialogs and the participants were less satisfied with their experiences. The willingness of participants to shift roles had a major impact on the quality of discourse. When one or more of the primary roles were absent, the match, while still successful, suffered in some form.

As the Internet and other telecommunications media become more accessible and affordable in the home, exchanges involving students using electronic mail to communicate with subject matter experts will become more commonplace. It is important to understand this individualized exchange dynamic. These results could be used to enhance communication and learning opportunities by classroom teachers and home schooling parents who want to provide subject matter experts as mentors for individual students.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER 1: INTRODUCTION</th>
<th>.......................................................... 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose of Study</td>
<td>........................................................................ 3</td>
</tr>
<tr>
<td>Relevance and Value of the Study</td>
<td>.......................................................... 5</td>
</tr>
<tr>
<td>Methods</td>
<td>........................................................................ 6</td>
</tr>
<tr>
<td>Assumptions and Limitations of the Study</td>
<td>.......................................................... 8</td>
</tr>
<tr>
<td>Organization of the Study</td>
<td>........................................................................ 11</td>
</tr>
<tr>
<td>Credits</td>
<td>........................................................................ 12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 2: REVIEW OF THE LITERATURE</th>
<th>.......................................................... 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical Overview of the Internet</td>
<td>........................................................................ 14</td>
</tr>
<tr>
<td>Student’s Use of the Internet</td>
<td>........................................................................ 17</td>
</tr>
<tr>
<td>Computer Mediated Communications (CMC)</td>
<td>.......................................................... 22</td>
</tr>
<tr>
<td>CMC Research</td>
<td>........................................................................ 26</td>
</tr>
<tr>
<td>On-Line Interactions</td>
<td>........................................................................ 27</td>
</tr>
<tr>
<td>Characteristics of the Groups and Organizations</td>
<td>.......................................................... 28</td>
</tr>
<tr>
<td>Social-Psychological Factors</td>
<td>........................................................................ 35</td>
</tr>
<tr>
<td>Technological Characteristics</td>
<td>........................................................................ 40</td>
</tr>
<tr>
<td>Related Discourse Analysis Research</td>
<td>........................................................................ 43</td>
</tr>
<tr>
<td>Electronic Mail</td>
<td>........................................................................ 54</td>
</tr>
<tr>
<td>Mentoring</td>
<td>........................................................................ 59</td>
</tr>
<tr>
<td>Telementoring</td>
<td>........................................................................ 64</td>
</tr>
<tr>
<td>Telementoring Services</td>
<td>........................................................................ 65</td>
</tr>
<tr>
<td>The Electronic Emissary Project</td>
<td>........................................................................ 75</td>
</tr>
<tr>
<td>The System</td>
<td>........................................................................ 81</td>
</tr>
<tr>
<td>Facilitators</td>
<td>........................................................................ 97</td>
</tr>
<tr>
<td>Past Research on the Electronic Emissary</td>
<td>.......................................................... 101</td>
</tr>
</tbody>
</table>
CHAPTER 3: RESEARCH DESIGN AND METHODS ............................................. 128

Nonpositivistic Research .............................................................................. 128
Strategy for Inquiry ...................................................................................... 131
Research Setting .......................................................................................... 132
Participants ..................................................................................................... 133
Sampling Procedure ...................................................................................... 133

Methods and Procedures for Data Generation, Collection, and Analysis ...................................................................................... 136

Method 1: Collaborative Coding of Message Functions/Speech Acts .......................................................................................................................... 137
Data Collection .............................................................................................. 137
Collaborative Data Analysis ......................................................................... 138
Analysis ......................................................................................................... 142

Method 2: Constant Comparative Coding of Data from Informant-Centered, Semistructured Interviews ...................................................................................... 144
Data Generation .............................................................................................. 144
Analysis ......................................................................................................... 148

Study Report ................................................................................................. 150
Rigor and Trustworthiness ............................................................................. 151
Authenticity ..................................................................................................... 160
CHAPTER 4: RESULTS

Books ............................................................................................................... 166
Medicine........................................................................................................... 192
Clouds.............................................................................................................. 211
Arthur .............................................................................................................. 233
Forecast............................................................................................................ 255
EE-scifair ........................................................................................................ 274
Primary Patterns ............................................................................................ 291

CHAPTER 5: CONCLUSIONS AND IMPLICATIONS

Projects with Deadlines vs. Open-Ended Discussions............................... 296
Message Functions and Their Use in Communications ........................... 299
Age as a Factor ............................................................................................... 304
Unanticipated Problems................................................................................ 306
Important Roles of Participants ................................................................. 313
  The Support Person ................................................................................. 315
  The Information Person.......................................................................... 317
  The Question Asking Person .................................................................. 318
  The Project Manager................................................................................ 318
Directions for Future Research ................................................................. 322
Conclusion ...................................................................................................... 324
APPENDIX A: PERSON AS INSTRUMENT .......................................................... 326

APPENDIX B: CONSENT FORMS ................................................................. 335

APPENDIX C: MESSAGE FLOW AND FUNCTION ................................. 343


REFERENCES .......................................................................................... 387

VITA ........................................................................................................ 402
CHAPTER 1: INTRODUCTION

People in many areas of professional endeavor and at all levels of technical experience are readily adopting electronic mail as a daily method of communication (Caswell, 1988). Since the early 1980’s, electronic mail has become an increasingly important tool in education as well (Black, Levin, & Mehan, 1983). The experience and expertise gained by educational uses of electronic mail has been made possible due to the rapid growth of the Internet. It is estimated that by the year 2001, upward of 35 million K-12 students will use Internet resources and tools from either home or school for educational purposes (Market Data Retrieval, 1999). This growth, coupled with the increase of student access to the Internet in the U.S., and with the fact that almost one-sixth of all American homes in 1994 supported a modem connection to a network (National Institute of Standards and Technology, 1994), has made communication between individual students and subject matter experts a practical and convenient activity whose educational antecedents are worthy of study.

Since 1993, the Electronic Emissary Project has functioned as a “matching service” between volunteer subject matter experts and students (Harris & Jones, 1999). The Emissary also allows for the collection and study of electronic mail exchanges between subject matter experts and students. In most cases, the Emissary fosters communication between subject matter experts and classroom groups. Approximately fourteen percent of matches
formed between 1993 and 1999 have been teams involving individual students and subject matter experts. Much of the published research developed from the project has focused on the larger number of matches involving student group-to-subject matter expert interactions (e.g. Harris et al., 1995; Harris & Jones, 1995). This research study will concentrate on the work of individual students with subject matter experts. Three previous pilot projects completed by this researcher have honed the methods used for this study (Jones, 1996; 1995; 1994). The methods section of this dissertation will detail the process finalized by these pilot projects.

Electronic mail (e-mail) communication may be used to foster partnerships between individual students and subject matter experts for various traditional and non-traditional educational activities. Hunter (1990) noted that much of the underlying motivation for experimentation in telecommunications with regard to student learning has stemmed from the desire to provide more real-world contexts for learning than what the typical classroom and textbook-based curriculum provide. Lenert & Harris (1994) observed several projects in which students’ electronic correspondence with adults had been documented, but it was clear that there was much more to learn about the nature of student-to-subject matter expert interactions. Riel & Harasim (1994) commented that the study of the nature of social interaction among the members of a networked community is one of three primary and viable approaches to research on educational telecomputing, resulting in "a better understanding of the overall community of users and
their shared activity” (p. 97). In order to better understand the types of communications that occur between individual students and subject matter experts during exchanges, in-depth analyses of these exchanges are needed.

**Purpose of the Study**

The purpose of this study is to understand how individual students and their telementors communicate. Analyses of discourse created by individual students and subject matter experts, interpreted and extended by interviews with the individuals participating, would be of assistance to educators wanting to have a clearer understanding of such communication. This research describes the exchanges themselves and the perceptions of available team members of the process of telecollaboration. Each analysis provides a richer notion of the participants’ perspectives on Emissary-facilitated interchange.

I believe that the findings of this research will add to existing knowledge about the types and methods of educational discourse and interchange that occur on-line. This information can then be used by interested parties (e.g. teachers, parents, educational administrators) who are considering student-centered telecommunications as a way to enhance student learning in either home or classroom environments. Understanding
the scope and depth of existing exchanges in these individual student-focused telementoring teams might result in a higher percentage of successful telementorships and a richer use of the medium by teachers and parents.

This study also addresses an existing need for research specific to the Electronic Emissary Project. Much of the published Emissary research to date has focused on groups of students communicating with experts. Research into teams with individual students allows a broader understanding of the Emissary Project as a whole. Communication differences between group and individual student teams have also emerged.

My interest in pursuing this research has been nurtured by my work on the design of the Emissary system from its initial conception and organization in 1992. This research represents the culmination of three previous pilot studies on various aspects of Emissary-related communications (Jones, 1996; 1995; 1994). Of the methods proposed for use in this research, some have been refined in the course of these past projects. It is hoped that this study will be perceived to be a worthy contribution to educational computing research, as well as to the specific body of work regarding telementoring.
Relevance and Value of the Study

There is a considerable amount of potential value that this research could have for the K-12 and home schooling educational communities. As more schools and homes gain faster access to the Internet, both communities seek new methods to utilize the informational bandwidth that is now available for educational purposes. While much of the earliest pedagogy has confined the Internet to use as a virtual and expanding library, Harris (1995) describes how educators are discovering more telecollaborative ways to use this newly accessible resource. Postero (1992) observes that once technology (e.g. Internet) is adopted as a group decision, individuals are left to determine implementation issues. He states, “Adoption of an innovation does not guarantee its acceptance or success.” (p. 1)

The rapid growth and availability of educational telecommunications within the classroom and the home, and its potential for enriching educational practices, are factors that highlight the need for this research (Anderson & Harris, 1997). The Internet has been recognized as an educational resource that can provide content-related, curriculum-based teleapprenticeships (Levin, 1987) or electronic mentorships (Riel & Harasim, 1994). Thus, the value of this study’s results lies in the exploration of a new type of student inquiry using the Internet. Teachers may be interested in telementoring as a method to advance individual student learning.
The results of this research may enable readers to better understand the nature of individual Electronic Emissary student telementoring work and to recognize the potential of similar exchanges. The research presented may help the reader transfer relevant findings to telementorships occurring locally.

Methods

The study that follows presents an integrated portrayal of message functions/speech acts, experiences, and perceptions of Electronic Emissary team members. The fifty-two teams available for study included individual students, teachers, facilitators, and subject matter experts who communicated between February, 1993, and December, 1999. The study focused on message functions/speech acts, seeking and reporting upon patterns of content, purpose, and intended audience of the messages exchanged. It also used interviews with available team members, highlighting multiple perceptions and differing experiences of individualized telementoring. Constant comparative coding of data (Glaser & Strauss, 1967; Lincoln & Guba, 1985) was used for data generated in informant-centered and semi-structured interviews with all available members of teams serving individual students. The interviews further explained communication patterns shown for each group available for study.
The following questions reflect the foci of the research and shaped the interview interactions:

• How do patterns of message function and flow correspond with the participants’ perceptions of the exchanges?

• How do the subject matter experts and individual students perceive communications in similar or different ways?

• Did the focus for interaction change during the exchange? If so, how?

• Were the students’ questions addressed? If so, how?

• What do the participants consider to be “good” exchanges?

• How comfortable were the participants during the learning experience? What, if anything, made them uncomfortable?

• What problems arose during communication? How did participants address them?

• What do the participants consider to be the best/most satisfying part of their exchange?

• What were/are the expectations as compared with perceptions of outcomes of the exchange by all participants?

More questions emerged once data generation began. Some questions were more relevant to the perspectives and experiences of particular informants than to others.
Assumptions and Limitations of the Study

The design of the inquiry was influenced by a number of phenomenological and personal assumptions. The following understandings are derived primarily from tacit knowledge and are based on personal experience gained during previous investigations utilizing the same strategy for inquiry:

• As a researcher, I can elucidate the interactions and the multiple realities of different participants through my own insight and understanding of the data.

• As a researcher, I can precisely use agreed-upon coding specifications for defining explicit message functions and flow types.

• The participants can provide reasonably accurate and detailed accounts of their experiences with regard to the project.

• The protection of privacy for each participant, by the use of pseudonyms and the promise of secrecy, will support unrestrained communications of perceptions without fear of reprisal from outside sources.

This study’s results may have been affected by some limitations. Only a limited number of interviews can be accomplished successfully with the informant pool and in the time available. Also, in some of the cases studied, a considerable amount of time will have elapsed between the conclusion of online teamwork and data generation for this study. Some informants were
not reachable and some were not able to recall their exchanges with enough clarity to provide meaningful data on some topics during the interviews. The use of specific messages from completed teamwork as examples seemed to help participants to recall their online experiences better, but findings are limited to the types and levels of experiences the participants could recall.

There is some risk of premature closure for this study. However, the following factors should help minimize this risk: a) my close and intimate involvement with the study over time is accounted for in the Person as Instrument Statement (see Appendix A), b) a detailed reflexive journal maintained throughout the inquiry should have helped to provide a basis for trustworthiness of results, and c) consultations with knowledgeable peers were done throughout the study as another way to ensure the trustworthiness of the study's results. These tools were used to ameliorate threats to credibility introduced by the assumptions and limitations of the study and to persuade readers of the study as to the trustworthiness of my findings (Lincoln & Guba, 1985).

The experience I gained from conducting the three pilot studies (Jones, 1994; 1995; 1996) should have increased my accuracy in analysis of message function/speech acts. However, I paid special attention to generating and coding interview data, since I previously had less experience with this approach than with other types of data generation.
As a nonpositivistic researcher, I have not predicted outcomes, but have allowed patterns and findings to emerge as the study progressed. My responsibility as a researcher was to report and show, with as much richness and detail as possible, the patterns discovered during the study. It is the responsibility of readers of this study to judge the transferability of the findings based upon their beliefs and previous experiences, and also to determine how best to use the information contained in this document within their own educational contexts.
Organization of the Study

This dissertation includes the following sections:

• Chapter One consists of a brief introduction and overview of the study.

• Chapter Two reviews the current body of literature most directly related to the study.

• Chapter Three discusses the research paradigm from which the focus and intent of the study are derived, the methods and procedures that were used to generate and analyze the data, and the techniques used to communicate the research findings.

• Chapter Four presents analyses of the selected electronic teams’ interactions, based on the discourse analysis as discussed in Chapter Three. This chapter also includes case reports providing descriptions of the experiences and perspectives of informants interviewed. A holistic view of participants’ perspectives is presented in order to better understand the patterns uncovered in the discourse analysis.

• Chapter Five contains conclusions, implications, and recommendations. The chapter discusses what has been learned from the study, as well as possible implications of the study’s results.

• The appendices contain information required to support and reference the methods and findings of the study.
Credits

The organization of Chapter One and Chapter Three was influenced by the work of two fellow doctoral students. I would like to offer special thanks to Karen L. Ferneding (Ferneding, 1996) and Maria Rousseau (Rousseau, 1996) for sharing their dissertation proposals with me. Additional special thanks are extended to Bridget Bem and Dorothy Jones for their help in proofreading and to my family and friends for their support during this journey.
CHAPTER 2: REVIEW OF RELATED RESEARCH AND THEORY

The purpose of this literature review is to provide a summary and interpretation of existing knowledge in the fields that directly relate to this study. These include:

• Historical overview of the Internet
• Students’ use of the Internet
• Computer-mediated communications (CMC)
  • Related educational telementoring and CMC research
  • Related discourse analysis research: electronic mail
• Electronic mail
• Telementoring and electronic mentoring services
• The Electronic Emissary Project
  • The system
  • Facilitators

Some of these areas of inquiry will only be summarized with regard to the study in question, since they represent libraries of knowledge as subjects in and of themselves. The topics will build on each other so that the reader may better follow and understand the types of research conducted and being proposed, then synthesize the information discovered and communicated in the study’s results.
Historical Overview of the Internet

How did the telecomputing tools related to this study originate? The main technology used in this project, electronic mail, has been in existence for only a short time, and has been used even more briefly within the educational environment. Not until three years after the first man walked on the moon, in 1969, was there something defined as “e-mail” being sent over a network connecting computer systems. In 1972 the first electronic mail message traveled over the ARPANET (Advanced Research Projects Agency Network) (BBN, 1996).

During the early 1950’s, ARPANET was created to foster the development of information technologies. A major concept of the ARPANET project became the design of packet-switching outlined by Paul Baran, which later became TCP/IP (Transmission Control Protocol and Internet Protocol) and the Internet. Electronic mail was a result of the creation of ARPANET; thus, nearly twenty years elapsed between the construction of the first rudimentary computer networks to the first electronic mail communications (Cerf, 1998).

The rate of change in the first twenty-five years of ARPANET (1950 - 1975) was at a snail’s pace when compared to the rapid growth and development of succeeding systems that have been in operation during the last twenty-five years. The first TCP (Transmission Control Protocol) software, which is key to today’s Internet, was written in 1977 for a DEC
PDP-11/44 computer, although its roots can be traced back to NCP
(Network Control Protocol) in 1970. Packet-switched TCP/IP is the key to
the Internet, because it allows computer information to be exchanged across
divergent network topologies and between varying computer architectures.
Six years after the creation of TCP, around 1983 the Internet came into
existence. In 1986, the National Science Foundation implemented the
NSFNet, a national system of regional networks connected over a central
backbone. Over time the NSFNet replaced ARPANET. Later, deregulation
of NSFNet was a main contributing factor for the tremendous expansion of
the Internet within the U.S. The expansion within the U.S. influenced greatly
the expansion of the Internet across the face of the globe, to include countries
on all continents (BBN, 1997; Hunt, 1992; MIDS, 1997).

The rate of growth of the Internet is phenomenal. In 1969, ARPANET
connected only four western state sites. By 1975, the number of sites had
grown to sixty-three. By 1980, APRPANET linked more than 400 host
computers at some 200 sites, allowing some 10,000 people across the United
States and in several overseas locations to communicate among themselves.
In 1983, TCP/IP (Transmission Control Protocol/Internet Protocol) was
established and the base from which the Internet grew was put in place. By
1984, the number of computers connected by networks grew from 400 to
1,000. By 1989, twenty years after the first four computers were connected,
the Internet was supporting more than 100,000 host computers. By 1993, the
Internet was allowing some 1.5 million hosts to interconnect with each other
(Ziegenhals, 1996). In January 2000, the Internet had grown to include 93 million connected computer hosts (MIDS, 2000).

An article published in January, 1999 reported that the Global Matrix, which is made up of all electronic networks that exchange electronic mail and which includes the Internet, is supporting over seven hundred million people, of which the Internet represented over one hundred million users. Only the future can tell where the growth and possibilities of the Internet will lead; however, it has been predicted that 827 million people will be using electronic mail by 2001 (MIDS, 1997). If this prediction of growth is accurate, then we can continue to expect an increasing number of students to have global electronic mail access at both home and school.

Just as the Internet grew from humble beginnings, so did many of the applications that allow easy access to the Internet. The first two user applications were Telnet (allowing use of remote computer applications) and FTP (allowing file transfer between computers) which were first available in 1971. This was one year before electronic mail (e-mail) came on-line. Gopher and WAIS user interfaces were not developed until 1991, twenty years after their more primitive predecessors. These very useful tools were followed quickly by the advent of the most widely-used Internet interface in 1992-93: the World Wide Web. Amazingly, most tools being used by the vast majority of users on the Internet today were developed during the first half of this decade (BBN, 1997; Musciano & Kennedy, 1996).
What this means to the many educational institutions now using the Internet is that their members have access to a vast storehouse of information and tools, and connection to many other Internet users through interconnected computer networks. For teachers and students, access to this information is a click away. Rapid, global interpersonal communications are also feasible in ways not possible in the past. Most people today can connect their computer to the Internet and immediately communicate with other people and computers that are also connected to the Internet anywhere in the world (Hunt, 1992). These new interactions are actively exploited by the Electronic Emissary Project.

**Students’ Use of the Internet**

As previously discussed, the Internet is an international set of interconnected information networks that today serves more than one-hundred million users in more than 237 countries (MIDS, 2000). While the Internet’s beginnings were focused upon providing communications among university researchers working on a military project, K-12 educators and their students have become a growing part of the system (Kantor & Neubarth, 1994). Since the early 1990’s, government and local programs, the media, and parents have pushed to get classrooms connected so that students and teachers can directly benefit from the wealth of information available via the Internet (Winters, 1998).
This growth of Internet access and usage in schools has been tracked by the National Center for Education Statistics (NCES) since 1994. Recently, NCES (2000) indicated that ninety-five percent of U.S. public schools had at least one Internet connection, which was a thirty-five percent increase since 1999. An important point in this report was that the five percent of public schools that did not have access to the Internet currently have plans to obtain access by the year 2001. The goal of having all schools in the U.S. connected to the Internet by the year 2000 has almost been attained.

As the NCES report states, establishment of Internet connections within schools is moving forward in many parts of the United States. In 1997, for example, Southwestern Bell announced the launching of a project called "Operation SchoolNet," which was intended to wire nearly 6,200 classrooms for Internet access throughout Texas, Missouri, Oklahoma, Arkansas and Kansas (Southwestern Bell, 1997b). Also in 1997, The Texas Education Agency (TEA) and the General Services Commission (GSC) of Texas negotiated a contract with Southwestern Bell Internet Services (SBIS) to provide discounted dial-up Internet access to support TENET’s 60,000 plus users (Texas Education Network, 1997a; 1997b). These services offered to educators in Texas support a graphical Web interface and other higher-end Internet applications that the original text-based TENET system did not provide. The SBIS system has replaced the original statewide dial-up access
service, which was provided by the University of Texas' Office of Telecommunications Services (OTS) from TENET's inception in 1991 (Knezek, Jones, & Brumbaugh, 1991). Ten years after its birth, TENET is being phased out as an Internet Service Provider in February 2001, since the expectation now is that each school has its own connection. TENET will continue to support web pages and electronic mail accounts. These are two examples of changes happening across the U.S. to bring more Internet connectivity to the local educator and student.

In 1998, 78 percent of students in grades 1-12 used the Internet at school, with the majority of these students having access to electronic mail. Students had higher access to the World Wide Web than the year before, but still was not as widely available as access to electronic mail (NECS 2000). Electronic mail is still the most common and available information-access mechanism for students and teachers. The Electronic Emissary Project was begun in 1993, when electronic mail was the single most available Internet resource. Even as the World Wide Web and other types of information access to the Internet continue to develop, electronic mail continues to be the most common resource for Internet communications in schools (Heaviside, Farris, Malitz, & Carpenter, 1997).

Individual student use of the Internet is increasing, as shown by the fact that the 57 million consumer users reported in 1997 is expected to increase to 377 million consumer users by the year 2001 (MIDS, 1997). The
two largest user groups showing significant growth in use of the Internet have been the young and the elderly (MIDS, 1997). A report from Southwestern Bell Telephone indicated that the number of second telephone lines and Integrated Services Digital Networking (ISDN) lines being installed into customers’ residences in Texas had doubled in 1996 as compared to 1995 (Southwestern Bell, 1997a). ADSL (Asymmetrical Digital Subscriber Line) and Cable Modem technology are currently replacing ISDN access, since access from these new interfaces provide cheaper and faster access to the Internet (Jones, 1998). Combine these facts and the end result is that an increasing number of students will have faster and less expensive access to the Internet at home.

As we begin the century and millennium, the chances of students being connected directly to the Internet both at home and school is greatly increased. However, as pointed out by Anderson & Harris (1997), education should avoid falling into the “Everest Syndrome,” in which we think that technology should be used in the classrooms simply because it is available (Maddux, 1991). Society can place too much emphasis on providing Internet connectivity without understanding the true nature of how students at home and school will finally utilize it. Salvin (1989) tells us that schools have a tendency to implement a technology, but never support it long enough to see results, before moving on to the next technology adoption. This “faddism” with the use of technology leaves students and teachers in a perpetual state of change, with never enough time to adopt and use the new
technology in a meaningful pedagogical manner. In an article published by IBM in *The Multimedia Today Interview* (Greene, 1995), Seymour Papert comments on this “technocentric” behavior surrounding the introduction of new communications technologies in schools.

If you start with the “technocentric” question of how can global networks be used for learning, you get bad answers. What we should be doing is developing a philosophy of learning and then asking how global networks can be used to support it. With the kind of learning I think is important, the kind where the most important thing is carrying out projects or accessing the knowledge you need to answer your curiosity, being able to communicate across the world offers fantastic opportunities. To be in touch with other people who have the same interests and can help you ahead to the next layer of problems. This aspect of global networking can radically transform learning opportunities. Classrooms are very artificial learning communities. The chance that some other kid in your classroom shares your interests is very small; the chance that somebody in the world does is very high. If you can get together with the people who think like you and share your interests, your learning will skyrocket because you’re able to follow through on what you care about and can do well.

(Greene, 1995, p. 1)
As Papert, Salvin, and Maddux point out, just connecting a student to the Internet will not ensure successful utilization and learning. More thought and energy must be devoted to the methods involved in applying technology to individual learning situations and interactions which best benefit the student. The types of interactions provided by the Electronic Emissary are representative of this approach. In my opinion, one of the strongest outcomes of the recent educational telecommunications revolution is recognition that it is the nature of exchanges between people that is responsible for the facilitation of learning, and not the networks themselves.

**Computer Mediated Communications (CMC)**

Computers connected together using the telecommunication infrastructure constitute the technical foundation of computer-mediated communications (CMC). The details of how the technical equipment transfers information are invisible and irrelevant to most individuals who make use of telecommunications, except when the technical difficulties restrict their access to services. The critical components of CMC are the combination of the everyday usability of the telephone, the ever-lowering cost and ever-increasing ease of use of computers, and the fact that one does not have to be an engineer to make these things work (Rheingold, 1993; 1996). Due to the growth of and access to the Internet, it is becoming one of the primary vehicles for CMC. *Cyberspace*, the term coined originally by
William Gibson in his science fiction novel, *Neuromancer* (Gibson, 1984), is one name for the conceptual space where words, human relationships, data, wealth, and power are manifested by people using computer mediated communications technology (Mays, 1997). Increasingly, this type of interaction also occurs on the Internet of today.

CMC learning environments are typically mediums of written discourse, which have some of the spontaneity and flexibility of spoken conversations (Kaye, 1989). CMC systems are now being used more frequently to provide non-traditional communications access to address a diverse range of business, industrial, and educational interests. This type of communication has become one of the fastest growing segments in the computer market and may become the medium of choice for person-to-person or group communication (Manning, 1986; Smeltzer, 1992). This technology growth has corresponded with an increase in educational research during the last several years. Clearly the field of telecommunications will provide fertile ground for researchers in the future (Nathan, Krajcik & Patrick, 1995). Beverly Hunter (1990), for example, felt that it is important to “... create and build upon a coherent body of knowledge concerning effective design characteristics of computer-mediated educational communities.” (p. 49)
A benefit of CMC is its independence from time and geographic constraints. This allows people to participate on-line whenever and wherever they find it convenient. CMC can also provide a democratic environment for group interaction by allowing equal time and access for participants to voice thoughts and interact, either initiating or in response to others. While they have increased potential for participation and more in-depth discussion, participants have time to think about their remarks and responses. An understanding of these benefits is important when using CMC (Romiszowski & de Haas, 1989).

Hiltz, Kerr, and Johnson (1985) list several important factors that may determine whether a CMC system will be used by its participant(s). Users must want to use the system at the outset. If a user does not start at the beginning of a communications cycle, there is a good likelihood that they will not participate during the conversation. Hiltz, et al. (1985) state that with some CMC systems, strong, active leadership must be present on-line to help organize and direct communications when discourse begins to wane and users procrastinate. In order to keep participants engaged in the process of communicating, the system being used should have adequate features, a good user interface, and a high level of reliability. While adequate features and good user interface may be circumvented, a lack of system reliability can seriously hinder successful use of the system (Simpson & Pugh, 1992). Users must also be adequately trained on the system in order to eliminate any reasons not to access and use the CMC environment being implemented.
Thus, when a user has a technical problem or question, support must be readily available in order to ensure that no breaks in communications occur (Simpson & Pugh, 1992).

There are several reasons why educators and researchers are promoting the use of networks and computer-mediated communication for education in K-12 classrooms. Although network facilities are commonplace in higher education environments, they remain less so in K-12 schools. One of the most common justifications given for the establishment of educational networking projects is the belief that use of computer networks fosters collaborative learning. Computer networks like the Internet are ideal channels for collaborative learning tasks (Silva and Breuleux, 1994). Computer-based communications technology makes it possible to extend the positive effects of cooperative learning by creating teams composed of participants who are in a variety of distant locations. In many cases, groups of students are brought together who would never have had opportunities to work together because of social class, geographic, or cultural differences (McCormick & McCormick, 1992; Riel, 1993; Zimmerman, Zimmerman, & Blanton, 1995).

As connections to the Internet by K-12 schools become more commonplace, educators will have new opportunities to integrate collaborative learning techniques with new curricular activities, projects, and instructional methods (Sellers, 1994; Spears & Lea, 1994). The Electronic
Emissary is one such telementoring project that can help teachers bring a diversity of instructional methods and resources into their classroom activities.

The next section of this report will discuss educational telementoring and CMC research relevant to this study. Much of the information presented details message analysis and flow of communications, which are important factors in this study.

CMC Research

In 1986, Hiltz identified four primary considerations when designing the research to study what she called the “Virtual Classroom.” The virtual classroom was defined as one that would virtually exist, with students, teachers, and others involved, but not physically located within the same classroom. These considerations may be summarized as a) on-line interactions; b) characteristics of the groups and organizations within which systems were implemented; c) social-psychological factors focusing on characteristics of the users; and d) technological characteristics of the system. This section presents relevant CMC research grouped using those areas of focus as outlined by Hiltz.
On-Line Interactions

Harris (1995) has compiled a list of interpersonal exchange activity structures that fit well within computer communications. Activity structures vary, depending on the method of exchange. Included in Harris’ list are keypals, global classrooms, electronic appearances, electronic mentoring, question-and-answer services, and impersonations. This list of activity structures provides a good overview of the types of communications employed for exchanging information and content between participants with electronic mail. As seen below, the Electronic Emissary fits into one of the categories of activity structures. Keypals structures involve electronic conversations between individuals, groups of individuals, and/or groups. Keypal projects were the first educational CMC activities to be used on-line. Electronic mail serves as the primary method of communications. The global classroom approach attempts to link classrooms in different parts of the world for the purpose of sharing perspectives, information, and research, with an emphasis on curriculum-related topics. By bringing together classrooms virtually, students can view realities from multiple global perspectives. Electronic appearances are possible when a special guest is available for correspondence. Activity is normally very short-lived, since the special guest often has a limited time to participate in the discussion. Electronic mentoring allows subject matter specialists from varying fields to interactively communicate with classrooms or students. These interactions can be long or short in duration. The Electronic Emissary supports such telementoring exchanges, which may last from several weeks up to several
years. Question-and-answer services allow students to ask questions which are answered by subject matter experts. Examples of such services are those offered by the U.S. Geological Survey and TAPR (Tucson Amateur Packet Radio Corporation). Students submit questions via electronic mail to the hosting organization, which then routes the question to an expert within the group. The answer is sent as a reply message from the subject matter expert to the person who posed the question. Impersonations require that someone assume the role of an historic, literary, or otherwise notable individual for the purpose of communicating with the group in character. This enacting of the special guest’s persona, accompanied by a suspension of disbelief by the other participants, provides a richer exploration of a topic of inquiry than a typical discussion would allow. All of these methods of organization provide the structures necessary to allow curriculum-based interpersonal interaction to occur.

**Characteristics of Groups and Organizations**

Margaret Riel, a well-known author in the field of CMC, has stated, “A crowd of people which only share an opportunity to communicate are not a group; it lacks organization and shared purpose” (1990, p. 445). Thus, it is important to study the characteristics of groups and organizations in how they make CMC function. Research on organization, structure, activity cycles, and flow concepts with respect to CMC will be presented here.
Riel (1990) identified several structures which lend themselves to the electronic communications medium that focus on participant roles and needs. These include electronic forums, computer conferences, special interest groups, teachers’ lounges, and realtime chats. Electronic forums, like on-line conferences, allow participants to interact over time. Normally, electronic forums are conducted using a shared system, but electronic mail can also be used. Special interest groups (SIGs) are groups of people sharing some special or common interest. SIGs can be hosted on several different types of communications systems. Electronic mail systems are a popular medium for SIGs. Teachers’ lounges, which are much like electronic forums or SIGs, use the premise of a virtual teachers’ lounge, or a place where teachers can meet between classes or during their breaks to discuss classroom topics and share information. Chats, often using IRC (Internet Relay Chat software), are synchronous person-to-person communications. That is, all participants must be on-line and connected to some form of communications system which relays what is typed to all participants in real time.

Based on these organizational metaphors, Riel (1991) has developed an analytic framework of participant structures to compare interaction within and across computer network communities. These structures examine network interaction and classify the interaction into four areas for review. The first area deals with how an organization may be characterized as a network group by looking at the size, common knowledge, interests, past experience, and locations of the group members communicating. Next, Riel
determines the types of network task organization and how the group members participate with each other using networked activities. Riel then examines the response opportunities and obligations of each participant. Factors such as ease of access and types of interaction are considered. The final condition is the amount of coordination and support that the structures require to help participants with curriculum development, quality of access, and quantity of exchanges. These factors allow a researcher to consider on-line communications in several different ways.

Riel and Levin (1995) applied Riel’s participant structures with a comparison of several different attempts to create networked communities. The factors weighed in the comparison were based on the Sharan’s Group Investigation model, which included such items as the formation of the group, project planning, task accomplishment, creating and evaluating the publication, and sharing the communications process. Riel and Levin also generated a list of factors that would indicate when a CMC interaction might succeed. These factors included: a) Do participants work together or share interest in the task, but find it arduous to meet at the same time and/or in the same location? b) Before communications begins, does the group determine and define a well-identified task to be accomplished? c) Does the group have reliable access to the necessary computer equipment for communications? d) Do participants share a sense of obligation to the group and/or task? e) Does the group have strong leadership? All of these issues appear to be important criteria in distinguishing between successful and less-
than-successful CMC interactions. These steps may be thought of as necessary check points in the development of a successful telementoring system (Riel & Levin, 1995). Work done by Kraut, Galegher, and Egido (1987) divided collaboration into the initiation, execution, and public presentation of CMC interactions. Research by Levin and his colleagues has followed up the work done on CMC organization and structures with research on activity cycles in classrooms in which electronic mail is utilized.

Research reports by Levin, Waugh, Chung, and Miyake (1992) and Levin, Kim, and Riel (1990) further characterize the activity cycles of classrooms that participated in the Intercultural Learning Network (Levin & Cohen, 1985) and AT&T Learning Circles (Riel, 1989; Riel, 1994). These studies report that the ebb and flow of activity in these environments correspond to the daily, weekly, semesterly, and yearly cycles of the classroom. Over the course of a semester, Levin et al. (1992) found that communication activity slowly builds to a peak, and then falls away completely when participants leave for holidays. One interesting assertion in this work states, “Patterns that we’ve observed in instructional electronic network interaction resemble those described in face-to-face apprenticeships” (Levin et al., 1990, p. 211). The researchers point out that this flow pattern, or the lack of it during school breaks, is a critical concern to designers who may not take this factor into account in the design of activities for use in K-12 classrooms.
Smeltzer (1992) proposes that, in addition to message cycles, research reveals relationships between message structure and intent. The research done was an analysis of CMC message activity and intent which used both qualitative and quantitative research methods. The goal was to gain a better understanding of the basic structure of messages generated in a CMC environment. CMC messages were obtained from two educationally-oriented bulletin board systems (BBS’s). The messages were then assigned to the categories of information requesting, information giving, and information neutral. Each category was then divided into message length, message complexity, and message readability, revealing that when... the purpose of the message was to give information, the message length, the message complexity, and the message readability all increased. Evidently, this group of CMC users, in composing information giving messages, tended to utilize more verbiage and longer messages to respond to information requests (Smeltzer, 1992). Another important finding showed that messages aimed at information giving and requesting were the prevalent types of message exchanges.

I completed a similar set of pilot projects, which included elements from both Smeltzer’s and Levin’s (Jones, 1994; 1995; 1996; Jones & Amill, 1996), and which were focused on determining message patterns that occurred for student groups and individuals in the telementoring environment of the Electronic Emissary Project. One clear conclusion was that decreases in activity did occur during school calendar holidays.
Messages aimed at information giving and requesting were also prevalent types, but only in some of the Electronic Emissary exchanges reviewed. However, no other consistent patterns could be discerned from analysis of message flow and function by participants over the three-year period. This could suggest that the activity of participants in a CMC environment is affected more by personal priorities than any other factor, since CMC interactions might be held as a lower priority than local commitments, such as going to the doctor or participating in a classroom field trip. This emerges in direct contrast to results of the Levin et al. (1989, 1992) and Smeltzer (1992) studies.

The functions of messages between participants have been an important topic of research within a CMC environment. A study by Quinn, Mehan, Levin, and Black (1983) states that CMC communications tend to develop multiple topics in a single message and that students initiate more conversations with teachers in this environment than in a traditional classroom setting. Research conducted by Riel (1989) has found similar results. Studies by Levin (1985), and later Levin, Riel, Miyake, and Cohen (1987), have reported that the CMC instructional environment helps primary students gain insight into problems more fully than in a conventional classroom, since students are not forced into a linear communication mode between each student and the teacher. They also found that students requiring more communications with the teacher benefit from the additional interaction.
An analysis of these studies shows that instructor-student CMC discourse develops more strands and persists longer than in the classroom. In face-to-face communications, as illustrated in Figure 1, the sequence of communications between students and teacher in a rational conversation or discussion takes place in a linear fashion (Romiszowski & de Haas, 1989), meaning no more than one individual, student or teacher, is speaking at a time. Communications in a CMC environment might occur at different levels and at different times. Figure 2 illustrates the potential sequence of non-linear communications in a CMC environment (Romiszowski & de Haas, 1989). The teacher or students can read and/or comment as they need or when they choose.

![Sequence of Verbal Exchanges over Time](image)

**Figure 1.** Sequence of communications between students and teacher that takes place in a linear fashion in a classroom environment (Romiszowski & de Haas, 1989).
Figure 2. Sequence of communications between students and teacher in a CMC environment. Conversation can occur between different individuals and at different times in a non-linear manner (Romiszowski & de Haas, 1989).

Social-Psychological Factors

Social-psychological factors focusing on characteristics of CMC users and their on-line interactions will be summarized in this section. Research reviewed will include the social psychological aspects of CMC as compared to face-to-face communications, the use of language in electronic communications, and the relationship of message structure to message intent.

In 1987, Kiesler, Siegel, and McGuire asked the question “How do people develop a communication network social structure using technology in social transition?” (p. 247) Their research compared the quality of group
decision making in face-to-face meetings with that of a CMC environment. They examined the problem in a descriptive manner by comparing the length, duration, and occurrence of interactions in face-to-face meetings and computer-mediated communications. Their research shows that differences in participation, decisions, and interaction among groups meeting in both fashions did occur. The study reveals that the group members using CMC participated more equally than they did when they talked face-to-face, although both types of interaction showed that one person tended to dominate the communications process. People in the CMC groups were less inhibited than they were in face-to-face groups. For example, the CMC discussions tended to have more uninhibited use of verbal behavior, such as swearing, insults, name calling, and hostile comments. These results were similar for both on-line conferencing and electronic mail-based experiments.

Kiesler et al. (1987) established several issues relevant to the social psychological aspects of CMC: a) Does electronic mail exchange change the quality, distribution, or the timing of information exchanged? The researchers in this study concluded the answer to be affirmative. b) Do communications through text alone reduce effective coordination of communications; that is, without the in-person forms of communications (eye contact, tone of voice, etc.) that typically modify exchanges. Is communication more difficult to sustain and follow? Again, the researchers believe this to be true. c) Does computer-based communication weaken social fluency by the absence of such nonverbal behavior as speaking loudly,
staring, touching, and gesturing? Although the study provides no answer to this question, today’s users of electronic mail messages may include emotion symbols (“emotions” such as smiley-faces, winks, frowns, etc.) to indicate many of these nonverbal behaviors. d) Is electronic communication depersonalizing? In fact, the researchers feel that electronic communications are empowering in many cases, since they allow a social anonymity that makes it possible to eliminate the vertical hierarchy and/or personal shortcomings that affect interactions in face-to-face meetings. e) Do users of electronic communications have computing norms and/or immature etiquette as compared to their behavior in in-person communications? In contrast to in-person communications, where social cues affect the type and level of discourse allowed, electronic communications have been seen to show both.

Kiesler et al. (1987) report that electronic mail oversteps conventional time/distance boundaries that divide office and home. As a result, the communications seem to mix work-related with personal communications. Exchanges can weave “boardroom and ball field” (p. 250) language interchangeably, to the extent that participants have a tendency to disregard normal conventions of privacy by posting personal messages to general bulletin lists.

Kiesler et al. (1987) suggest that CMC exhibits these social-psychological factors because of a) the lack of social feedback and unpredictable styles of messages, b) the equal social influence among
participants, due to the lack of hierarchical cues, and c) free and impersonal communications created by the rapid exchange of text, and d) “the absence of norms governing the social interaction which redirect attention away from others and towards the message itself” (p. 208).

Ang and Cummings (1994) examined the difference between face-to-face communications and CMC in relation to feedback-seeking patterns. Analysis indicates that positive feedback propagates greater subsequent seeking of feedback than negative feedback in both face-to-face and computer-mediated communications. Subjects who used CMC were more willing to seek feedback at the next immediate opportunity than to defer seeking it at some later occasion. In contrast, subjects in a face-to-face environment seemed more reluctant in seeking feedback, and instead selected either to delay it until later, or not to seek feedback at all.

In the area of interactions issues, a study by Smeltzer (1992) analyzed CMC message structures and meaning using both qualitative and quantitative approaches. The goal was to gain a better understanding of the basic purposes of message-based interactions generated in a CMC environment. The sample was based on one hundred and eleven messages obtained from several Bulletin Board Systems (BBS) located in the St Louis, Missouri area. Messages were then assigned to three broad categories based on where the user had posted his/her message. Technical and general bulletin-board forums generated the most messages. In addition, three categories of message intent were defined by Smeltzer. These included:
information requesting, information giving, and information neutral. Messages with information giving and requesting were the dominant message types. In addition to these two categories, the researcher assigned a message structure to each exchange, which included message length (words, sentences), message complexity (polysyllables, unique words, type/token ratio), and message readability (FOG index). Message length — based on character, word, and sentence count — showed that messages mainly varied according to the information intent of the messages. Technical conferences, for example, were more likely to respond to requests for information (35%). The conferences did not seem to be influenced by the message structure (Smeltzer, 1992). No flow analysis or message content designation within messages was attempted in the study. There was also no discourse analysis of message content.

An article by Romiszowski (Romiszowski & de Haas, 1989), which discusses interaction levels and message content, focused on an electronic mail conference between the University of Twente, The Netherlands, and the University of Syracuse, New York. The class in The Netherlands was evaluating the potential impact of new technologies on the practice of education and training. At Syracuse, a similar group of students was already using electronic mail to discuss their coursework. The instructors used a certain amount of imposed structure in order to initiate face-to-face strategies of instruction. Some 100 messages from 47 students (23 at Twente, 24 at Syracuse) were exchanged within a three-week period. Analyses of message
content were performed by both universities. The findings indicated that only 32 messages were directly related to the conference theme. The others were a mixture of test messages, hello messages, chit-chat, and some technical messages. The 32 theme-related messages were contributed by only 19 participants.

A second conference was piloted in May, 1989. The duration of the conference was shortened, while on-line interaction and group size were increased. The outcome of the second conference was not what the authors had expected. The number of actual participants who contributed content-related messages was even smaller than the first study, despite the larger group size. Only after several attempts, by the conference moderator at Syracuse to get discussion focused, did a significant level of interaction develop (Romiszowski & de Haas, 1989). This study points out that management and structure of CMC is very important in determining educational outcomes.

**Technological Characteristics**

The following section examines research that deals with technological characteristics of CMC and how it can influence communications between users. It is important to look at the technology aspects of CMC, since interactions between participants can be greatly influenced by technology.
In a U.S. Army study (Simpson & Pugh, 1992), electronic mail was used to support reserve officer training. The Army found that, although their system worked well, problems were encountered with setting up equipment, hardware breakdowns, lesson pacing, and misunderstanding the rules for computer conferencing. The researchers felt that for electronic mail to work well in education, the CMC system must be mastered without extensive training, be usable with minimal practice, and have technical support available.

Ray Olszewski of The Nueva School (Valauskas & Ertel, 1996) discusses similar issues regarding technology implementation. He suggests that to avoid the problem of very low to no usage of CMC equipment, discussions should start small and administrators of the systems should focus on ensuring that telecommunications access is of high quality and consistency. His experience was based on trying to get several classrooms on-line using electronic mail and other Internet resources. “Linux developers [at the time] were releasing new kernels [operating systems] almost weekly” (p. 76). This, coupled with a hardware-limited server, caused many crashes, and until they could solve technological problems use was limited mostly to faculty.

A similar issue was noted by Harris and Jones (1995). We found that during the first semester of the Emissary work, the server crashed and took five days to get back on-line. The period before the crash saw all teams
active, but a sharp drop-off in messaging was noted after the crash. One might speculate that teachers either lost confidence in the process or the omission of five days of activity disrupted the telementoring exchanges enough to hinder communications even when the server was fixed. It should be noted that at the time of the crash, the Emissary had not yet begun to utilize facilitators. This experience was one of the reasons facilitators were added to each team later in the project. Facilitators have the ability to bridge breakdowns in technology and interpersonal relations by sharing critical information with all parties concerned by using alternate communications context if necessary.

In the literature reviewed for this report, technological characteristics seemed to be reported more often when they caused hindrances to virtual communication. When a CMC system works well, researchers emphasize the overall operations of the CMC system in order to give the reader a better understanding of the context of the on-line cooperation. Thus, it appears that little research has been published on the technological characteristics of education-related systems themselves.

This section has discussed issues related to CMC that are relevant to this research study. The following section will focus on related discourse analysis research.
Related Discourse Analysis Research

Like the products of other, more traditional communications media, electronic mail can be analyzed. Bringing past research on conversational and spoken discourse analysis (e.g. Austin, 1962; Werth, 1981; Coulthard, 1977) together with more recent studies on non-real time interactions (e.g. Black, Levin, Mehan, 1983), analysis of electronic mail interchanges can provide relevant information for educators.

In 1935, J.R. Firth urged linguists to study conversation, for “it is here that we shall find a key to a better understanding of what language is and how it works” (cited in Coulthard, 1977, p. 1). While linguists would agree that human communications must be described in terms of at least three levels: meaning (discourse), form (syntax), and substance (phonology), there are disagreements over the boundaries of linguistics (Coulthard, 1977). Text is a choice, since the text represents a selection within numerous sets of options; everything that is written implies the background or context of the writer. Halliday (1975, p. 120) stated “A language and its linguistic system is part of the social system. Neither can be learnt without the other.” Thus, every electronic mail message presupposes a “set of options that have the potentiality of being selected under the given conditions” (Halliday, 1975, p. 78), by the writer.
Bellack, Kliebard, Hyman, and Smith (1966) propose that all interactions may be described in terms of four “moves.” Coulthard (1977) suggests that this system is of special interest to those studying techniques of discourse analysis. Coulthard (1977, p. 97) outlines the categories of Bellack et al. as follows:

1. **Structuring moves** serve the function of setting the context for subsequent behavior by either starting or excluding interaction between students and teachers. For example, teachers frequently start a class period with an opening remark in which they focus attention on the topic or problem to be discussed during that session.

2. **Soliciting moves** are intended to elicit a) an active verbal response on the part of the persons addressed, b) a cognitive response, and/or c) a physical response. All questions are solicitations, as are commands and requests.

3. **Responding moves** bear an alternating association to soliciting moves and occur only in relation to them. Their function is to fulfill the expectations of soliciting moves. Students’ answers to teachers’ questions, for example, are classified as responding moves.

4. **Reacting moves** are caused by a structuring, soliciting, responding, or prior reacting move. These moves serve to modify and/or to evaluate what has been said previously. Reacting moves differ from responding moves, since a responding move is always directly generated by a solicitation; preceding moves serve only as the occasion for reactions.
One part of discourse analysis is the study of speech acts. A speech act is the function that an utterance is intended to accomplish. J.L. Austin (1962) made the observation that a statement like “I name this ship the Queen Elizabeth,” uttered when smashing the bottle against the stern of a submarine, should be considered an assertion and, as such, is an example of a speech act. Written and spoken discourse has been analyzed by philosophers of language, linguists, psychologists, and others according to speech acts that individuals perform (Austin, 1962; Searle, 1969).

Determining the act that a particular text represents involves examination of the context in which the utterance occurred. Since statements in an electronic message context are simple and convenient to gather in their entirety (Beals, 1992), it appears that the analysis of speech acts is appropriate for discourse analysis studies that aim to uncover the functional nature of electronic mail communications (Harris & Jones, in press). The studies discussed below have used speech acts for discourse analysis in coding electronic mail.

Levin, Kim, & Riel (1990) used speech acts, which they termed “message acts,” in a study of electronic messages exchanged among adults and students in six countries involved in the Intercultural Learning Network (ICLN). The study looked for IRE sequences (teacher initiation, student reply, teacher evaluation) which were defined by Mehan in 1978 (as cited in Levin, Kim, & Riel, 1990). The researchers found that 71% of the evaluations
contained in the messages were written by adults and a substantial number were made by students. However, “less than half (39%) of the initiations were made by adults” (p. 206). Message flow analysis showed that different projects displayed peak activity at different times during the course of the exchanges.

A study by Goldman & Newman (1992) examined electronic discourse between sixth-grade students and their teacher. The communications were within a common classroom and were compared to face-to-face communication that occurred among the same participants. The study is similar to that of Kiesler, Siegel, and McGuire (1987) and relates to the results of the ICLN study (Levin, Kim, & Riel, 1990). Goldman & Newman’s (1992) students initiated interactions more frequently in electronic exchanges than in face-to-face communication, and their teachers offered evaluative comments less frequently on-line than face-to-face. Both students and teachers were conscious of similar differences in status and hierarchy in their communications within both of the two contexts.

Stuhlmann and Hochella (1995) investigated elementary and high school students’ writing while they participated in an on-line conference called “Elementary Books” during a two-year period. Exchanges between a third grade and a fifth grade class and two high school English classes in different regions of Virginia were examined to study how the presence of an authentic audience might influence the nature of the exchanges, as well as to
define the text structures present in the exchanges. A sentence-by-sentence analysis of the messages was conducted to determine the types of information being exchanged and the nature of the interactions. All exchanges were coded independently by the two researchers and communication patterns were identified and compared. The following categories were defined: a) Story facts, which contained information related directly to facts, characters and/or incidents in the story; b) Elements of a personal nature, including information about self, personal opinions, compliments, expressions of gratitude, or comments of a personal nature; c) Discourse that was somehow related to the story, but did not deal directly with facts of the story; and d) Instances of discourse that extended beyond the book’s content and into other literary areas.

Some of the results included messages that became more lively and conversational as the students began to make personal connections to the characters with whom they were corresponding. The researchers were surprised that elementary students revealed much more personal information about themselves, while the high-school students revealed more personal information about the characters, than the researchers had expected. Sixty-five percent of messages sent after initial exchanges contained both increased personal and story-related information.
McCormick and McCormick (1992) employed a naturalistic observation technique, similar to the one proposed in this research, in the study of undergraduates’ use of electronic mail at the State University of New York, Plattsburgh. Captured electronic mail discourse and self-reports collected from undergraduates were used as data. During the observational part of the study, all non-deleted electronic mail received was collected automatically each three-hour period by a computer program developed by the researchers. Ethically, the researchers felt that the students should be allowed to delete any messages they did not want to be studied. All duplicate messages were deleted from the data prior to coding. Two coding teams of two raters each were trained to use a twelve-category coding system. This coding system was developed in a previous study by McCormick and McCormick (1985), while analyzing undergraduates’ electronic mail. The categories are presented in Table 1.
Table 1  
Definitions of Coding Categories used by McCormick and McCormick Study

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-Related Coding Categories</td>
<td></td>
</tr>
<tr>
<td>Center Operations</td>
<td>Messages necessary for administering the computer facility</td>
</tr>
<tr>
<td>Program Sending</td>
<td>Computer program or game is sent through the mail</td>
</tr>
<tr>
<td>Work Comments</td>
<td>Remarks about the computer system, computer assignments, computer science courses, academic progress in computer science, and computers as they affect the user or recipient of e-mail</td>
</tr>
<tr>
<td>Less Intimate Social Coding Categories</td>
<td></td>
</tr>
<tr>
<td>Salutation</td>
<td>Polite, typically brief greeting or inquiry</td>
</tr>
<tr>
<td>Threats and put-downs</td>
<td>Intimidating or insulting remarks directed at the recipient of e-mail.</td>
</tr>
<tr>
<td>Crude Flirtation</td>
<td>Electronic ‘wolf whistle’; any flippant or sex-role stereotyped attempt to describe sexual prowess or show attraction to the recipient of e-mail.</td>
</tr>
<tr>
<td>Humor and Symbolic</td>
<td>Sender jokes with the recipient of electronic mail;’ plays a prank, or sends a drawing, poem, or song.</td>
</tr>
<tr>
<td>More Intimate Social Coding Categories</td>
<td></td>
</tr>
<tr>
<td>News and Sharing</td>
<td>User shares and/or asks for information about topics that are largely unrelated to computer science.</td>
</tr>
<tr>
<td>Refined Flirtation and Relationship Establishment</td>
<td>User tries to establish a new relationship or friendship. In the message potentially romantic relationships, sexual implications are suggested in a clever, charming fashion.</td>
</tr>
<tr>
<td>Work on Relationship and Love Messages</td>
<td>User expresses deep (positive or negative) feelings about an ongoing relationship; self disclosures are revealing.</td>
</tr>
<tr>
<td>Other Coding Categories</td>
<td></td>
</tr>
<tr>
<td>Foreign Language</td>
<td>Most or all of the messages are written in a language other than English</td>
</tr>
<tr>
<td>Garbage</td>
<td>Statement that consists of too little information to be coded meaningfully.</td>
</tr>
</tbody>
</table>

By the end of their analysis, McCormick & McCormick’s inter-rater reliability reached 82.6% and 90.2% for the primary coding category for each piece of 1,750 electronic mail messages. In addition to coding, each message was labeled by the date when it was sent and the number of words fitting the assigned coding category. The study calculated the frequency and average length of text of messages in each coding category. Out of all electronic mail examined, only 5% was characterized as garbage, or incapable of being classified. A small proportion was classified as center operations (6.7%). The last third of the semester saw 49.5% of the messages fitting into the program sending category and that percentage increased to 66.0% during the two weeks before finals. The researchers did not expect that the work comments category would comprise the single most used characterization during the observational period.

The study did make an important statement: “Although translating feelings and ideas into text took considerably longer than face-to-face conversation, users seemed to believe that the effort was worthwhile” (p. 388). Social electronic mail was equally divided into messages of a less intimate (24.1%) and more intimate nature (27.6%). Polite, brief greetings, coded as salutation made up a small portion of the electronic mail (6.6%). Electronic mail was also more likely to contain humor and symbolic content in the middle of the semester than during either the initial or later third of the semester. Mail messages that were assigned to one of the seven intimate categories were significantly longer in length than those in any other
category, other than program sending submissions. The authors did not find this surprising, since messages designated as program submissions contained little discourse, but much programming content. Programming content as defined in this study cannot be considered discourse, since the message was made up principally of computer source or executable code. Another trend noted was that electronic mail containing news and sharing content increased as the semester progressed. Also, students sent more news and sharing content after school holidays. As with the Levin et al. (1989, 1992) research, McCormick and McCormick noted that their findings appeared to reflect the social realities of the academic calendar.

In 1990, Ross, Morrison, Smith, & Cleveland explored online academic tutoring by graduate teacher certification candidates with at-risk sixth graders who had access to telecomputing facilities both at home and at school. Part of the data analysis included determining the type of message sent. These types were defined as: a) social, b) assignments, c) tutor business, d) tutee problems, e) reminders, f) explanations, g) grade reports, and h) miscellaneous. Ross et al. (1990) found that messages containing social content were sent most often (n=274), with assignment-related messages sent somewhat less often (n=104), and reminders, explanations, and grade reports sent least frequently.
Rueda's (1992) study of online discourse between learning-disabled students in grades four through six and their teachers in seven special-education classrooms showed that, although there was a high level of interactivity, communication was dominated by the teachers. This is similar to the IRE studies mentioned earlier (Levin, Kim, & Riel; 1990). Rueda coded each sentence or phrase of each message as representative of one of nineteen language functions, such as requesting personal information, reporting opinions/feelings, and reporting general fact. The study then compared the numbers of function types in three groups. Teacher-initiated and student-initiated messages that led to extended topic chains formed the first two groups. Teacher-initiated messages that did not lead to extended topic chains formed the third group. When considering all of the messages exchanged in this project, Rueda found that teachers wrote more, asked more questions, and introduced more new topics than students did, but teachers were also more conversational and informal in online exchanges than in face-to-face communication. Rueda noticed that those communications between learning disabled students and their teachers that were more conversational in style were also maintained longer than those that reflected a more traditional manner of teacher and student interactions. The perceived style of telecommunicated text exchanges is an important point to consider, in combination with purpose and participant role, when analyzing the functional nature of networked interaction (Harris & Jones, 1996).
As mentioned earlier, Smeltzer (1992) categorized messages posted to two educationally oriented electronic bulletin board systems by adults as information requesting, information giving, and information neutral. Smeltzer found that these electronic bulletin boards were used primarily for information acquisition and information giving (78%).

The above studies have several factors in common: a) They each employ some form of discourse analysis with respect to electronic communications; b) a majority of the studies examine the direction or flow of speech or message acts; c) several of the papers use categorization methods to classify discourse into exchange patterns or sequences for later analysis; d) several of the studies look into some form of student and teacher interactions when using electronic communications; e) each uses a different coding scheme for analysis process, although a few share coding similarities; and f) several studies indicated that some form of purely social exchange takes place with the use of CMC. Each of these areas is important to the research proposed for this study, and each suggests some aspect of the process and method proposed here.
Electronic Mail

Electronic mail is one of the most common ways to exchange information using the Internet (Costales, Allman, & Rickert, 1993). As a tool for communications, electronic mail “fits into a continuum of communication media, including the telephone, physical mail delivery systems, even broadcast media such as radio and television” (Caswell, 1988). Its widespread availability is one reason electronic mail is used as the primary means of communication for the Electronic Emissary Project. Electronic mail has been available on most large academic computing systems for more than two decades. Until the beginning of this decade, its capabilities largely were not explored beyond traditional uses of it as an electronic type of mailbox (D’Souza, 1991). In the academic environment, electronic mail has been used primarily by university faculty and staff to communicate with colleagues and to access research facilities and research (D’Souza, 1991).

Electronic mail uses text-processing communications software to provide an information exchange service between pairs or among groups of users. Understanding electronic mail use requires consideration of three issues. First, electronic mail is text based. Unlike telephone or face-to-face communications, electronic mail has no picture or sound components. This limitation is beginning to fade as the attachment of multimedia files to electronic mail messages becomes easier. Second, electronic mail is a fast
communications medium, as compared with more traditional methods of sending text. Electronic mail can reach a destination thousands of miles away in seconds, with the reply being delivered back just as quickly. Third, electronic mail is asynchronous in nature. That is, the sender and receiver do not have to be engaging in communications at the same time. In contrast, a telephone call is synchronous, even though as technology has advanced, telephones have become capable of providing asynchronous communications by using voice mail for the storage of messages (D’ Souza, 1992; Sproull & Kiesler, 1991).

Several tools are required to send and receive electronic mail: a computer, a connection to a network, electronic mail software, and communications software (D’ Souza, 1992). Until the user can compose an electronic message on a computer, connect to a network (i.e. the Internet), and then use software to send the message across the network, the user is not able to participate in electronic mail exchanges with others.

Several obvious benefits result from the introduction of electronic mail into the classroom. First, electronic mail can relax the physical boundaries imposed by the classroom. Students can use electronic mail to travel to and communicate with people in distant places. Second, electronic mail can lead to greater communication among the members of the class. Electronic mail allows students the time and focus to deal with communication anxiety, while interaction in a traditional classroom might not. Third, electronic mail allows
students and teachers to gain access to resources not found within the school or classroom (D’ Souza, 1992). Considering these points, Cleveland (1985) states that electronic mail can serve as an important tool in the process of educational communications.

While there are benefits to using electronic mail, Shapiro and Anderson (1985) list a number of drawbacks. First, it is often difficult for the reader to discern the level of formality of a message from its appearance. This is due to the lack of any verbal or body gestures that ordinarily set the level of formality in face-to-face or verbal communications. Second, since most senders of electronic mail messages are neither professional nor exceptional writers, attempts at humor, irony, or sarcasm are often misinterpreted. Third, the lack of feedback from body language and other in-person cues can sometimes lead to misunderstanding of the context of the message and result in “flaming.” Flaming is the exchange of messages containing content which is emotionally charged, hostile, and insulting in nature (Thompsen, 1993). Flaming typically happens because the reader has misinterpreted the intent of the original message. Fourth, long delays between the time a message is sent and the reply later is received can often blunt the effectiveness of the message.
These types of differences between in-person communications and electronic mail communications has led researchers since the late 1970’s to increase their interest in the study and theory of electronic mail use. There have been numerous studies of different aspects of electronic mail, including computer conferencing (e.g. Rice, 1984), electronic mail organizations (e.g. Schmitz, 1988), and computer bulletin board systems (e.g. Steinfield, 1983).

Researchers working with the Electronic Emissary Project are also examining what happens when people use electronic mail for communication. In the case of the Emissary project, communication happens among members of a team comprised of a teacher, student(s), a volunteer subject matter expert, and a facilitator. At first, the Emissary staff assumed that team members would be able to communicate productively within a short period of time after being introduced to each other. After the first semester of research, it was apparent that the electronic mail medium was different enough from other types of exchanges to cause problems in communication. Electronic mail requires that different interaction strategies be used for maximal educational benefit (Harris & Jones, 1995). In subsequent semesters of the project, a facilitator for each group was added to help with communication difficulties and project planning/implementation. The facilitator for each Emissary group plays a critical role in helping resolve
issues related to the medium, since not all participants have the necessary background to use electronic mail without difficulty (Harris, O'Bryan, & Rotenberg, 1996).

Facilitators are responsible for starting up teams, planning projects, sustaining communications, addressing problems, and performing housekeeping chores. The facilitator first sends out messages to each person explaining the Emissary system and the method to use to send electronic mail. Once a team has begun on-line collaboration, the students, teacher/parent, and subject matter expert communicate by electronic mail for the duration of their project. If a problem should arise or communications cease, the facilitator will step in to handle the problem or restart communications, often using telephone or fax technologies to contact silent team members. At the conclusion of the team’s collaboration, the facilitator then helps the participants write a report detailing their Emissary experiences.

As with any new medium, the impact and use of electronic mail will change as users and their needs evolve. As a future possibility, on-line facilitators’ services might not be needed in Electronic Emissary teams, since participants might better understand electronic mail’s limitations from previous personal experience. As stated above, one of the benefits of electronic mail is the ability to create communications among individuals.
who might not normally communicate. The Electronic Emissary Project focuses on creating these telementorships among students, parents/teachers, and subject matter experts. The next section will discuss some issues relevant to mentoring.

Mentoring

“The mentor is not so much interested in fixing the road as in helping the protege become a competent traveler” (Cross, 1986, p.ix). The term “mentor” had its origin in Homer’s Odyssey, when a wise and learned man named Mentor was entrusted with the education of Odysseus’ son, Telemachus. Healy and Welchert (1990) and Fleming (1991) state that the act of mentoring is a dynamic, reciprocal partnership between an expert (mentor) and a novice (protege), aimed at promoting the development of both. Wighton (1993b) lists a definition of mentorship given by Heller and Sindelar in 1991 as “simply the advice from a respected, experienced person provided to someone who needs help.” (p. 1)

Mentorships can be as simple as the matching of a student’s special interests in the classroom with a community member, or as complex as linking a number of students with a community network formed around many interests (Runions & Smyth, 1985). For some years educators have known that interest in learning and motivation to explore are critical
elements of successful educational experience (Fairclough, 1989; Williams & Kornblum, 1985). Research has supported this assertion by showing that students learn better when motivated by their own interest in a subject, and mentoring is a method that has potential to foster this motivation (Hendricks & Scott, 1987).

Today’s students are motivated by the use of computers and the methods that interconnect them, such as the Internet (Fairclough, 1989). The increased use of computers in the classroom and at home has resulted in an increase in teacher-student, student-student, and student-subject matter expert interactions. Instructors now use telecommunications as a means to conference with their students, either during class time or outside of it, as well as to encourage student-student interactions and collaboration (Bump, 1990). As new types of electronic exchange technology are developed, teachers, mentors, and students have had to take on new roles and operate in new contexts. New technology has supported a “desire to provide more real-world contexts for learning than the typical classroom and textbook-based curriculum provides” (Hunter, 1990, p. 49). Yet despite the increase in the use of educational telecommunications, studies exploring in detail the interactions that take place between students and subject matter experts via telecommunications are still few in number, but are growing. Most of the published research on electronic mentoring before 1994 seems to be focused on the corporate setting (Duin, Lammers, Mason, & Graves, 1994).
There are two approaches to mentoring: one classical and one modern. The classical approach can be defined as an event that occurs spontaneously between two people. It is dynamic and multifaceted in nature, long term, and potentially profound in its impact. One derivative of the classical example implemented today can be found at Oxford University, England, where a mentor/professor meets with a student over a long period of time. A better example of the spontaneity of the classical approach can be seen in Amateur Radio, when one or more hams will “Elmer” or mentor newer members to the amateur radio service. This mentoring happens at local club meetings and over the radio waves, during spontaneous contacts or meetings with others, as information or knowledge is sought after by the novice operator. The more modern definition of mentoring is shaped by the limited amount of time available for this activity, since students and mentors are often assigned short-term, cost-effective arrangements, which may or may not have significant personal impact on the individuals involved (Healy & Welchert, 1990). The Electronic Emissary is a good example of the modern mentoring process. The main difference between the classical and modern approaches is one of depth and length of engagement.

The role of the student who is the object of mentoring can be seen as one of an understudy or apprentice. In many cases, the student is self-directing his or her own search for knowledge. This self-directing model is one that gifted and talented programs have often adopted, due to the possibilities presented by mentoring situations for their students (Runions &
Smyth, 1985). For example, Cecelia Lenk (1989), reporting on the National Geographic Kids Network, explained the kind of impact that moving beyond the classroom walls with communications could provide to students studying acid rain. She stated that having the students either being mentored by experts, or mentoring each other on-line, is a far more powerful and compelling approach than confining communication to the limits of the classroom.

Freedman and Jaffe (1991) postulate that experts become involved with mentoring because they enjoy spending time with young people, as well as fostering and supervising the study of a subject in which they excel. With the creation of electronic telementoring projects (described below), such as the Electronic Emissary, adult mentors can take advantage of the asynchronous nature of discourse with students and fit mentoring into their own busy schedules. When using in-person (face-to-face) communications, significant commitments of time and presence are involved in conventional mentoring relationships (Goldman & Fuller, 1997).

Runions and Smyth (1985) list three common criteria found in mentoring relationships—reality, relationships, and responsibility. Reality emphasizes the need for learning from the world outside the classroom. This can be accomplished by introducing experts, who can share their world experiences the classroom. Relationships stem from connections made between mentors and students at multiple levels. Responsibility arises necessarily as the mentor and student participate as partners in the
mentoring experience. These three precepts suggest that specific positive conditions are needed for quality mentorships. Good characteristics of a mentor include being interested, supportive, competent, sharing, unexploitive, and positive in attitudes toward the student (Scott, 1992). Alleman, Cochran, Doverspike, & Newman (1984) suggest that mentoring behaviors can be taught, although they point out that other research argues that mentoring skills depend on certain unalterable aspects of personality development.

Mentorships are not without their difficulties, most of which are attitudinal (Runions & Smyth, 1985). Two of the most common problems encountered occur when the teacher shifts from the role of the expert within the classroom to that of the facilitator of the mentoring process, or when teachers try to make mentors into remote teachers (Runions & Smyth, 1985). These problems may appear because the change between roles is sometimes not easily distinguishable to the classroom student — or to the teacher, for that matter. Horgan and Simeon (1991) point out some interesting trends that pose additional concerns. Their study discusses how female mentors in a corporate environment were more likely to volunteer if they, themselves, were dissatisfied on the job. Males tended to mentor when they were satisfied with their job situations. The authors suggest that this implies the protege could have a significantly different experience, based on the gender and job satisfaction of the mentor. While this study was conducted in a corporate setting, it will be interesting to see if the same pattern becomes evident in the communications of the teams selected for this study.
The mentoring process is influenced by individual characteristics of both the mentor and student, with each helping to shape the eventual outcomes of the collaboration. Since the introduction of telecommunications, electronic systems have been developed that provide mentoring opportunities for students who were once isolated by time and distance. The next section will discuss issues related to the area of telementoring.

**Telementoring**

"Telementoring" is defined as a mentoring relationship or program in which the primary form of contact between mentor and mentee exists through the use of telecommunication media (Wighton, 1993a). Another definition states that "telementoring" is the formal and informal on-line exchange among teachers, students, and/or scientists, usually collaborating on specific curriculum-related topics, especially when in-person communications would be impractical (CoVis, 1997b). Telementoring has evolved due to the realization that merely getting people on-line is not enough to help them fully utilize the potential strengths of on-line communications. Telementoring is a form of distance learning, and, as such, it is sometimes associated with today’s computer technology; however, it is hardly a new concept. Correspondence learning, in which the tutors and tutees interact through surface mail or telephone networks, has been in existence for many years (Quinn, Mehan, Levin, & Black, 1983).

Telementoring, as depicted in this section, makes use of two basic forms of telecommunication applications: text teleconferencing and electronic mail.
Attention and care should be paid to building and maintaining a sense of community on-line (“Telementoring Using Telecommunications,” 1996), in order for telementoring to become more than simply an electronic connection among individuals and groups. Telementoring can be interpreted as an organized connection for the support of mentoring using electronic means. In addition to the Electronic Emissary Project, other telementoring systems have been formed in the 1990’s.

Telementoring Services

CoVis (Learning Through Collaborative Visualization)

The Learning Through Collaborative Visualization, or CoVis Project, “is a community of thousands of students, over one hundred teachers, and dozens of researchers all working together to find new ways to think about and practice science in the classroom” (CoVis, 1996). CoVis, a project based at Northwestern University, is an educational networking testbed funded by the National Science Foundation for the purpose of exploring issues of computer and communications technology in practice. The objective of this project is to build upon new technologies, in order to support learning communities with interactive networked collaborative systems. Unlike the Electronic Emissary, which focuses on electronic mail as its base interchange system, CoVis uses a broad range of systems and software that include electronic mail, on-line conferencing systems, video conferencing, the World
Wide Web, and custom-developed collaborative software packages. Currently, CoVis has developed software that links its participants together in collaborative projects focused upon the geosciences. Programs such as the Weather Visualizer, the Weather Graphics Tool, the Climate Visualizer, and the Greenhouse Effect Visualizer are used by CoVis’ participants. The goal of CoVis is to allow teachers to choose from a broad range of technology support when adapting projects for classroom use (CoVis, 1996). The first years of the CoVis project saw earth science, environmental science, and technology and society classes as the only groups involved in their collaborative projects. This fits with the goal of CoVis: to support scientific investigations by joining practicing scientists with teachers and students in classrooms.

Published research on CoVis activity has covered several areas, including “Scientific Visualization Tools & Theory,” “Collaboration & Communication Tools & Theory,” “Mentoring, Classroom Assessment,” and “Project-Enhanced Learning” (CoVis, 1997a). The project’s research is directed towards determining the effectiveness of CoVis’ work and its ability to foster incremental progress toward widespread usage of telecommunications. CoVis researchers are exploring how collaboration tools and scientific visualizers are used by students and teachers in project-based activities. Other aims are to understand some of the relationships between local context and project implementation, and to identify pathways and obstructions to project-based telementoring (Gomez & Pea, 1996).
Telementoring is but a single aspect of CoVis, used to bring the scientific community and classroom together in the exploration of topics. CoVis has reported that mentors working with students: (a) help them come up with interesting and answerable scientific questions, (b) help locate library, Internet, and periodical resources relevant to the investigation, and (c) clarify and refine project concepts. In addition, scientific mentors help students determine the best method to analyze data in a practical and relevant manner (CoVis, 1997b). CoVis’s experience thus far indicates that the most significant problem with their telementoring groups is creating sustained, meaningful discussion among the students and science mentors for the duration of a project (CoVis, 1997b). Somehow, the mentor has to feel equally responsible for the project’s success. CoVis’s first solutions to this issue involved increasing the mentor’s participation in the creation and assessment of the project, but they found this “forced arrangement” to be inconsistent with a more natural flow of telementoring (CoVis, 1997b). No facilitators are assigned to any of the CoVis mentoring groups. The teacher and mentor must monitor and regulate all communications during the project (CoVis, 1997b).

Hewlett Packard E-Mail Mentoring Project

Another Internet telementoring project is the HP E-Mail Mentor program, which establishes one-to-one mentor relationships between HP employees worldwide and 5-12th grade students and teachers throughout the United States. The central purpose of the system is the creation of one-
on-one mentoring relationships (Hewlett Packard, 1997a). No ongoing research observes the outcomes or types of environments created within the system and between the participants. Nor does the program provide facilitators’ support during communications.

The HP program began its pilot in 1995/1996, with 350 mentor relationships generated between students and HP employees. The 1996/1997 program created 1654 mentor relationships with participation from 1546 HP mentors, 1508 students, and 146 teachers (Hewlett Packard, 1997b). The 1997/1998 program created over 1100 relationships (Hewlett Packard, 1998). The program states that 4000 students have participated in mentoring connections up through the end of July 2000 (Hewlett Packard, 2000). The program has created 75% more matches in one year than the Electronic Emissary has during its entire project life. However, there are indications that HP collaborations are very short-term and limited in scope, as compared with Electronic Emissary-sponsored collaborations. Similar to CoVis’ concerns, sustaining meaningful discussion over time has proved to be difficult for HP program participants. The HP E-mail Mentor program lists two of its main objectives to be (a) the encouragement of young women and minorities towards studying science and mathematics, and (b) the improvement of science and math proficiency (Hewlett Packard, 1997b).
EDC/CCT Telementoring Project

A project of the Center for Children & Technology (CCT) division of the Educational Development Corporation (EDC), “Telementoring Young Women in Science, Engineering, and Computing” was funded by the National Science Foundation. EDC/CCT’s Young Women project was a three-year venture that drew upon the strengths of telecommunications technology to build on-line communities of support among female high school students, professional women in technical fields, parents, and teachers (EDC/CCT, 1997). The Young Women project was created “to provide supportive environments in which young women in high school can safely discuss their school experiences and feelings with practicing women professionals who have ‘made it’ in science and technical fields” (“Telementoring young women,” 1996). One student participant described her match and mentor as follows:

She (my mentor) was really busy with work, but we had a really good relationship. We talked about college; like things I would need to take with me. We also talked about careers, like she told me about hers (it was really interesting), and I told her what I’m interested in. We also talked a bit about our hobbies and life where we live – like about water quality, and she was in an earthquake not too long ago, and I live in a relatively small town (EDC/CCT, 1997, p. 1).
The project focused on four types of on-line activity: one-on-one mentoring, discussion forums, peer lounges, and use of resources. One-on-one mentoring, which was the heart of the project, focused on creating mentoring relationships between young high-school age women and professional women active in the fields of science, engineering, and computing. Unlike the Emissary, individual students are matched with individual mentors only after each participate in separate on-line sessions to prepare for the individualized communication. Students and their mentors typically exchange electronic mail once or twice a week during the project period. Topics of discussion during the project have diverse foci (EDC/CCT, 1997).

The Young Women project has spent considerable time on the development of on-line preparation and training for potential mentors. The preparation serves to provide successful mentoring experiences. It takes place via a “Mentor Lounge,” which is a private electronic mail list shared among mentors and project managers. The mentors participate in a series of on-line discussions for approximately two to four weeks before they are matched with students. This ensures that mentors who have technical problems are discovered before mentoring begins. During this period, the project attempts to instill the philosophy and basic assumptions upon which it is organized, as well as provide guidelines for ensuring good online communication. The “Mentor Lounge” is used throughout the project to allow mentors to support one another during the process (“Building and maintaining,” 1996).
The Young Women project has attempted to determine the elements of a successful match (EDC/CCT, 1997; “What makes for a good match?,” 1996). They have taken different approaches to establishing mentor-protege teams, which include teacher selection of mentors for students, student selection of their own mentors, and random selection of mentors for students. From these samples they have discovered that when students select their own mentors, they often are more motivated to initiate the online communications process. Students tend to make selections based upon personal interests, such as shared hobbies and career aspirations. Teachers’ selection of mentors appear to be based upon many different criteria, such as the tone of the potential mentor’s writing. Random matching is easiest for the project coordinators, but the outcomes are sporadic with regard to useful mentoring that maintains the correct content focus.

The outcomes of the Young Women’s project have provided valuable information that furthers our understanding of the telementoring process and also supports the findings of Emissary research.
Writers In Electronic Residence (WIER)

Writers In Electronic Residence (WIER) connects student groups across Canada with mentors who are in the field of writing. The writers, who are all well-known Canadian authors, join groups of classes electronically to read and consider the students' work, offer reactions and ideas, and guide discussions among the students (Growden, 1997). WIER was created in 1988 and by 1990, the Writers’ Development Trust adopted the project as its educational program. In 1992, the Faculty of Education at York University assumed pedagogical and technical responsibility for WIER. In January of 1993, WIER opened its first writing conferences. The purpose of WIER is to provide mentoring between professional writers and students in the classroom and to advance on-line learning through teacher education and research (Growden, 1997).

The approach that WIER takes to organizing mentoring groups is unique. Organizers begin by grouping classrooms into "electronic literary salons," with each salon containing approximately five classes. Classrooms are only accepted on a for-fee subscription basis. Each salon is then grouped with another salon to form a “conference.” This conference is then assigned one or more mentors. WIER uses one professional Canadian writer for every six classes that participate in the program. To allow all the various participants to interact, WIER uses the FirstClass® conferencing system instead of just electronic mail. This type of system offers electronic mail, conferencing, and on-line chat sessions.
Unlike the Electronic Emissary, which assigns one mentor to one classroom or individual student, WIER uses multiple mentors for multiple classrooms and students. This is similar to the “learning circles” (Riel, 1994) that were used during the Circle Project held on the TeachNet FirstClass System at the University of Texas, Austin (Christal & Kennedy, 1996). In addition, similar to the Emissary project, each WIER conference has a teacher/moderator to help facilitate and direct discussions.

**HOOP Happenings**

HOOP Happenings creates teams that focus on talking and writing about mathematics in order to foster its appreciation and enjoyment. The project was conceptualized by Caroline Brennan and Joannan Yantosh, math teachers at Drexel Hill School of the Holy Child, an independent Catholic school near Philadelphia. Classroom teams are comprised of students in their elementary and middle school mathematics classes who communicate with college students attending Iowa State University. The college students are selected from seniors participating in an elementary math teaching methods class at the university (Brennan & Yantosh, 1997).

Students work in small groups of three to five. Each week the college student mentor sends a mathematics question for the group of younger students to solve. Communications regarding the problem and how to work it ensue. The mentor provides help by answering questions and directing,
until eventually the students come to a solution. The project relies on electronic mail as its only communication interchange method. An interesting aspect is that student teams choose names for their groups, which they use during discourse with the mentors. Project leaders have commented that the mentors typically pose harder problems than would be normally encountered at the students’ grade levels. The project leaders describe some of their initial concerns with this, but note that the mentoring relationship, in conjunction with the teachers’ availability for additional consultation, allows the students to perform at a higher achievement level (Brennan & Yantosh, 1997a). The project does use facilitation in the sense that the project leaders, who are also the classroom teachers, monitor all communications between the mentors and their groups.

One shortcoming mentioned was the fact that the electronic mail programs used do not support the inclusion of graphics, so that students must take additional time to describe their results in text. Commenting on this fact, the project leaders state, “Although it was frustrating, this limitation put even more emphasis on student communication skills.” (Brunnan & Yantosh, 1997b, p. 1)

The above illustrations of telementoring projects share several features in common. They all employ telecommunications in the form of text discourse, using either electronic mail or conferencing software, to make information exchange possible between mentors and students. The
Electronic Emissary primarily uses electronic mail as its basic mode of information exchange. Several of the above projects incorporate facilitators into the communications for various reasons. One justification for using facilitators is to monitor communications; another is to foster and direct communications. The Electronic Emissary uses facilitators for all three of these purposes. Each Emissary-supported project has a different object, goal, or focus as the reason for its creation. The Electronic Emissary Project, unlike the other projects reviewed above, is not focused on a few defined outcomes or goals, but primarily on support of individualized curriculum-based telecollaboration and teleresearch. The following section will describe the operations and functioning of the Electronic Emissary.

The Electronic Emissary Project

Since 1993, the Electronic Emissary Project has provided a database that allows teachers and parents to locate subject matter experts in different disciplines for the purpose of creating electronic exchanges among students, teachers/parents, and these experts (Harris & Jones, 1998). The project’s organizing concept is to allow communications among these groups to strengthen K-12 curriculum-based education through the use of Internet-based electronic mail.
The Electronic Emissary “matches” K-12 students with subject matter experts around in the world, to help them explore new ways to experience collaborative learning (Harris & Jones, 1994). The project’s initial concept of providing electronic mail links among students, teachers, and subject matter experts was brought to the University of Texas, Austin, by Dr. Judi Harris. The development of the Electronic Emissary began when the Texas Center for Educational Technology (TCET) funded the first semester of matches and made access to their UNIX-based workstation available for system development. In 1994, money was made available by the federally-funded CIRCLE project at the University of Texas, Austin, to provide further match support. In 1995, the system was moved from the TCET site in Denton, Texas, to the Tucson Amateur Packet Radio Corporation (TAPR) site located in San Antonio, Texas (Jones & Harris, 1995). The Emissary project was funded for six semesters by TCET and for two concurrent years by the J.C. Penny Corporation. The system was relocated to the University of Texas, Austin, during the summer of 2000 and is currently funded by both the office of the Provost at the University of Texas at Austin and a federal regional educational technology grant managed by the Southwest Educational Development Laboratory (SEDL). Figure 3 shows the World Wide Web home page of the Electronic Emissary Project.
Figure 3. Electronic Emissary Home Page
The Electronic Emissary serves two primary functions. The first is to promote a “matching service” that allows teachers to locate experts in different disciplines, for the purpose of providing curriculum-based electronic exchanges for student(s) (Harris & Jones, 1998). Second, the project has been exploring text-based interactions among students and adults in which students are active participants in the inquiry process. (Electronic Emissary, 1996; Harris, O’Bryan, & Rotenberg, 1996)

The Electronic Emissary has matched and supported approximately 500 groups spanning sixteen academic semesters. Electronic Emissary projects augment and broaden interactions occurring among teachers/parents and student(s) in face-to-face communication with asynchronous electronic mail exchanges that introduce a subject matter expert into the interaction (Harris et al., 1996). Some of the examples of matches made during past semesters include:

Ninth grade students from San Angelo, Texas, who corresponded with an anthropologist from Los Angeles, California about civil rights, both as they could be explored in reference to the first Rodney King trial (that was taking place at the time of the exchange) and historically, by examining the struggle for African American rights during the late 1950’s and early 1960’s, with particular emphasis upon the contributions of Dr. Martin Luther King, Jr.
Sixth grade students in Houston, Texas, who were engaged in multi-disciplinary study of the Middle Ages, posed questions to a medieval history professor who worked at the University of Illinois.

Fifth grade students in Amarillo, Texas, communicated with a researcher from AT & T Bell Laboratories about sailing and celestial navigation. The subject matter expert in this team both answered questions and suggested simple experiments for the students to try to help them to understand the information that he was communicating.

Fourteen gifted high school students from Nacogdoches, Texas, interacted online with 14 different subject matter experts on topics of individual and mutual interest and research, including marine biology, blues music, harmony in music, computer graphics, the Elizabethan era, biotechnics, black holes, documentary direction and production, the physics of fire-fighting, the effect of the media on public opinion, genetic engineering, the New Age movement, reincarnation, and the effects of day care on child development (Harris, 1996, p. 1).

To show the impact of this telementoring, an article published in the Daily Sentinel by Richard Smith (1995) quotes Melissa McMillian-Cunningham commenting about her experience using the Electronic Emissary’s services for a “gifted and talented” class in Nacogdoches, Texas. The gifted-and-talented students were able to expand their research areas of
interest during their communications with individual subject matter experts, thereby adding the personal insight and knowledge of a primary source to their projects. This type of project is “…[the students’] way to dispel the notion that small schools have little to offer in the way of advanced information and technology” (Smith, 1995). Both students and teacher said “such a program helps in showing a small school not fitting a stereotype of having few innovative programs to offer their students” (Smith, 1995, p. 2).

The above illustrations show how use of interpersonal resources by students, teacher/parents, and subject matter experts can help to create powerful virtual working relationships. These benefits are made possible because groups can be formed using the Electronic Emissary system. We will now discuss how the Electronic Emissary system functions.
The System

The Electronic Emissary requires five phases of participation and provides its services using two different software interfaces. The following are the main actions required for the creation of a project group, which will be detailed in this section.

- Multiple Subject Matter Experts fill out electronic applications at the Emissary’s WWW site and submit the applications for review, at which point the applications, if complete and appropriate, are accepted and placed in the Emissary database.
- A Teacher/Parent accesses the Emissary system via the WWW site and searches the subject matter expert (SME) database to select an SME, at which point they submit an electronic request for an Emissary match.
- A Facilitator then receives the Emissary request, after it has been reviewed by the Emissary’s coordinator, and contacts each participant. If participation is acceptable to all parties, the facilitator requests that the System Administrator generate the necessary Emissary accounts.
- The Emissary Project begins and team discourse occurs, facilitated in an individualized fashion by the facilitator.
- The match is concluded, with the participants preparing and writing a summary of the team’s work, then offering evaluations of their experiences in response to open-ended questions sent by electronic mail.
Figure 4 illustrates the main software components of the Electronic Emissary information, search, and submit system.

The Electronic Emissary Information, Search, and Submit System (Figure 4) was originally written as a Telnet application. Subject matter experts (SME) and teachers accessed the interface using Telnet sessions in
1992 and 1993. In the fall of 1993, a series of Web pages was designed for the system to take advantage of the ease and growing pervasiveness of the World Wide Web. Today, the vast majority of access to the Emissary system is Web-based. As is shown in Figure 4(❶), an Emissary-sponsored team’s formation begins when an SME is recruited or volunteers to become a member of the SME database. The SME accesses the Emissary system and uses a Web-based form (Figure 5a & 5b) to complete and submit an application to become a telementor.

The form asks the SME to respond to a number of detailed questions which request personal information, contact information, subject expertise, and applicable experience with children. This information is used to contact the SME in the future if electronic mail contact is lost, to provide a general search capability based on information about the SME’s specialities, to provide in-depth information about areas of expertise, and to provide the teachers and students reviewing the application with a holistic sense about a possible telementoring project with this individual. Upon submission of the completed application by the new volunteer expert, the document is sent to the SME applicant reviewer, currently the project director, for review (Figure 4(❷)). If found acceptable, the SME’s information form is placed within the Emissary’s SME database and then made available to the Internet community (Figure 4(❸)). An SME application remains in the active partition of the database until selected for a potential match by the teacher/parent in Figure 4(❹).
Figure 5a. SME On-line application.
Figure 5b. SME On-line application.
Since 1993, the Emissary SME database’s size has fluctuated between 80 and 300 experts in the system for selection by teachers. Over time, the project has sent out requests to discussion lists and newsgroups to refresh the SME database. In 2000 the system allow currently-listed SMEs to update their profile documents interactively by using a Web-based form.

The second phase of Emissary teamwork begins when a teacher accesses the Emissary system and begins the search and selection process (Figure 4(1)). The teacher goes through a three-step process, which is shown in Figure 6. Steps 1 and 2 represent the search phase and step 3 allows the teacher to enter a request for the expert selected while searching the database.
Figure 6. Interface for Teacher search and request.
The teacher, in some cases with the assistance of students, searches the Emissary's database of volunteer experts (SMEs) by curriculum-related keyword. Figure 7 shows the Web-based SME database search page. The teacher searches this SME database by using search terms that relate to the content that student(s) will be exploring in the project they have planned. When ready to begin the search, the teacher clicks on the “Submit Search Request” button.

Figure 7. SME Database Search Form.
After a search is done, links to all SME applications containing the keyword(s) supplied are displayed (Figure 8).

Figure 8. Search Result Output.
The teacher then chooses one expert (SME) from the database’s search results (e.g., Figure 9). This is typically the one SME that the teacher thinks is best suited for the planned project. The displayed information does not contain the SME’s phone number, street address, or electronic mail address in order to respect and protect the volunteer’s privacy. The teacher notes the expert’s information, specifically the SME application number, then completes an on-line application form requesting a match with the expert selected (Figure 10; Figure 4(5)).

![Image of SME Application Form]

Figure 9. Emissary Request Form.
When the teacher submits a completed electronic application form (Figure 10a & 10b), the selected SME’s information document is moved from the active partition of the database to the partition containing the application of experts that have also been selected recently or are already engaged in active Emissary work (Figure 4(❺)). The teacher is then electronically mailed a copy of the application appended to the SME’s information (minus specific contact information). A similar acknowledgement is sent to each new SME volunteer, once they complete and submit their information form. The original teacher application is e-mailed to the Emissary director’s and waits to be approved as a match (Figure 4(❹)).

![Figure 10a. Emissary Request Form.](image)
Figure 10b. Emissary Request Form.
The third phase of Emissary team formation includes contacting and configuring the match. If the Emissary’s director sees no problems in the teacher’s application and SME selection, it is passed to an on-line facilitator (Figure 4(7)). The facilitator then uses the information contained within the application to contact the SME. The SME is asked whether s/he is available to participate. If the SME agrees to the proposed telementoring project, the teacher is contacted again. When all is ready, the facilitator then requests that an electronic mail address be created for the matched team. The Emissary’s system programmer/manager (the author of this document) uses specially-developed software tools to generate the necessary customized program (described below) and files for the new electronic team (Figure 4(8)). The facilitator is then notified that a team address has been generated. The facilitator sends out messages informing all participants in the team that the address has been set up and is operational. This phase can be completed in one day, but typically takes less than a week. Early SME and classroom teacher matches were arranged manually by using a word processor’s search and find features (Jones & Harris, 1995).
The Electronic Emissary used the READER program (Figure 11) until 1998. The READER program, custom software developed for the project (Jones & Harris, 1998), provided automated electronic mail copying and forwarding between the various members of a team (student(s), SME, teacher, facilitator) once a match had been made. Several purposes of this program were (a) to allow the automatic archiving of all discourse, which could then be reviewed and analyzed at a later date, (b) to provide some security that could prevent unauthorized participants from sending electronic mail through the Emissary’s accounts to team members, and (c) to provide a single electronic mail address that the team members could use for all electronic mail correspondence related to the Emissary team’s project.

Figure 11. Operational Diagram of Emissary READER software
When incoming mail was routed to an Emissary address, it was appended to an incoming mail file for the appropriate team. Every fifteen minutes, the Emissary system would run the READER program for each active team account and, if new mail existed, the program would then process it. READER would loop through all new messages and, one by one, determine who originated the new electronic mail. If the sender was one of the authorized account participants (student(s), SME, teacher/parent, facilitator), READER would then send copies of the message only to the other members of the team. At this same time, the READER program would archive the message into the team’s mail log for later access, and append an entry to a master log file for the account that indicated current activity. If the READER program encountered a subject of a message that contained the phrase “FAC,” then that message was directed only to the facilitator. This permitted private communications between any of the participants and the facilitator, while still allowing all messages to be archived by the Emissary system. If a mail message was encountered that did not match any of the participants’ electronic mail addresses in the team, then the message was sent to the attention of the facilitator for further handling. This simple filtering process allowed the system to avoid “spam” and other junk mail from entering the teams’ communications from unauthorized outside sources. The weekly activity log indicated, both daily and weekly, possible communication breakdowns in a team’s discourse. It was electronically mailed to the facilitators and its use helped to reestablish interaction when communications problems arose.
In 1999, the Electronic Emissary changed from READER to using a list-based system called Lyris. Lyris, a graphically-based Web-accessed electronic mail list management system, allows for the easy management of the topics used each semesters by matches (Lyris, 2000). One of the shortcomings of electronic mail systems before Lyris was the problem of providing confidential communications without having everyone be anonymous. The READER program was designed and implemented because it allowed the Electronic Emissary to achieve this purpose. Lyris was selected to replace the READER system because it can allow the individual matches to maintain the confidential nature of electronic mail addresses, but still allow all participants to know who is originating each message.

During the fourth phase of Emissary work, the participants begin communicating, as shown in Figure 4(9) using an electronic mail list created within the Lyris system. Once communication begins, participants use their assigned match list, although the team members are aware only that they are sending electronic mail to an address on the Electronic Emissary server. The purpose of setting up lists in this manner is to enable the creation of project-specific electronic mail addresses. These addresses are then used by the subject matter expert (SME), student(s), teacher/parent, and facilitator when sending messages to each other.
By using an address common to all team members, the SME can assume a persona if s/he wishes. To date, approximately six teams have used this type of impersonated exchange. For example, the team that discussed “explorers” had the SME taking on the personas of Cabeza de Vaca, Coronado, De Soto, Columbus, and Cortez (Amill, 1997). However, most Emissary teams use communications between student(s) and SME communicating as themselves (Jones & Harris, 1995).

The Emissary’s function-specific software programs have greatly reduced the overall effort required to support the project, in an attempt to provide increased satisfaction and reliability to participants (Jones & Harris, 1994).

**Facilitators**

Having facilitators assigned to each team was not something that was planned when the Emissary project was first visualized. The first semester of research made it apparent that a majority of team members, primarily those in classrooms, had problems sustaining communications. To help correct this problem and assist members of each group in coping with issues related to use of the medium, a facilitator was added for each team in subsequent semesters. The facilitators in each Emissary group play critical roles in resolving issues related to the medium, since not all participants have the necessary background to use electronic mail for pedagogical purposes without difficulty (Harris, O’Bryan, & Rotenberg, 1996).
McGee and Boyd (1995) examined the skills needed and roles played by facilitators in computer-mediated communication systems like the Electronic Emissary Project. They commented that facilitators have the ability to greatly enhance the experience of using the electronic environment for the participants. Individual dialog may develop unique needs, and the facilitator must remain open to these changing roles in order to meet those needs. Strategies employed by the facilitator emerge from the constructed role behaviors and prerequisite skills for successful online dialog. Successful facilitation can potentially enhance the participants’ experiences.

McGee and Boyd (1995) outlined several prerequisite skills required for the facilitator: technical skills, communication skills, organizational skills, and interpersonal skills. Technical skills are those abilities that relate to the operation and organization of resources and functions within a given technical system. The facilitator should have a working understanding of the technical operations of the system in which the interaction takes place. Technical skills include the ability to send and receive electronic mail, to make changes to passwords and logins, and to send files through the system. Communications skills include the ability to communicate effectively and clearly to participants to help prevent repetitive and tedious messages. Types of communications skills recommended include encouraging new participants to introduce themselves in an appropriate way, engaging all participants in online dialog, setting the stage for collaboration, and
providing new participants with any operational/organizational procedures they will be expected to follow. Organizational skills refer to the day-to-day operations of online interaction and relate to the managerial aspects of facilitation, including establishment of agenda and goals, effective moderation of issues that arise, and regular monitoring of electronic mail to respond or provide assistance as needed in a timely fashion. Interpersonal skills are those abilities that help the facilitator understand the participants’ motivation and intrinsic needs as well as those social-psychological factors that influence online communication, including providing the participants with support and being sensitive to their feelings.

McGee and Boyd (1995) also reflect on the roles of the facilitator, which are moderation, mediation, and facilitation. Moderation requires defining the context of interaction, including time constraints and method of communication. Mediation requires locating resources on the Internet and creating communiques that reflect the status or intention of an interaction. Facilitation requires drawing in participants and allowing them to construct ownership.

As outlined in the preceding section, the facilitator makes first contact with the subject matter expert and begins the process of creating the environment for the team’s exchange. The facilitator’s job, before electronic mail communication begin, is to work with the teacher and student(s) to plan their project. This planning process normally focuses on the creation of
realistic expectations based on the fact that limited interaction time with the SME is a reality within a semester, or shorter, time frame. The facilitator then introduces the individual participants to each other and ensures that all team members can send and receive electronic mail using the Emissary’s addressing system. If during the course of a project, the flow of communications slows or stops, the facilitator determines why the exchanges have ceased. S/he then attempts to remedy the situation, be it technical problems or some other challenge to address.

The facilitator must also be prepared for when team members have differing levels and types of expectations for the telementoring experience. This occurs, for example, when the teacher might expect the SME to be on-line more often, or if the SME expects the teacher and students to provide more than one-line questions to be answered. Problems like these, if not handled properly, can result in early termination of a project. At the conclusion of the exchanges, facilitators collect project summaries and individual evaluative feedback (Harris et al., 1996; Sanchez & Harris, 1996).

The facilitator’s primary responsibilities include: (a) helping the teacher, students, and SME with project planning, (b) initiating the team’s exchange, (c) ensuring that all parties in the match are technically able to communicate, and (d) monitoring and watching for breakdowns in communications. If any problems should arise, the facilitator helps maintain and sustain productive interactions among the team members.
The Electronic Emissary system extends beyond the scope of one person or mechanism. It consists of software, hardware, management, facilitators, developers, teachers, subject matter experts, and students. Each component provides a key link in attempting to make each semester’s exchanges conclude with perceptions of successful communications between participants. This section has discussed some of the important aspects of the process and how they interrelate and operate. Understanding the basic mechanisms of Emissary operations provides a conceptual context necessary in order to fully explain initial Emissary-related research, which is reviewed in the next section.

**Past Research on the Electronic Emissary**

This section will review several research papers and studies on the Electronic Emissary Project written to date. They are presented in approximate date order of publication/writing. The papers cover various aspects of the Emissary project including on-line mentoring, text-based asynchronous learning environments, and analysis of communications during various semesters using different methods of research.

The first research conducted on the Emissary project was a descriptive analysis of the spring of 1993 Electronic Emissary classroom matches (Jones, 1994) for a directed study course at the University of Texas, Austin. This research, along with historical literature reviews, was presented in April of
1995 by Harris and Jones (1995) at the annual meeting of the American Educational Research Association (AERA) in San Francisco, CA. During a fifteen-week period of the first semester of the Emissary project, 320 messages were exchanged among the ten active groups. The ten groups, or teams, were all classroom students/teachers exchanging electronic mail messages with subject matter experts. There were no individual-student matches during the first semester. These ten teams represented successful groups, which were defined as those that had exchanged at least ten messages containing content. The first stage of analysis focused on a qualitative review of the messages obtained during the project in order to define the category, function, and message flow of each message. An initial set of seventeen messages was selected for analysis by both myself and Dr. Harris and the results of the analysis compared. Two additional message sets containing twenty-five messages were similarly checked in order to obtain the necessary inter-rater reliability needed for the analysis. It is important to note that this first study used inter-rater reliability instead of the method of discourse analysis of message functions or speech acts using collaborative data classification between two researchers as described in this dissertation. Over time this more comprehensive method was chosen to give a higher level of quality than the methods that previously had been used.

The entire message bank was analyzed using the category, function, and message flow that had been determined during the initial three message reviews. These categories, functions, and message flow types have not
changed since this initial study. During the full review of the message exchanges, the researchers met and continued to improve inter-rater reliability. By the end of the initial analysis, inter-rater reliability had moved from 70% in the initial message to 83% with all message analysis. The second half of the analysis examined the information that had been defined by the researchers in the first half of the analysis, and inserted additional message attributes (e.g., size and date).

Several interesting issues appeared. The Reporting of Personal Information, Idea/Opinion/Emotion (I/O/E), and General Information were the highest occurrence of reporting. Content exchange made up only 12% of the actual exchanges, with the top three representing 67%. Most of the reporting functions were generated by the Subject Matter Experts. Requesting of Content, Direction, and Personal Information emerged as the highest occurrence of requesting. Requesting functions were mostly sent from Teacher/Students. The requesting of Idea/Opinion/Emotion (I/O/E) represented only 1% of the exchanges, which seems to indicate that students were requesting more fact-related information. Salutations, Planning, and Thanking made up the highest occurrence within the Other group.

The flow of messages, which is still used in the current study, defined six different combinations of Subject Matter Expert (SME), Teacher (TEA), and Student (STU) that exchanges matched. This first study did not include a facilitator, which reduced the number combination of flow types seen. SME to TEA and SME to STU, followed closely by TEA to SME originated the most
exchanges at 24.4%, 21.9%, and 23.8% respectively. Subject Matter Experts generated a total of 52.9% while Teacher and Students generated only 47.2% of the exchanges. Exchanges involving students originated information STU to SME and TEA/STU to SME exchanges represented only 17.5% and 5.9%. From these 23.4% of exchanges, Subject Matter Expert generated 28.5% (91) of the messages in response to student exchanges.

Trends within the Other category indicated that Teacher and Students originated more messages with Salutation, Planning, Thanking, and Complaining than did the Subject Matter Expert. The Subject Matter Experts did the most Apologizing. In Reporting, Subject Matter Experts sent the most exchanges containing: Personal Information, Procedure, Content, I/O/E, Resources, and Direction. Teachers and Students headed up General Information and Feedback. In Requesting, Teachers and Students sent the most messages in Procedure, Content, and I/O/E. Subject Matter Experts sent the most messages in General Information, Personal Information, Feedback, and Direction. It should be noted that many message-flow groups had zero (0) exchanges within a specific function. Subject Matter Experts sent no messages requesting Procedure. Other had very little activity.

Taking a plot of each function over the time period of the project, we saw that Salutation, Planning, and Thanking dominated the trend, with the other functions being very hard to differentiate any commonality. When looking at Reporting functions, Procedure, Resource, and Personal
Information followed the overall trend. Of interest is how many of the lesser functions moved towards zero for the last several weeks. Requesting showed that I/O/E followed the trends until the last weeks, while the rest of Requesting did not seem to follow a coherent pattern during the project.

What we found was that Subject Matter Experts and teachers "talked" more on-line, respectively, than students, even though the focus of the telementoring was upon students' inquiry. We also noted that participants' roles, singly and in combination, were associated with greater and lesser frequencies of certain message function types. We observed that requests or reports directly related to curriculum content comprised a surprisingly small percentage of total identified message functions. Also, when viewed longitudinally, "reporting" and "requesting" functions followed very different frequency patterns.

In 1994 Lenert and Harris (1994) published “Redefining Expertise and Reallocating Roles in Text-based Asynchronous Teaching/Learning Environments.” This naturalistic inquiry purposively sampled six maximally variable Emissary teams from the spring 1993 matches of 32 total teams. The researchers studied the text-based interactions among the Subject Matter Experts and the student(s)/teacher of six selected teams. Lenert member-checked data from multiple tape-recorded telephone interviews with each of the 13 informants, which were triangulated with text generated by their electronic mail messages during the project, and later among the team members and between the interviewer and the informants.
Two categories of themes emerged: “the structure of the CMC learning environment itself and the type of social or mediated personal presence developed by the SME.” (Lenert and Harris, 1994, p. 132) The researchers felt that the mediated personal presence of the SME was an extremely important factor. If the role of the SME were to expand beyond that of an on-line resource, the successful exchange of communication cues was required. The researchers indicated this might best be accomplished through the exchange of personal information and history. They concluded that this was one of the most important aspects of the process. In addition, those teams that integrated their Emissary work with existing curricula seemed to feel more successful.

There were other issues that the participants saw as important byproducts of the Emissary project. These included that communications with an adult SME at a professional level helped build students’ self-esteem, and that continuity and shorter periods of time between message exchanges was very important to creating the necessary positive information exchanges. The publication discussed five team profiles in detail to show some of these conclusions.

In 1995, Jones and Harris (1995) published a paper covering the design and initial trials of the Electronic Emissary Project. This paper detailed the history of the project and the design, programming, and overall operations aspects of the system. Many of these elements have been discussed earlier in
this chapter. In addition, Jones and Harris presented information concerning the three semesters of Emissary project work that had occurred prior to publication of this paper. These included Emissary projects concluding in the Spring of 1993, Spring of 1994, and the Fall of 1994.

In the spring of 1993, Emissary telementoring teammates were “matched” by hand. The first problem with this practice was the amount of time needed to make a match and then actually to start team communications. In addition, the process of trying to match classrooms to SMEs turned out to be much more difficult than was expected. Several of the matches were erroneous. For example, a classroom had asked for a match with a SME on dinosaurs. One of the SMEs had a PhD in the area and was doing research. Two weeks into the match, the SME indicated that the match was maybe not correct. After several exchanges the reason was understood: his specialization was invertebrate paleontology, and the class wanted to discuss vertebrates: dinosaurs. After episodes such as this, it was deemed necessary to have some sort of facility available for the teachers and students to browse and choose their own mentors, which later became the interface described earlier for SME selection (Harris & Jones, 1995).

Several matches were made for teachers who were either just getting an electronic mail account or were sharing accounts with others. This eventually turned out to be a problem. The users new to electronic mail had a difficult time working with the system and had numerous end-user
problems at their school which kept them from maintaining regular contact. The accounts that shared electronic mail accounts had other types of problems, ranging from the other teacher(s) deleting their messages to someone changing the account password. These effects necessitated that later sessions ensure that the classroom participant(s) had their own e-mail account(s) and had been using the Internet for some amount of time. The accounts that did well in the spring of 1993 met these criteria. Later sessions seemed to prove this rule.

During the third week of the Spring, 1993 session, the Emissary computer system crashed. It took several days to get the system back in operation, but the loss in communications and subsequent loss of confidence in the system seemed to hurt the newest users the most. Breakdown in communications for 5 of the 19 classrooms happened during this week. In addition, the Emissary READER software had several unique problems, which caused some unique “testing pains” during the session. One problem arose from the fact that one SME sent mail from six different electronic mail accounts, which had not been anticipated.

In March and April of 1993, several teams stopped communicating and either did not start again or needed help to get back on track. Checking with several of these teams found, not surprisingly, that Spring Break was the cause. Several of the teams had weeks off at different times, causing sometime two weeks or more of no communications being exchanged.
After seeing these kinds of problems in communications during one semester, something was needed to ensure that communication problems would not contribute to the end of a telementoring project. The simple answer was that the two researchers needed more help, since thirty-two accounts were too much for them to handle adequately. The answer was to provide a facilitator for each account. In the next Emissary project sessions, a facilitator was provided for each of 10-20 teams.

The major difference between the Spring, 1994, session and the one a year before was the creation of the Electronic Emissary Exchange. This facility automated the process of SME application entry and teacher database searching and match selection. In addition, two facilitators were available through a grant to provide support for thirty of the matches. The other twenty-seven matches were not facilitated. The facilitated groups had a very high rate of activity over the entire session. Overall message exchange tripled from the 1993 spring session. The unfacilitated groups did not have as many failures as did the Spring, 1993, session. This can be partially attributed to the more stable READER program and the fact that more e-mail educated teachers were selected, using the criteria outlined above.

The third session of the Emissary project was started in September, 1994. This was the first time that the Emissary had been tried during the fall. The number of matches were lower than in the two previous semesters. One current thought is that the ability to recruit teachers to participate during the
July-September time frame is not as good as recruitment in the months of November through January (Harris & Jones, 1995). Overall activity in the matches was highest to that point in the project. The role of the facilitator was determined to be necessary in order to start and check up on matches as they operated in order to increase the matches’ success rate. Experience has shown that some groups require no facilitation, but most require a message from time to time in order to establish and maintain good message flow. The paper concluded with a discussion of research methods, which was the same as discussed in the previous Jones (1994) and Harris and Jones (1995) publications.

During the Fall 1995 semester, I undertook another directed research project which focused on a descriptive analysis of Spring 1993 and Spring 1995 Electronic Emissary individual matches (Jones, 1995). The flow of the messages between students, teachers, subject matter experts, and project facilitators, in addition to individual message content and count, provided the body of the data for this analysis.

A previous analysis of the Spring, 1993, data had been compiled for whole classroom/Subject Matter Expert matches (Harris and Jones, 1995), but no work had been done on individual team matches. This analysis covered the discourse conducted between individual Students, Teachers, and Subject Matter Experts during the spring of 1993, and between individual Students, Teachers, Facilitators and Subject Matter Experts during the spring of 1995.
Unlike the previous inter-rater reliability method used in the group match analysis, a different method was used for this study. This was an inter-scorer agreement approach. The first stage of analysis focused on qualitative coding of each message in terms of its category, function, and message flow. The process of coding message function was based on the 22 descriptors formulated by Harris and Jones during the summer of 1994 (Harris and Jones, 1995). The two researchers, Jones and Amill, met at the beginning of the analysis, agreed upon the coding method, and talked through several messages to reach a basic understanding of the types of codes to be assigned. The two researchers began to code the messages individually and then met periodically during the coding process to gain 100% agreement on the codes assigned to the messages. Unlike the method used in this dissertation, the researchers agreed upon coding each full message as a whole. Once the Spring, 1993, individual matches were coded, the same process was used to code the 1995 individual matches.

The analysis process yielded thirteen successful groups with 247 messages exchanged during the spring of 1993 and ten successful groups with 216 messages during the spring of 1995. The thirteen spring of 1993 matches came entirely from one gifted and talented classroom, with one supervising teacher. The spring of 1995 matches represented a mixture of student/teacher participant sources with the majority of the matches coming from one classroom with one supervising teacher.
What was found was the possible beginning of a trend in patterns between matches in the two different semesters. A later study, which will be discussed below, shows that these patterns did not carry on past these two semesters. Message flow among members of participant categories over the semester period was similar between both semesters. Also, the type and ordering of flow types were similar between semesters.

Harris, O’Bryan, and Rotenberg (1996) examined Electronic Emissary teamwork and described several important issues regarding facilitators and how they are involved with computer mediated communications (CMC) between subject matter experts (SMEs) and student(s). They found that assumptions at the beginning of the Emissary project concerning the ability of matches to be successful based solely upon giving them access to an electronic mail system that would allow exchanges for communications was wrong. “We had overlooked the very real challenges of time, medium, and differing expectations. We quickly discovered the critical need and important role for the online facilitator.” (p. 53) The medium of electronic mail changed the forms of interactions and exchanges significantly. Therefore, having a specially skilled person to facilitate or mold a positive “teaching/learning experience” could benefit the computer mediated communications. The authors felt that the best qualified person for this job was someone who combined an understanding of Internet-based communications with a background in education. The authors believed that facilitators were vital in many cases to helping teams continue to communicate within a semester period.
Another issue was that of differing expectations between subject matter experts and student or teachers in K-12 teaching/learning environments. This was observed in the fact that subject matter experts have frequent and easy access to the Internet and are used to sending brief exchanges in short period of time, as compared to many K-12/student users, who have shorter period of times for access with greater periods of time between those Internet communications. The authors saw that it was important at times for the facilitator to explain and help with these adjustments in order to have smooth communications.

Lack of time is another common challenge found within the classroom environment. Subject matter experts are not aware of the time constraints placed on K-12 teachers and students. This can lead to frustration of one or more of the participants. Harris, et al (1996) presented the example of a teacher who was unable to communicate for over a week and resulted in the subject matter expert becoming frustrated and then offended by the lack of response by the teacher/student group. The Spring Break period can cause these types of problems if the dates of these dropouts in communications are not communicated in advance. The authors feel that timing issues “present one of the most difficult challenges to creating logistically workable electronic partnerships between people inside and outside of the K-12 school.” (p. 56) Facilitators can help to ensure that these gaps of communications do not occur, and if they do, that they do not escalate into something that has a
negative impact on communications. The rest of the article deals with important points that can help facilitators, as well as matches without facilitators, better communicate through this medium. These important points include the following suggestions for how to improve communications before and during a telementoring project:

- Before student and subject matter expert communications begin:
  - Emphasize planning and setting realistic goals before the project begins.
  - Plan operational details and learning goals.
  - Set possible dates for non-communications and frequency of communications that can be expected.

- During the exchanges between subject matter expert and student(s):
  - Try to maintain a regular pace of mail traffic, with short enough turnaround so that contexts are maintained.
  - Focus on inquiry-based and student-centered communications.
  - Avoid just fact-based inquiry. Explore communications that balance scholastic with personal information shared in exchanges. (Harris, et al., 1996, p. 55)

In 1996, Sanchez and Harris published an article concerning online mentoring which discussed several success stories occurring through the Electronic Emissary Project. Sanchez used her experience as a facilitator with the Electronic Emissary to write about several ingredients that might make mentoring experiences successful. Sanchez and Harris (1996) defined a successful match as one in which everyone learned. A major point discussed was the need for online writing to be “authentic and motivating” since there
is a human audience for which these messages are being crafted. Also, such exchanges help improve writing and communications skills of the students while also focusing on the curriculum content of the subject matter expert.

Many of the items discussed concerned why matches might be successful and are congruent with those points discussed above in the Harris, O’Bryan, and Rotenberg (1996) article. The items indicated as being important in a successful online mentoring match in the Sanchez and Harris (1996) article include:

- A clear purpose and topic for the exchange at the start
- A motivated student with active support for participation from adults
- A committed expert with a genuine interest in teaching
- Evidence of a developing personal friendship among expert, student(s), and teachers or parents involved
- Reliable access to electronic mail
- A clear goal for the project that is built into the curriculum
- Scheduling enough time for communicating and at frequent enough intervals and then keeping to that schedule
- Keeping lines of communications open between the teacher/parent and subject matter expert on how the student is reacting to the mentoring.

(p. 59)

In 1996, I conducted a third descriptive analysis of the Fall, 1995, Electronic Emissary teams involving individual students and subject matter experts (Jones, 1996). The direction of this study was to discover if there were indeed patterns between various types of matches that occurred on the Electronic Emissary. The method selected for this study was that of
interscorer agreement which Harris, Pryor, and Adams (1997) had researched and which is described below. In addition, we wanted to determine whether there would be differences between message function if electronic mail were analyzed for both overall message content and then again at the sentence level. The paper presented information concerning an analysis of each of these methods as well as a comparison to two previous semesters of individual student to subject matter expert analyses from the spring of 1993 and spring of 1995, which was done using the older whole message analysis approach.

The study began with the gathering of individual student/SME matches from among Fall 1995, groups. Only six individual matches were deemed successful matches, because they contained at least ten messages which had been exchanged within the match. This was the first semester encountered during the project where all the individual matches started were actually completed as defined successful matches. The process of coding message function was based on the twenty-two descriptors formulated by Harris and Jones during the summer of 1994 (Harris and Jones, 1995). Jones and Amill, who conducted the analysis, met and reviewed the coding standard that had been used in their previous research paper regarding individual matches from Spring, 1993, and Spring, 1995 (Jones & Amill, 1995). The researchers also discussed the additional dynamics of coding each line within a message and how that might impact the process of both coding time and review process.
The two researchers coded the messages individually and then met five times over a two-week period during the end of the coding process to gain 100% agreement on the codes assigned to the messages. The process of gaining agreement between the researchers entailed each researcher sitting at a table while one researcher went through the messages orally stating what was found. The second researcher either affirmed each step or placed a disagreement. The researchers had a high amount of agreement during the process, which may be attributed to their having worked together on the same type of analysis the previous semester. Once a disagreement was announced, the researcher in disagreement typically asked a question, such as “I don’t see a Report of Content here -- where do you see it?” The stating researcher then explained what was found and how. A debate, sometimes vocal, began and eventually concluded in closure on the item in disagreement. With items that were seriously in debate, breaks for food and snacks were required in order to reach 100% agreement on a specific assigned code. While these hotly contested codes were rare -- they did seem to happen more frequently during the longer coding agreement session. The additional coding of each individual line of each message added considerable time to the coding process as compared to coding the entire message as a whole.

Again, as in past research, the second half of the analysis process added message attributes (word, line, character length and date) to the data set. After all coding was completed, the information was entered into a
spreadsheet and prepared for analysis using SPSS. The above process yielded six successful individual matches with 221 messages exchanged and 2002 lines analyzed in those 221 messages during the fall of 1995. The fall of 1995 contained two groups which had been active in previous semester projects. Each of the six groups were discussed in detail.

The purpose of this report was to analyze and develop information concerning the Individual Student to Subject Matter Expert matches from the fall of 1995 using both whole message and individual line analysis. The message exchanges by week were different from previous studies. However, there was a slight similarity with the Spring, 1995, analysis. Besides the basic patterns which were observed, no significant repeatable patterns emerged that would link the Fall, 1995, semester with previous semesters’ studies. This was something that I had hoped would be seen. The lack of similar patterns between matches over semesters is the reason that this dissertation has evolved into a multiple case study.

Yet, there were some very interesting outcomes from this research:

- Analyzing individual lines, while very much more time consuming, gave a better representation of functions that can be reported more often than those that have fixed patterns. Functions that appeared less than 1% or occurred in traditional locations (e.g., Salutations) tended to allow the individual line analysis and whole message analysis to generate similar information. Functions that could be weighted more than once within a message (e.g., Content or Resources) had potentially higher significance in the line analysis method.
• Adults continued to do most of the talking about non-content related issues.

• There was an increase in Facilitator interaction at the content and personal level with all participants.

• Groups that were continuing on for a second or subsequent semester of discussion tended to be less focused on the content area and formed more of a general mentor relationship that covered a broad range of topics.

• Based on the line analysis, General Information, Content, and Idea/Opinion/Emotion might need to be further segmented into smaller chunks. However, splitting these functions for whole message analysis would not seem to accomplish the same impact if done on the larger number of N provided in the line analysis.

• While there are significant differences between the Fall, 1995, and the Spring, 1993, and Spring, 1995, studies, some patterns began to emerge.
  • Certain message flow types were more prevalent than others
    STU to SME, SME to STU, TEA to SME, SME to TEA
  • Certain functions were more prevalent than others General Information, Idea/Opinion/Emotion, Content, Personal Information
  • Message Exchange rates over a period of weeks had certain highs and lows in common. There was a peak in the first part of the period with a general decline towards zero at the end.

Dimock (1997) published a naturalistic inquiry case study regarding what happens in classrooms when teachers and students participate in telecomputing projects, specifically the Electronic Emissary Project. The
stories of teachers, subject matter experts, and students were used to describe how electronic mentoring evolved in four different classrooms. Seven teachers were selected from the Emissary project as part of Dimock’s purposeful sample. Four teachers responded to the request for participation in the study and each of these was contacted for telephone interviews. The teachers were asked to provide information about their classroom environments, teaching strategies, and their experiences with the Electronic Emissary Project. In order to ensure that the data reflected the events portrayed as collected from teachers, Dimock arranged interviews with students of each teacher. The transcribed interviews were then analyzed and themes emerged after several parses by the researcher. A story for each of the four Electronic Emissary matches was then presented in the paper. Dimock (1997) identified three major emergent themes from the investigation:

- Teachers established goals for the Electronic Emissary Project that were consistent with their preexisting teaching philosophies and practices.

- Teacher flexibility provided opportunities for student to study more content, study content in more depth, and increased students’ access to educational resources.

- The on-line context allowed the creation of relationships between students and subject matter experts, as well as between students and other students. These relationships formed a new social context for learning that in turn provided authentic experiences and seemed to increase student interest in the curriculum. (p. 33-37)
Dimock (1997) felt that participation in projects like the Electronic Emissary increased student “interest and engagement with content and increased the amount of content and depth of analysis of that content” in the classrooms examined and discussed. She also believed that the matches met characteristics that would encourage an “active construction of meaning proposed by Brooks and Brooks.” (p. 39) Brooks and Brooks (1993) specify active construction of meaning as a way to motivate and stimulate learning by allowing the student to take more control of the learning environment.

Harris, Pryor, and Adams (1997) published a paper exploring the relevance of “intercoder agreement in interpretive, document-based inquiry.” The researchers explored two different methods of conducting discourse analysis to determine which procedure might provide greater credibility and methodological harmony. The two methods being examined were intercoder agreement and interscorer agreement. I had used intercoder agreement in one of my studies (Jones, 1994) and, as a result of that study, I have used interscorer agreement in two following studies (Jones, 1995; Jones, 1996). Interscorer agreement is also used in this study’s method of research. The Harris, Pryor, and Adams study examined the research method that Dr. Harris and I had used in 1994, and compared it to a method that seemed to indicate a more appropriate approach for analyzing messages exchanged in an electronic mail discourse. They had concerns that after establishing coding specifications, the “lone researcher” might begin to
shift those coding specifications as the messages were processed and that additional member checking, or in this case interscorer agreement/checking, would ensure better accuracy throughout the coding process.

Pryor and Adams took the messages which I had coded in 1994 and coded them using the sentence as the coding unit instead of the whole message. They independently assigned message function(s) from the list established by Harris and Jones in 1994 to each sentence or fragment. When the researchers disagreed with a particular reference or code they would then discuss that disagreement until an accord was reached. After this coding was done an analysis was done between this method and the results I found in 1994. There were several areas of analysis that seem to be better reflected in this methodological approach. Reporting Information jumped from 41% in my study to 56% in this study. Within each category (Reporting, Requesting, Other) the researchers found additional function classes that differed by at least 10% from my first study. Their conclusion best explains the usefulness of coder agreement at the message sentence level throughout the coding process.

As a research team working on related, but differing projects, we feel that the credibility (Erlandson, et al., 1993) of our results is significantly enhanced when we extend in-depth peer debriefing to the data coding process. The meanings of the texts that we are analyzing cannot be co-constructed with the documents’ authors, but the documents’ apparent purposes can be co-constructed within the context of a collaborative research group. We offer this
methodological suggestion to other teams engaged in document-based inquiry, with hopes that a call for and example of congruence among research paradigm, perspective, strategy for inquiry, and methods will help investigators to think beyond the notion of "accuracy" in interpretive data coding. (Harris, Pryor, & Adams, p. 24)

A naturalistic inquiry study done by McGee (1997) interviewed teachers, subject matter experts, and facilitators who participated during the Spring, 1996, semester of the Electronic Emissary. Out of the 29 teams she contacted, four complete teams participated in the research. Each informant, after answering an initial survey questionnaire, participated in a one-hour telephone interview. The study discussed several interesting themes some of which have already been touched on above. A new theme not yet discussed indicated that teachers felt that although they had laid out the goals of the project, they had allowed the subject matter expert to direct the course of electronic conversation; however, subject matter experts felt that the teacher directed the project and that they participated in an ancillary manner. McGee conjectures that this might be a phenomena of electronic mail “in which lack of nonverbal information limits the users’ perceptions of others.” (p.15)

This lack of cues seems to be apparent when McGee discusses the subject matter expert’s awareness of the classroom environment and student participation. None of the subject matter experts truly understood what was happening in the classroom. One interesting note, though, was that the
subject matter experts were not really worried about this fact. Also, the subject matter experts deferred to the teachers’ expertise and plans for the projects, even when the subject matter experts saw better avenues to take. The teachers seemed to take on more of the role of intermediary between their students and the subject matter experts. McGee saw this as “reflecting a constructivist approach in teaching in which the teacher supports and guides students’ learning rather than directs it.” (p. 27)

For all teams the level of responsiveness that the subject matter expert put forth allowed the teacher the freedom to “go with the flow” of the conversation, something that might not happen in the traditional classroom setting. This could have also led to the feeling of who was directing the project. McGee saw that the teacher set the course with the subject matter expert steering as the communications evolved. A familiar theme that McGee commented on was the fact that communication between subject matter expert and students was higher than communication from teachers to any of the other participants. In addition, most participants felt that when the subject matter expert and student could share personal information the overall electronic mentoring became more real and human. “Each team came to ‘know’ the subject matter expert in different ways.” (p. 18).
One issue that was shown both by Harris, O’Bryan, and Rotenberg (1996) and Sanchez and Harris (1996) was that of the subject matter expert’s higher expectations with regard to message frequency and continuity.

The SME expected to ‘get a lot more out of it’ in terms of frequency of messages. He thought there would be more interactions and was surprised when things seemed to suddenly stop.

The SMEs in the other teams did not seem to have as well-defined expectations for project involvement, although they also were surprised by how few messages were exchanged. (McGee, 1997, p. 20)

McGee points out that some of the subject matter experts used specific strategies to keep communications going between themselves and the student. One SME would ask a question at the end of each response. This approach would prompt a response from the student. The subject matter experts all mentioned the fact that teachers provided them with minimal information concerning the instruction or the rationale behind these concepts. They felt that having more prior information or knowledge would have helped during the exchanges.

With regard to facilitators’ interactions, both the teachers and subject matter experts said little. They saw the facilitator as someone who was lurking or “looking over one’s shoulder” throughout the process and
making sure things happened if they broke. All the facilitators felt “that their primary role was to support the teams with information and help, as they needed or requested it.” (p. 31). The facilitators felt that communication regarding technological support was the most common information shared. In support of the themes above, the facilitators felt that teams needed to share some form of personal information in order to create a higher association and empathy during the electronic communications. Also, they felt that matches that had clearly stated goals from the beginning required less facilitation than other teams. “The more organized the teacher is and the more clearly conceived the long range goals, the more likely the project will be successful.” (p. 31)

McGee did a further naturalistic inquiry in 1998 which examined the perceptions of unintended professional development among teachers and subject matter experts who worked together in the Electronic Emissary Projects. This study focused on the teacher, not the students or other participants in the teams. McGee interviewed ten teachers and twelve subject matter experts who had participated in Electronic Emissary teams. Data was generated over four months through telephone interviews, electronic mail logs of team discourse, open-ended survey responses, project summaries and evaluations, and electronic mail between McGee and the informants. What McGee discovered was that most teachers interviewed had unintended learning or professional development occur. Teachers entered into their Emissary project without intending to learn, and yet most teachers perceived
that they learned as they practiced and through reflection, during and after their project. The theme of discovery learning that emerged from McGee data analysis indicates similarities between teacher and student learning in the context of Emissary communications. Although most of the themes emerging from this study relate only indirectly to teacher learning, they all have implications for teacher development. Because of the immediate and ongoing nature of an Emissary project, teachers had to make decisions, reflect, and respond as they taught. Teachers’ perceptions about their learning and its contexts suggest that opportunities to learn while teaching may provide new ways of fostering teacher development. McGee suggests, “if these kinds of learning experiences are to be nurtured, the structure of the teacher’s work place must be reevaluated to consider issues of time, flexible schedule, access to resources, opportunities for reflective practices, and access for teacher-determined online collaboration.” In summary, her research shows that there are many facets occurring with online discourse.

The studies discussed above have brought to light some of the more important observations by Electronic Emissary researchers since the project was begun. Research continues, and this dissertation will be added to that collection of information being gathered concerning on-line telementoring.
CHAPTER 3: RESEARCH DESIGN AND METHODS

This chapter discusses the methods and procedures that were used to generate, collect, and analyze data as well as report the research findings. The paradigm for the research design for this study is nonpositivistic and interpretivist in nature. This orientation lends itself more readily to the topic under study by recognizing the fact that “each individual, each school, each culture is likely to have an idiosyncratic set of values, feelings, and beliefs that can only be discovered through intensive, interactive study of that individual, school, and culture” (Borg & Gall, 1989, p. 24). A nonpositivistic study should produce materials that when read by the reader and referenced within his/her own personal context, allows the reader to construct a meaningful understanding of the research presented (Erlandson, Harris, Skipper, & Allen, 1993).

Nonpositivistic Research

This research study is situated within a nonpositivistic paradigm. Nonpositivistic research can represent the situations being examined more effectively than would quasi-experimental analysis. This nonpositivistic research approach differs from the more traditional positivistic approach, which Reese describes as “a family of philosophies characterized by an extremely positive evaluation of science and scientific methods” (cited in
Lincoln & Guba, 1985, p. 19). In nonpositivistic research, a basic assumption is that each individual perceives and reacts to the world in a unique manner and that it is this singular world view that is important in understanding the individual’s behavior (Lefrancois, 1994). “Singular” in this reference refers to the person’s unique personal interpretation of their context and/or environment. Although some quantitative information is examined with regard to frequency, length, and duration of correspondence, the use of primarily qualitative data generation and analysis methods yields a more complete representation of the information being examined in this study. If we examine the data only with numbers, many of the participants’ interpretations of the environments in which telementoring takes place are lost.

A nonpositivistic approach to inquiry takes into account the variability of individuals and the world in general, and can be stated with four basic axioms (Lincoln & Guba, 1985; Erlandson et al., 1993). The first is that multiple constructed realities exist. In other words, with each reality generated by individual perspectives, nonpositivistic research assumes there is no single and objective reality, but multiple individual perceptions of which the researcher must be aware. Research results should produce an extended and enhanced awareness of those divergent realities, rather than concentrating upon a single, shared reality. The second axiom is that there is no cause and effect, but only mutual simultaneous shaping among participants and researcher(s). No one element impacts another in a
discernible way, but the whole of the environment shapes its course and outcome. All aspects of reality are interrelated and nonpositivistic research emphasizes this holistic character. The third axiom is that there is no generalization possible from the isolate to the whole. To isolate one aspect from the total context destroys much of its meaning. Therefore, knowledge cannot be generalized from the specific to the general, or from one research study to another. Thus, no generalizations are made in this study, but possible implications of the research findings are offered in the final chapter. The fourth axiom is that the researcher and “researched” interact and therefore cause change because of this interaction, in addition to co-constructing the data and results for the study.

Nonpositivistic research reports are most often written in a less formal, descriptive and narrative style. The writer of the report must be willing to accept critical feedback from the respondents and use it to develop accurate descriptive text through which the reader “vicariously” experiences the contexts and phenomena explored. The writing of the report must also be free of the writer’s overt evaluations, so that the reader can judge the trustworthiness of the study’s findings (Erlandson et al., 1993; Lincoln & Guba, 1985). This style of writing is used in the analysis and report sections of this document in order to provide a full, thick description of the interactions under study, thus allowing readers to generate their own interpretations about one-on-one telementoring.
Strategy for Inquiry

The strategy for this inquiry blends two research traditions which are both nonpositivistically grounded. The first approach is based on discourse analysis of message functions/speech acts and message flow, as outlined first in Harris and Jones (1995). This approach supports the analysis of individual electronic mail messages exchanged among participants using a collaborative coding method, which brings the researcher and selected peer-debriefer/scorers together to code each sentence of all exchanged messages. This method produces a more complete and in-depth rendering of the content contained within a set of messages, since the scorers interpret the messages and functions collaboratively.

The second method of data analysis is the constant comparative coding of data from informant-centered, semistructured interviews of all available members of selected teams. From these interviews it is possible to gain a more thorough understanding of the multiple contexts of Emissary-facilitated interchanges in which messages serve multiple functions.

These two methods of data analysis were used to acquire insight into the types of exchanges that individual students had when communicating with subject matter experts. This insight is then described in a manner that should allow others to see inside the matches created by the Electronic Emissary project and better understand the dynamics involved in telementoring. The perception gained by the reader may be helpful in the structuring of future individual telementoring partnerships.
Research Setting

The research settings for this study are virtual environments created by the selection and matching of individual students with subject matter experts communicating by means of electronic mail on the Internet over an extended time period. Individual students who “successfully” communicated with subject matter experts between February, 1993 and December, 1999 were selected for study. (See section on sampling procedure.)

These virtual communications environments begin to be formed at the request of a teacher or parent using the Electronic Emissary system. While the communications technology used is similar for all electronic teams being examined in the study, the tone and feel for each exchange was very different depending on the “space” and focus created by the participants. The “space” is co-created by the participants and is reflected in how they use text-based discourse to accomplish their curriculum-related learning goals (Harris & Jones, 1995).
Participants

The students participating in these on-line environments are either enrolled in K-12 schools or are home schooled. Subject matter experts come from a wide range of fields and are selected by either the student and/or the student’s teacher/advisor/parent. The teachers/advisors/parents who help form the electronic teams work with the subject matter experts, the students, and university-based on-line facilitators to shape the interaction. In addition, the teachers/advisors/parents and on-line facilitators “lurk” (unintrusively monitor) and, on occasion, participate in the electronic discussions once they have begun. The on-line facilitators, as described in Chapter 2, are graduate students at the University of Texas, Austin, and are experienced educators.

Sampling Procedure

I began by examining all Electronic Emissary teams involving individual student participants that occurred between February, 1993, and December, 1999 and which were deemed “successful.” A “successful” match is classified as when a group exchanges at least ten messages containing content related to the planned project focus. Prior research (Jones, 1994) has shown that this minimum number of exchanges indicates that a team has established a fundamental “space” for communications. Groups with fewer than ten messages exchanged have been defined as non-functional, since in
the pilot studies for this dissertation (Jones, 1994; 1995; 1996) no significant amount of content was exchanged to create a “space” within which the participants to communicate. (An abstract of pilot study results can be found in Appendix D.) To be included in this study, teams with the most participants available had to be located for interviewing.

From the fifty-two Electronic Emissary teams involving individual students that have been formed to date, six were selected for study. It had been estimated previously that between five and ten individual student teams would be accessible from the total. The teams selected were the ones with the greatest number of participants available for interviews. I studied as many teams as were available, therefore not creating a purposive sample. The function of a purposive sample is to “maximize discovery of the heterogeneous patterns and problems that occur in the particular context under study” (Erlandson et al; 1993, p. 82). Yet, I feel that the cases that were available for study were by nature heterogeneous. The investigation of all possible teams of this type has led to a more sound and rich understanding of Electronic Emissary-facilitated telementoring involving individual students communicating with subject matter experts.

Once the teams involving individual students were identified, prospective participants were contacted first by electronic mail and later by telephone, and asked to participate in the interview process. It was not expected that additional consent would be required, since at the onset of their
Electronic Emissary participation, each team gave written consent for the study, analysis, and follow-up interviews regarding their textual electronically-conducted dialogues. However, I felt that additional consent with respect to interviews was necessary in order to maintain the highest levels of trust between myself and the participants. Consent information was collected from all informants contacted. This final list of informants available determined the teams for study.

The importance of informed consent is clear. As discussed in *Doing Naturalistic Inquiry* (Erlandson et al; 1993), consent granted at the beginning of a study should not suffice. It must continually be renewed throughout and in the context of the study so that participants fully understand the research process and maintain a clear perspective of the work. To avoid possible problems, I discussed with each participant all foreseeable risks. In so doing, I gained the trust of the participants, and thus encouraged them to share more in-depth information during the interviews.

Each participant signed a consent form prior to their participation in this study (see Appendix B). The consent form notifies participants about the rights and responsibilities that would be associated with their roles. It also states that participation of all informants in the study would be entirely voluntary and that informants would have the right to withdraw from the research at any time and without stating reasons for doing so. None of the informants withdrew.
Each participant was asked to create a pseudonym for use in the report of findings. Informants were asked to choose pseudonyms that would not allow close associates to infer their identities. These pseudonyms were then used in all steps of the study, including interview transcriptions. The pseudonyms assisted the researchers in preserving participants’ confidentiality. While there is no way to guarantee full anonymity in descriptive research, all steps were taken to limit the possibility that traceable information might become known (Lincoln & Guba, 1985, p. 155).

**Methods and Procedures for Data Generation, Collection, and Analysis**

The selection of methods and procedures explained below reflects the study’s goal of focusing on the message exchanges in electronic teams involving individual students and subject matter experts. This study used discourse analysis of message functions/speech acts and descriptions of message flow, along with constant comparative coding of data from informant-centered, semistructured interviews of all available members of selected teams. This seemed to be the best approach for creating a multidimensional picture of the communications of each team. Previous pilot studies (Jones, 1994; 1995; 1996) indicated that discourse analysis, in and of itself, does not generate a full, in-depth understanding of team members’ exchanges. The addition of the interviews focused upon perceptions of team communications helped to clarify the patterns and issues uncovered during the discourse analysis.
Two research strategies were combined in this study. Each required different data collection or generation and analysis. The first method is based on discourse analysis of message functions or speech acts using collaborative data classification between two researchers. The second method of analysis is a constant comparative coding of data from informant-centered, semistructured interviews of team members. Each method will now be described and explained.

**Method 1: Collaborative Coding of Message Functions/Speech Acts**

**Data Collection**

The collection of electronic mail messages exchanged among participants in an Electronic Emissary-sponsored team is automatic. The Electronic Emissary software makes automatic archival of all electronic mail exchanges possible. In addition, the data collecting software provides basic statistics on these exchanges, including numbers of lines, words, and characters contained in each message (Jones & Harris, 1995).
Collaborative Data Analysis

As in the two previous pilot studies, the data collected for this project were assigned the message sentence as a coding unit. Each message sentence unit was classified according to its perceived function and message flow. The process of coding message sentence functions was based on the twenty-two descriptors formulated by Harris and Jones in the summer of 1994 (Harris and Jones, 1995) and is discussed below in Table 3. These descriptors are based on Rueda's (1992) nineteen functions which were tested in the first pilot study and later extended to provide a more comprehensive classification system.

I enlisted the help of one peer-debriefer and two scorers to help with the task of message sentence coding. The method for gaining closure on coding messages is discussed in two previous research papers regarding individual matches from Spring, 1993, and Spring, 1995 (Jones, 1995; Harris, Pryor, & Adams, 1997) and is summarized below.

Each scorer was assigned matches and asked to classify each sentence individually by function of each message. We met periodically during the coding process to gain 100% agreement on the codes assigned. Agreement was established when the peer-debriefer and I reviewed and discussed each sentence unit and mutually concurred as to its classification. Once agreement was achieved on a sentence, I noted its categories and stored it in the data analysis database.
The process of coding begins with the assignment of a message flow type. These flow types represent the direction of the exchange between participants. This could be from Student to Subject Matter Expert, Teacher to Subject Matter Expert, or any of a number of other combinations possible within a team. Table 2 shows the possible message flow types encountered in this study. The sentences of each message are then assigned one of the following message sentence category types: "Reporting Information," "Requesting Information," and/or "Other." A sentence can contain one or more function types. Once a sentence category is assigned, the sentence is examined for apparent specific function. These function categories are shown below in Table 3. Appendix C contains a detailed description of the message flow and function types.
Table 2
Listing of Message Flow Types

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<thead>
<tr>
<th>Facilitator</th>
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<th>All</th>
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<td>Facilitator</td>
<td>to</td>
<td>Subject Matter Expert</td>
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<tr>
<td>Facilitator</td>
<td>to</td>
<td>Subject Matter Expert/Student</td>
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<tr>
<td>Facilitator</td>
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<td>Subject Matter Expert/Teacher</td>
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<td>Facilitator</td>
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<td>Student</td>
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<td>Facilitator</td>
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Table 3  
**Listing of Message Sentence Function**

<table>
<thead>
<tr>
<th>Reporting Information</th>
<th>Requesting Information</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Information</td>
<td>Content</td>
<td>Salutation</td>
</tr>
<tr>
<td>Procedural Information (content-related &quot;how-to&quot; information)</td>
<td>Procedural Information (content-related &quot;how-to&quot; information)</td>
<td>(greetings and closings, not including signatures)</td>
</tr>
<tr>
<td>General Information</td>
<td>General Information</td>
<td>Planning (project planning)</td>
</tr>
<tr>
<td>Directions (non-content-related &quot;how-to&quot; information)</td>
<td>Directions (non-content-related &quot;how-to&quot; information)</td>
<td>Thanking</td>
</tr>
<tr>
<td>Personal Information</td>
<td>Personal Information</td>
<td>Complaining</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>Ideas/Opinions/Emotions</td>
<td>Apology</td>
</tr>
<tr>
<td>Resource (book, video, or other resource information)</td>
<td>Resource (book, video, or other resource information)</td>
<td></td>
</tr>
<tr>
<td>Feedback (non-content-related suggestions, evaluations, etc.)</td>
<td>Feedback (non-content-related suggestions, evaluations, etc.)</td>
<td></td>
</tr>
</tbody>
</table>
The process of gaining agreement between myself and the peer-debriefer/scorer required that we meet in person to review the codes assigned independently. We reviewed codes sentence by sentence. I would orally state a descriptor choice, then the scorer either affirmed each label or voiced disagreement. Once a disagreement was announced, the scorer in disagreement typically asked a question such as, “I don’t see a report of content here -- where do you see it?” The original scorer then explained what was found and how. A discussion would ensue and eventually closure on the item in disagreement would be reached. At the end of the process, 100% agreement on assigned codes for all message sentences was attained. Past research shows this to be an effective method for ensuring trustworthiness of the on-line texts interpreted (Jones and Amill, 1995).

Analysis

Once all messages were coded, I added quantitative descriptive message attributes (word, line, character length, and date) to the data set. After all coding and attributions were completed, I then used SPSS™ to perform a statistical analysis of the coded information. SPSS™ is a statistical software package that allows coded information to be quickly analyzed by mean, mode, standard deviation, and a number of other statistical functions. I then reviewed the analysis, examining it for patterns within each team’s communications. The following questions reflect the focus of the research that guided the initial discourse analysis of the inquiries:

- What was the number of exchanges by message flow?
- What was the mean of exchanges by message content size?
• What were the frequencies of pattern exchanges, message flow, 
  functions, and categories over time?
• What were the means and frequencies of message attributes (word, line, 
  character length, and date) for messages exchanged within each team’s 
  communications?
• What were the means and frequencies of message functions (e.g., 
  Reporting, Other, Requesting) within each team’s communications?
• What were the means and frequencies of exchanges of message flow, 
  subclassified by function?
• What did the message sentence functions and message categories, 
  separated by message flow types, show?

These areas of focus have been shown in previous research to reveal 
important and meaningful patterns within the discourse of the electronic 
team (Jones, 1994; 1995; 1996). Chapter 2 overviews the past pilot projects 
and their results.
Method 2: Constant Comparative Coding of Data from Informant-Centered, Semistructured Interviews

Data Generation

Once the analysis of textual discourse for each electronic team was completed, I began semistructured interviews with the available participants. Each respondent was asked to participate in several interviews. Due to the geographical distances between the participants and myself, all of the interviews occurred using the telephone or via electronic mail. Three of the informants requested that the interviews take place exclusively over electronic mail because of their schedules or issues with telephone access.

Before some of the interviews took place, I determined if materials or information needed to be sent to the informant. This information included transcripts of previous interviews, details concerning discourse analysis about which the informant was to be asked, and other information that might help the informant remember the electronic exchanges being discussed. This information assisted the informant and myself when questions regarding message content or other similar issues needed to be discussed. I had hoped that this would limit memory deficiencies in the discussion of information about e-mail exchanges that were held a year or more prior to the interviews. While the information provided did help, all the informants commented on their lack of recollection due to the amount of time that had passed since their discourse. I took time before each interview to review notes and questions to provide better direction during the semistructured interviews (Stake, 1995).
Interviews lasted between 15 and 45 minutes each. All telephone interviews were audiotaped for transcription. As interviews were transcribed, they were coded as soon as possible. I had originally planned on using the NUD*IST software program for the coding of interviews. This software package allows for the assignment of topics discussed in the interview to be associated with specific text blocks in the transcript. With later analysis, major themes can be identified, described, and associated, using NUD*IST searching and recording features to assist in this process. After experimenting with the software, however, I decided to resort to the simpler method of using index cards for interview analysis, because the interviews were intended only to add depth to the discourse analysis and thus did not require the more sophisticated software tool to be used to coordinate multiple groups and layers of codes. As expected, the coding process allowed various themes that described the nature of these computer-mediated collaborative contexts to emerge and gave further insight into discursive analysis of the interactions. Information gathered from the informants was member checked (see below) for accuracy and then triangulated with the information generated from the data analysis and field notes, as discussed below. Member checking with the informants took place at different times during the research. This provided an environment in which major themes were revealed in an emergent and co-constructed fashion.
I took field notes during all interviews. I recorded such items as date, time, observations about the setting, duration of interview, and any other personal notes that I felt were important to understanding the contexts or meanings expressed in the interviews. The field notes and transcripts were used for member-checking throughout the interview process, as well as for the triangulation of data. Member checking with the informants took place during three phases. Informants were asked to validate or correct my understanding of what was said during the interviews, to review and correct condensed summaries of previous interview(s), and to check the draft of results for accuracy. I wanted to give informants the opportunity to say whether they were comfortable with the contents or if corrections or additions needed to be made. All informants commented that they felt that the analysis reflected their match.

Interviews focused on aspects of online interaction to help clarify themes that emerged during discourse analysis. The purpose of the interviews was for the respondents to describe and explain in personal terms those patterns that I had identified during the discourse analysis. The following questions reflect this aspect of the research and were used to guide the interview inquiries:

- What did the participants consider to be the most satisfying parts of their exchanges?
- What did the participants consider to be the least satisfying parts of their exchanges?
• How comfortable did the participants feel while communicating online?

• To what did they attribute their comfort or discomfort?

• What were/are the perceptions of the outcomes of the exchanges both prior to the exchange and at its completion?

• At what level of satisfaction did the participants feel that their content questions were answered?

• Did the content focus of the match change during the exchanges? If so, how?

• What, if any, problems arose during the course of the communications? If so, what were the origins and eventual dispositions?

• Did the patterns identified during discourse analysis reflect the respondent’s recollections of the match? What was the nature of any differences perceived?

• Did the subject matter expert and the individual student perceive the communications exchange similarly? How, if at all, did the teacher’s perception differ from the SME’s and students?

When thematic saturation occurs, the majority of themes available to be studied have emerged from the information. Thematic saturation in this study occurred once the informants had commented on various patterns the researcher had questions on and when they felt they had no additional information to provide. Upon reaching saturation, the interview section of the data generation was completed.
Analysis

The method selected for analysis of interview data is a constant comparative procedure. This procedure requires the separation and breakdown of raw data into smaller and congruent parts for close and organized study. Using this method, I segmented the information, then assigned coding categories based on themes or patterns I felt were significant (Creswell, 1994). I gradually discovered these groupings contained within the raw data through continuous comparisons of coding categories to one another and back to the data. As is the nature of such nonpositivistic "grounded theory" generation, I allowed these groups and categories to emerge during the data analysis. Creswell (1994, p.112) states that "grounded theory should follow the data as it is analyzed instead of being developed before analysis."

I followed several basic steps as outlined by Creswell (1994, p. 155) after initial coding of the interviews was completed in order to reveal and discover themes within the data for each team studied.

- I gained a sense of the entire representation of the data collected during the interviews by reviewing content summaries of all transcripts.
- I then began to gather common topics and categories, based on my review of the transcripts, grouping like topics together.
- After a list of topics had emerged, I reviewed the entire data set, coded the data and checked to see if other topics or themes emerged from this process.
- I then constantly compared and reduced the topics.
Lincoln and Guba (1985, p. 339) outline a similar process to discover patterns and themes from coded data, derived from a method developed by Glaser and Strauss (1967).

- The researcher should organize categories and topics based on their “feel” and begin to see how prominent themes emerge.
- The researcher should continue to assign, alter, and adjust descriptive labels while data categories continue to emerge.
- Once categories are finalized, the data analysis is complete and the writing of the case report can begin.

This section has discussed the methods and procedures that were used for the generation, collection, and analysis of the data in this study. The use of discourse analysis of message function/speech acts and message flow along with constant comparative coding of data from informant-centered, semistructured interviews of all members of selected teams provided a multidimensional picture of the communications of each telementoring team. This picture of team interaction is described in detail in the study’s report, the nature of which will be discussed in the next section of this chapter.
Study Report

The report of study results presents the discourse analysis of speech acts combined with informant interviews for each team selected for study. The discourse analysis presents patterns that were revealed during message sentence analysis. The themes and experiences gleaned from the informants’ interviews are used to add depth to the discourse analysis. In this way, a holistic view of the perspectives of the participants is presented in order to understand the patterns revealed during discourse analysis. The case study report is the preferred mode for revealing the results of the inquiry, since it can best present the multiple realities present in the different teams examined in the study (Yin, 1989; Lincoln & Guba, 1985).

Erlandson et al. (1993) offer several reasons for using the case study to report results. A case study builds upon the reader’s tacit knowledge by presenting holistic and lifelike descriptions that allow the reader to experience the context vicariously. Case studies are better suited for in-context inquiries, since they present holistic information, and allow reader’s to transfer findings into their own understanding and context as they see fit. Furthermore, case studies provide a method in which grounded information can be presented in a context that is itself grounded (Huberman & Miles, 1994). These are the primary reasons a multiple case study has been chosen to describe the information which emerges from discourse analysis and informant-centered, semistructured interviews.
Rigor and Trustworthiness

Rigor and trustworthiness are demonstrated by defining, establishing, and showing credibility, transferability, dependability, and confirmability both during and at the conclusion of the study (Lincoln & Guba, 1985). Credibility is considered to be one of the more important aspects of establishing trustworthiness of nonpositivistic research findings (Erlandson et al., 1993). Credibility deals with the degree of confidence in and accuracy of a study’s results. Lincoln and Guba (1985) and Erlandson et al. (1993) outline the following means to be used to help attain and maintain credibility relevant to this study:

- prolonged and persistent engagement with participants, data, and analysis and a sufficient investment of time by the researcher to achieve immersion in the contexts being examined,
- triangulation of sources of information gathered,
- member checking data, interpretations, and conclusions by asking participants to comment and critique the interpretations and themes formed during the study,
- peer debriefing to check summaries, analyses, and reporting of materials gathered, and
- referential adequacy by archiving a small part of the data uncoded, to be available at a future date to check comprehensiveness of analysis.

I implemented all of the above procedures to ensure rigor of methods and trustworthiness of results. The following will describe how I fulfilled these requirements.
In order to ensure prolonged engagement and persistent observation, I maintained long-term, in-depth contact with the participants and data, invested the necessary time to learn the on-line culture, tested for misinformation or distortions entered into the analysis by myself or respondents, and refined the observations to an extent that allowed me to feel confident in sorting out irrelevancies (Lincoln & Guba, 1985, p. 301-204). I ensured that data generation and analyses were not concluded until thematic saturation had occurred. Discourse analyses were planned to take place over a three- to five- month period, and interviews with participants were planned to occur during a subsequent five- to six- month period of time. By the end of the research, discourse analyses took four months and interviews took place over an eight month period. The amount of time involved in this process allowed me the benefit of prolonged engagement and persistent observation to allow patterns to emerge.

Triangulation permits cross-checking of interpretations through the use of “multiple sources of data (time, space, person) [and] methods (interviews, discourse analysis)” (Erlandson et al., 1993, p. 137). In this study, triangulation was accomplished by analyzing transcripts of interviews with multiple participants, discourse analyses of electronic mail messages, and notes I had written. Triangulation of data was also accomplished by interviewing different informants at different and multiple times and using e-mail exchanges from different groups generated during different semesters.
The six individual student teams selected for discussion met the sampling procedures described earlier in this chapter. To qualify for selection, the Electronic Emissary teams involving individual student participants must have occurred between February, 1993 and December, 1999 and had to be deemed “successful.” A “successful” match was defined as a group exchanging at least ten messages containing content related to the planned project focus.

Originally I had planned to interview each participating member of the selected teams. However, several of the participants could not be contacted, even after numerous attempts. This raised the issue of how the final selection of teams used in this study would be made. The teams selected were the ones with the greatest numbers of participants available for interviews. The absence of some participants has implications for the trustworthiness of the study’s results, specifically in limiting the triangulation of sources of information, which helps to build the dependability and transferability of the findings. Table 4 shows the participants’ availability for interviews conducted after the conclusion of the project.
Table 4
Interview Presence

<table>
<thead>
<tr>
<th>Team</th>
<th>Subject Matter Expert</th>
<th>Teacher</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
</tr>
<tr>
<td>Medicine</td>
<td>Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>Clouds</td>
<td>Available</td>
<td>Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>Arthur</td>
<td>Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>Forecast</td>
<td>Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
<tr>
<td>EE-scifair</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
</tr>
</tbody>
</table>

All Subject Matter Experts were available and were contacted. Their interviews provided the bulk of the commentary upon and supplementary information about the projects studied. Out of the six teachers in the sample, only three were available for interviews. The three unavailable teachers had either moved, leaving no information as to where they had gone, or no longer had electronic mail addresses or phone numbers that were valid. Only two of the six students were available for discussion regarding their telementoring experiences. The two students who were available for interviews were able to be contacted because the teacher or subject matter expert were still in contact with them or had more recent information on how to contact them.
I was surprised by the lack of response from the student in the Arthur team. I had expected to have her participation in my study. The subject matter expert had remained in touch with her after completing the project, but even his requests went unanswered by the student or her parents. The other three students were all seniors in high school at the time of their telementoring work. Having left school, these students’ information on how to contact them became outdated, and without being able to contact their teachers (who were also unavailable) all methods of tracking them down had been exhausted.

While the Electronic Emissary Project keeps records on subject matter expert and teacher contact information, the only information kept in the students’ files is their electronic mail addresses. In three of the cases discussed, students used a school electronic mail address or a public electronic mail address (e.g. hotmail.com) which are the kinds of electronic mail accounts that are terminated after a time. In most cases the teacher is the primary link to the student. Therefore, when the teacher was unavailable it was also very difficult to reach the student.

The only methodological issue affected by the absence of some participants is that of triangulation of sources of information. Triangulation permits cross-checking of interpretations through the use of “multiple sources of data (time, space, person) [and] methods (interviews, discourse analysis)” (Erlandson et al., 1993, p. 137). In this study, triangulation is still
accomplished to a degree by the analysis of the transcripts of interviews with multiple participants when available, discourse analyses of all participants’ electronic mail messages, and my notes (i.e. reflexive journal, personal diary, and interview notes). Triangulation of data type and source was accomplished by interviewing the available individual informants at different and multiple times and by using all the electronic mail exchanges from different groups generated during different semesters.

Member checking was done continually during the interview process. Lincoln and Guba (1985) state that member checking is “the most crucial technique for establishing credibility.” (p. 314) Through member checking, my interpretations and understanding of data and themes were discussed and evaluated with the respondents throughout the inquiry to ensure that the unique realities of the informants were accurately depicted in the final report (Erlandson et al., 1993).

I had planned on keeping a small part of the data generated untouched and available for future study to meet referential adequacy guidelines. However, once the number of groups available for the study were known, all data was required for the analysis. I felt there were not enough data to allow referential materials to be sequestered (Lincoln & Guba, 1985, p. 313).
Transferability is judged in terms of how well the findings of the study can be transferred or applied to contexts and situations familiar to the reader. Since it is impossible to know beforehand who will be reading the study, it is assumed that transferability will be highest among those working in contexts similar to the ones described. Guba and Lincoln (1989, p. 241) state, “in a naturalistic study the obligation for demonstrating transferability belongs to those who would apply it to the receiving context.” Transferability is best approached by providing rich, thick descriptions of the study’s contexts and presenting that information in a manner that the reader can comprehend and apply to his or her own context.

Finally, confirmability is “judged in terms of the degree to which the study’s findings are the product of the focus of its inquiry and not of the biases of the researcher” (Erlandson et al., 1993). Confirmability ensures that findings can be traced to the original sources and that the analyses and interpretations of the data are reasonable and logical, given participants’ perceptions (Lincoln & Guba, 1985). Four methods used to demonstrate confirmability are triangulation, member checking, the keeping of a reflexive journal, and an audit trail. Triangulation and member checking have been discussed above. The reflexive journal and audit trail will be discussed in the following section.
I maintained a reflexive journal for the duration of the study to record important information concerning the researcher as human instrument and my research methods. Lincoln and Guba (1985, p. 327) state that the reflexive journal “consists of separate parts that include the following:

1) the daily schedule and logistics of the study;
2) a personal diary that provides the opportunity for catharsis, for reflection upon what is happening in terms of one’s own values and interest, and for speculation about growing insights; and
3) a methodological log in which methodological decisions and accompanying rationales are recorded.”

I kept a reflexive journal which detailed 1) times and dates for all schedules and meetings; 2) a personal diary that contained observations, personal thoughts, insights, questions, and methodological decisions made; and 3) all notes made before, during, and after all interviews.

I maintained a comprehensive audit trail during and after completion of the study. Lincoln and Guba (1985, p. 319) identify the following items as part of an audit trail: “raw data, data reduction and analysis products, data reconstruction and synthesis products, process notes, materials relating to intentions and dispositions, and instrument development information.” The reason for keeping an audit trail is to maintain the dependability of the research. Dependability as defined by Lincoln and Guba (1985, p. 290) is a mechanism that provides the readers of a study with evidence that if the
study were to be replicated with the same participants in a similar context, the study’s findings would be repeatable. However, in the paradigm used in this research study, dependability is expressed in the effort to establish consistency (Erlandson et al., 1993). Consistency is maintained by keeping a comprehensive audit trail during and after completion of the study. With a naturalistic research strategy, I believe that observed instability can be attributed not to errors in the method, but to shifts traced to particular sources. “Consistency is conceived in terms of ‘dependability,’ a concept that embraces both stability implied by ‘reliability’ and the trackability required by explainable changes” (Erlandson et al., 1993, p. 34). The findings presented in this study are consistent, since various methods were implemented to ensure dependability and reliability of the research.

Audit trail material can be subjected to a formal audit to determine the rigor and trustworthiness of the study at any time. All data generated, including raw data, data reduction and analysis products, data reconstruction and synthesis products, process notes, materials relating to intentions and dispositions, instrument development information, and the reflexive journal will be preserved in the audit trail for this study. However, in keeping with the expectations of the Institutional Review Board of the University of Texas at Austin, all audio tapes will be erased as soon as the study is completed. Although a formal or external audit is the preferred measure of testing rigor
and trustworthiness, such an audit is not planned as part of this study. The formal audit as described in Lincoln and Guba (1985) is an expensive and time-consuming operation, and thus is not feasible for a study of limited scope. Therefore, the trustworthiness of this inquiry will be established through the rigorous use of the techniques described above. These procedures should be sufficient to establish credibility, transferability, and confirmability, which will allow the reader to confidently transfer and apply research findings to other contexts and situations as s/he sees fit.

### Authenticity

According to Manning (1998, p. 94) “Authenticity involves a set of criteria ... which commits the constructivist researcher to a set of actions (e.g., balance of perspectives, learning by the researcher and respondents, shared knowledge, and social action).” Authenticity is important to this study in order to ensure that the informants have voices and ownership during and after the research. Manning identifies five types of authenticity criteria, which include fairness, ontological, educative, catalytic, and tactical authenticity.
Fairness deals with giving the participants a voice in the research and recognizing them as “stakeholders” (McGee, 1998, p. 84). In this study, the teams whose members were available for interviews were contacted. I attempted to conduct interviews with these participants as fairly as possible to ensure that the participants were given maximal time and voice during the interview and in the member checking of the summaries of previous interviews.

The second criterion, ontological authenticity, enables the participants to expand their understanding of their experiences within the context being discussed, by virtue of being involved in the study. Since this research is primarily a discourse analysis, I saw ontological authenticity at two levels. The first level was seen during the discourse analysis of the electronic mail exchanges, where the participants’ dialogue evolved during the telementoring conversations. The second level of ontological authenticity was seen during the interview phase. This happened as I discussed with each of the participants the patterns that emerged from the discourse analysis and gathered their insights into experiences (Manning, 1998). Likewise, during this interview process, the third category of educative authenticity was manifested when the participants “acknowledged growth through the process of discussion” (McGee, 1998, p. 84). I listened for such events to occur during the interviews without promoting or directing participants to make these conclusions.
The fourth category of catalytic authenticity refers to the “extent to which decisions and actions are facilitated by the expanded constructions of the stakeholders” (Erlandson, et al. 1993, p. 154). In order to satisfy this criterion, I noted of any comments made by the participants with regard to their making decisions to take action based on our interactions during and after the research.

The final category, tactical authenticity, refers to participants’ having taken action. This differs from catalytic authenticity in that the action has been taken or rather than just being discussed.

In order to provide authenticity, I am responsible for writing a clear and truthful report in such a manner that anyone, including informants and other stakeholders, who reads this study can take the information gleaned during this research and usefully apply it to their environment. In addition, I must take into account the fact that all data and information gathered is owned by the participants of the study. I, as the reporter of the study, can only describe the emergent data patterns discovered during the discourse analysis and interviews. My duty as researcher is to ensure that the respondents understand that they are the authors of the data and I am only the chronicler. In this manner they, the participants, maintain full ownership and share the credit for the research being done.
CHAPTER 4: RESULTS

This chapter describes the analysis of discourse from six Electronic Emissary teams that involved individual student participants that occurred between 1995 and 1999. The selected teams for this study are teams whose project names relate to the topics they studied. These project names are: Books, Medicine, Clouds, Arthur, Forecast, and EE-scifair. The Books project had on-line discourse (e.g., exchanged electronic mail) for 177 weeks from January, 1997 until June, 2000; Medicine had discourse for fourteen weeks between February and May of 1998; Clouds had discourse for fifty-one weeks from September, 1998 until August, 1999; Arthur had discourse for seventy-seven weeks from September, 1995 until January, 1997; Forecast had sixteen weeks of discourse between February and May of 1997; and EE-scifair had discussion for thirteen weeks between February and May of 1999.

From the fifty-two electronic teams that involved individual students communicating between February, 1993 and December, 1999, only six were selected for this study. The six matches selected best suited the proposed sampling procedures of the study. The Books, Clouds, and Arthur projects were very active and long-lived, each having generated a large volume of discourse and lasting for more than a year. The Forecast, EE-Scifair, and Medicine projects were relatively short-lived and supported considerably less discourse than the much longer-lived teams. The discourse from the selected teams shows the wide range of communications that can take place with
Electronic Emissary Projects. Each of these matches is considered “successful” since each group exchanged at least ten messages containing project-related content.

A very important factor in the selection of these teams for study is the fact that at least one or more of the participants was available to discuss the message analysis with the researcher, as described in Chapter 3. The purpose of interviewing the participants was to provide a richer description of the information revealed during the analysis. It must be noted that all of the interviewed participants commented to some extent on their lack of clarity remembering team communications due to the passage of time since the teams’ project took place.

The descriptions of each team were drawn from information the participants provided when the matches were requested, during their online discussions, and during their interviews. The match descriptions vary in detail and length as a result of both the information available and the information shared by each team member.

The patterns described below are drawn from discourse analysis of message functions/speech acts and message flow, as outlined first in Harris and Jones (1995) and discussed in depth in Chapter 3. The analysis of electronic mail correspondence among the participants took place over a period of several weeks using the collaborative coding method as described
in Chapter 3. This process brings the researcher and selected peer-debriefers/scorers together to code each sentence of all exchanged messages. This method produces a more complete and in-depth rendering of the content contained within a set of messages, since the scorers interpret the messages and functions collaboratively.

After the collaborative coding was complete, I took the data acquired from coding, and using Excel and SPSS™ software, produced the analysis which is presented below for each team. Using the information gained during analysis, I then contacted the available participants and began a series of informant-centered, semistructured interviews. As will be pointed out in each of the following team’s sections, the interviews took place using the phone and electronic mail, depending on the needs of the informants. Considering these interviews along with the speech act analysis has provided additional clarity on the nature of exchange’s between individual students and subject matter experts during telementoring.

The information in this chapter presents results of discourse analysis of speech acts and informant interviews for each team selected for study. Discourse analysis revealed patterns during individual sentence analysis of each message. The themes and experiences gleaned from the informants’ interviews are used to add depth to the discourse analysis. A holistic view of the perspectives of the available participants is presented in order to better describe online communications among team members. All names used are pseudonymous.
The Books team began communicating in January 1997, bringing together three unique individuals in a long-term collaborative discourse. In a majority of Electronic Emissary Projects, the collaborating team is initiated by a teacher or parent who contacts the Electronic Emissary Project and requests that a match be created. The Books match was not a typical Electronic Emissary teaming: there was no teacher or parent participating in the combination of active discourse participants. The match was started by Janice Karr, an Education Writer for Excite and the creator of a popular Internet site which focuses on K-99 educational projects. Karr lives in California and is a poet and mother of an 11-year-old daughter. She can be classified as an experienced electronic mail and Internet user.

In this match, the “Teacher,” in this case, Janice, and the subject matter expert, Laura, were both mentors to the student, Joan. This is evident in the large amount of content exchanged among all three participants. Janice had discovered the work of Joan and wanted to help her find a niche in life and on the Web. Janice encouraged Joan’s dream of creating a Web page to give advice to children on what books to read and to serve as a type of ‘mentor’ for them. For Janice, the project was about helping Joan become a better book reviewer and to help her share her work with others. In this section all references to ‘Teacher’ will refer to Janice. Janice provided comments about the speech act analysis during phone interviews and by electronic mail.
Joan, the student, was attending high school in Petaluma, California, during the discourse. Since the Books project began, she has graduated from high school and has begun studies at Stanford University in English. Joan attributes her pursuit of English to her positive experiences during this Electronic Emissary Project. Joan has a disability which limits her physical activity. When asked by the subject matter expert about the difficulties she has reading, she commented:

This has been a problem for me because I read constantly, but I do not have an automatic page turner. My family has not been able to find one that is effective. I like to read a lot, but it is difficult to find someone to turn pages whenever I am reading.

From talking with all the participants, it became apparent that Joan’s family provided extended support during the discourse. Both the subject matter expert and teacher commented on the fact that the student’s mother went to great lengths to ensure that Joan got the materials and aid required to enable her to do her work. When Joan was asked to comment about her experience, she had this to say:

My mentor has influenced me to pursue a path that will always involve literature. I am an English major now and I hope to publish fiction as my career. The program sparked my interest in literature four years ago and I have been enthusiastic about becoming a publisher ever since. The program taught me important skills for reading and writing.
The mentor introduced me to the process of reading critically. I learned that my opinion about a book is not enough. I have to find the literary value of the text. And then, when I do offer my opinion, I cannot offer a thumbs up or thumbs down review; I have to provide reasons. The only way to convince my audience to read the book, or not, is to construct a logical argument for or against the book. As far as my writing skills go, the mentorship gave me my first opportunity to write for an audience. I quickly learned that I have to consider the "needs" of my audience as I write. For example, I no longer make assumptions about my readers, like "You will like this book...." because maybe they will not like it. My mentor was the first person to critique my writing. I appreciated her comments because at the time I was frustrated with the lack of feedback from my high school teachers. I feel that my writing began to improve for the first time in several years while working with her. As I mentioned above, my mentor initiated my interest in literature and writing. Now that I think about it, she also was crucial to helping me identify as a writer; I took myself seriously. She gave me the focus and the self-confidence to take the reins as editor of the high school literary magazine, which would not have been published otherwise.

Selected as subject matter expert was Laura, a professional writer and editor with many years of experience. Laura also lives in California, about 50 miles northwest of Sacramento. She also has a disability which can limit her activity at times and did limit her somewhat during one part of the discourse.
While not an experienced Internet user at the time, she was an experienced electronic mail user. She had the following to say about the project:

When we first started out she [Joan] thought that being a book editor would be a great idea and had no idea of what it took to get there and we kind of backed up and started from the beginning and said, okay, this is what you need to study while in high school, this is what you need to study while in college, and that is how we ended up with her doing a lot of writing. I think that Joan learned a lot from me, she asked really good questions, she has a tremendously supportive family who was willing to try anything that I might suggest, as far as getting her resources and that kind of thing. If I suggested a book for her to read, they would make sure she got it. Of course reading for her was very difficult because she couldn't turn the pages and I didn't understand that for a while, I had been suggesting to her to read some newspapers and I had no concept for a while of what she had to go through to read, but she stuck with it and I know I saw discernible differences in the way she was writing by the time she and I were done.

During the one-hundred seventy-seven (177) weeks of discourse, the participants exchanged two-hundred and six (206) messages. This was one of the longest ongoing communications the Electronic Emissary has sponsored. The exchanges among the participants were fairly well-distributed, with each sending between twenty-three (23) and thirty-three (33) percent of the messages. This represents a very balanced exchange of messages between the participants. The teacher, with sixty-four (64) messages, and the subject
matter expert, with sixty-nine (69) messages, sent the most, followed by the student with forty-eight (48) messages. When asked about this trend, Laura and Janice felt that it was because they were both mentoring Joan. Another factor to be considered in this message exchange is the amount of time and difficulty it takes Joan to write an electronic mail message. Table 5 shows the frequency of message exchanges among the participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>64</td>
<td>31.1%</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>69</td>
<td>33.5%</td>
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<tr>
<td>Student</td>
<td>48</td>
<td>23.3%</td>
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<tr>
<td>Facilitator</td>
<td>25</td>
<td>12.1%</td>
</tr>
</tbody>
</table>

An examination of the Message Flow shows that the subject matter expert sent messages mainly to the student (22.3%), the student sent messages to both the subject matter expert and teacher (20.4%), and the teacher sent messages to both the subject matter expert and student (24.3%). The majority of the facilitator messages were sent to all participants (16%) and were frequently announcements or requests about activity status. Table 6 shows the frequency of message flow among the participants. Other types
of message flow were used considerably less than the following five flow types: Subject Matter Expert to Student, Teacher to Subject Matter Expert/Student, Student to Subject Matter Expert, Student to Teacher, and Facilitator to All. These emphasize the discourse happening among the Student, Subject Matter Expert, and Teacher.

Table 6
Frequency of Message Flow Types in the Books Team

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>12</td>
<td>5.8%</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>46</td>
<td>22.3%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>6</td>
<td>2.9%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>5</td>
<td>2.5%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>1</td>
<td>.5%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>6</td>
<td>2.9%</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>9</td>
<td>4.4%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>30</td>
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</tr>
<tr>
<td>Teacher to Student</td>
<td>20</td>
<td>9.7%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>26</td>
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</tr>
<tr>
<td>Student to Facilitator</td>
<td>1</td>
<td>.5%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
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<td>.5%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Teacher</td>
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</tr>
<tr>
<td>Student to Teacher</td>
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</tr>
<tr>
<td>Facilitator to All</td>
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<td>7.8%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>1</td>
<td>.5%</td>
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<tr>
<td>Facilitator to Teacher</td>
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<td>2.9%</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>1</td>
<td>.5%</td>
</tr>
</tbody>
</table>

Total Exchanges 206
By examining the flow of words sent in the exchanges, as shown in Table 7, it can be seen that the subject matter expert kept a relatively steady flow of words used in her exchanges with a mean value of between 400 to 600 words per message. The student tended to be much more verbose in her message discourse. This can be attributed to the fact that she was posting her book reviews for comment to the group, which was one of the agreed-upon purposes for the project. The responses back from the subject matter expert and teacher generally did not contain the entire book review, but contained feedback and other response types which will be shown when discussing message functions by type of message flow, below. This made for slightly shorter messages from the subject matter expert and teacher to the student. The teacher sent generally shorter messages as compared with the student and subject matter expert. When reading these messages from the discourse, the result of dual mentoring in this match is apparent.
## Table 7
Message Flow by Mean Words in Messages Sent in the Books Team

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<tr>
<th>Message Flow Type</th>
<th>Mean Words</th>
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<td>Subject Matter Expert to Teacher</td>
<td>345.50</td>
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<td>Subject Matter Expert to Student</td>
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<td>Subject Matter Expert to Teacher/Student</td>
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<td>Subject Matter Expert to Facilitator</td>
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<td>Subject Matter Expert to Facilitator/Student</td>
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<td>Teacher to Subject Matter Expert</td>
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<td>Teacher to Facilitator</td>
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<td>Teacher to Subject Matter Expert/Student</td>
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<td>Teacher to Student</td>
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<td>Student to Subject Matter Expert</td>
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<td>Student to Facilitator</td>
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<td>Student to Subject Matter Expert/Facilitator</td>
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<td>Student to Teacher</td>
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<td>Facilitator to All</td>
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<td>Facilitator to Subject Matter Expert/Student</td>
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<td>Facilitator to Teacher</td>
<td>202.93</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>123.50</td>
</tr>
</tbody>
</table>

Mean of all exchanges 371.231
Figure 12 shows the activity of the match by the number of messages sent per week. The discourse started successfully and kept a steady flow of messages up until week 145, almost three years into the match. The first twenty (20) weeks of the project, a typical length of an Electronic Emissary Project, showed nearly constant activity. This activity suggests that the participants started communications immediately and kept “going strong.” There were no “stutter steps” at the beginning of the match, which might have caused the project to be unsuccessful. This can be seen in the lack of facilitator messages in the early weeks of the match focused on procedures or trouble-shooting. It is not uncommon in an Emissary project to see the facilitator being very active in the early part of a match, helping with issues and problems. In this match, there were no problems with electronic mail accounts, no problems maintaining the focus of the project, or gaining a pattern of message exchange that worked for the participants. These types of problems might have caused the facilitator to be much more active; inversely, this also might have resulted in less participation by the other members involved. Additionally, the message exchanges were kept steady by the fact that Joan felt strongly about the importance of communications and kept working on her personal development that came from the communications. She commented that she looked forward to messages from her mentors.
Table 8 shows the breakdown of Message Flow Types sent for each week of the first 100 messages of the match. The subject matter expert and student were very active during the first forty-one (41) weeks of the match. The teacher was providing feedback and input as needed. After starting the project, the facilitator’s electronic mail contained a large amount of reporting of general information which was aimed at helping the participants with their project more than providing direction or correcting problems.
The number of messages per week ranged from zero to eleven, but averaged approximately four messages a week when messages were being exchanged. An interesting trend to note is the breaks in activity. After week twenty (20), the participants would exchange several messages, then pause for a week or more. In examining the message discourse, the reason found for this trend was the participants’ busy schedules. When asked to comment, the participants couldn’t recollect any other reason for this trend. All participants responded promptly to messages. This can be seen with the four or more messages sent each week when discourse occurred. When someone sent a message, one or more of the participants would respond and provide content or feedback. The participants each felt that the prompt feedback was a significant factor in contributing to the depth and quality of the discourse.
# Table 8a

Number of Message Flow Types shown by Week in Books Team

<table>
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<tr>
<th>Message Flow Type</th>
<th>Week</th>
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Table 8b
Number of Message Flow Types shown by Week in Books Team

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<td>Student to Subject Matter Expert/Teacher</td>
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</tr>
<tr>
<td>Total Number of Messages Sent each Week</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
As discussed in Chapter 3, when coding messages, the sentences in each message were assigned one of the following category types: "Reporting Information," "Requesting Information," and/or "Other." These categories and subsequent functions allow insight into the flow of information during the discourse. Once a sentence was categorized, it was examined for apparent and specific functions. Each sentence of each message can contain one or more function types. (Appendix C contains detailed descriptions of message flow and function types.) It should be noted, as a result of this coding scheme, that potential multiple codes being assigned to each sentence did occur. Therefore, percentage of occurrences in all messages for function or category will not necessarily total 100%. This is because each function or category can occur in a message and thus the percentage is relative to each function or category across all messages.

In the Books group’s discourse, several patterns emerged when the analysis of message sentence function analysis was completed. Table 9 shows the categories of use overall and Table 10 shows this broken down by message flow type. The Reporting category was most often used by the participants, comprising 79.1% of functions coded. This was followed by Requesting at 11.2% and Other at 9.7%. Reporting Functions were almost four times more likely to be used by the participants during this match than other function categories. Within Reporting, the Reporting of Content was the most frequently seen message function at 48.96%. This directly reflects
the amount of discussion between the participants regarding the focus of the project. Reporting of Content (48.96%) was used more than the other three most frequently used functions combined (46.45%): Reporting of General Information at 18.43%, Personal Information at 15.20%, and Ideas/Opinions/Emotions at 12.82%. The remaining reporting functions of Procedural Information, Resources, and Feedback appeared less than 2%. When asked about the reporting of content compared to other functions, the subject matter expert stated that the content discussed was book reviews and critiques. Suggestions on these reviews dominated the exchanges for most of the project. The subject matter expert and student sent almost an identical number of sentences with reporting functions during the discourse, making up 68% of the total reporting functions for the project. These can be seen in Table 11.

Table 9
Frequencies of Message Flow Categories in Books Team

<table>
<thead>
<tr>
<th>Message Flow Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td>2355</td>
<td>79.1%</td>
</tr>
<tr>
<td>Requesting</td>
<td>332</td>
<td>11.2%</td>
</tr>
<tr>
<td>Other</td>
<td>290</td>
<td>9.7%</td>
</tr>
</tbody>
</table>
Table 10
Frequencies of Message Functions by Message Category in Books Team

<table>
<thead>
<tr>
<th>Message Category/Function</th>
<th>Frequency</th>
<th>Percent Total</th>
<th>Percent within Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>1153</td>
<td>38.73%(^1)</td>
<td>48.96%(^1)</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>47</td>
<td>1.58%</td>
<td>2.00%</td>
</tr>
<tr>
<td>General Information</td>
<td>434</td>
<td>14.58%(^2)</td>
<td>18.43%(^2)</td>
</tr>
<tr>
<td>Personal Information</td>
<td>358</td>
<td>12.03%(^3)</td>
<td>15.20%(^3)</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>302</td>
<td>10.14%(^4)</td>
<td>12.82%</td>
</tr>
<tr>
<td>Resource</td>
<td>27</td>
<td>0.91%</td>
<td>1.15%</td>
</tr>
<tr>
<td>Feedback</td>
<td>34</td>
<td>1.14%</td>
<td>1.44%</td>
</tr>
<tr>
<td>Total of Reporting Functions</td>
<td>2355</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Requesting               |           |               |                         |
| Content                  | 49        | 1.65%         | 16.90%\(^3\)           |
| Procedural Information   | 10        | 0.34%         | 3.45%                   |
| General Information      | 39        | 1.31%         | 13.45%                  |
| Personal Information     | 99        | 3.33%         | 34.14%\(^1\)           |
| Ideas/Opinions/Emotions  | 29        | 0.97%         | 10.00%                  |
| Resource                 | 1         | 0.03%         | 0.34%                   |
| Feedback                 | 63        | 2.12%         | 21.72%\(^2\)           |
| Total of Requesting Functions | 290 |                         |                         |

| Other                    |           |               |                         |
| Salutation               | 253       | 8.50%\(^5\)   | 76.20%\(^1\)           |
| Planning                 | 1         | 0.03%         | 0.30%                   |
| Thanking                 | 57        | 1.91%         | 17.17%\(^2\)           |
| Complaining              |           |               |                         |
| Apology                  | 21        | 0.71%         | 6.33%                   |
| Total of Other Functions | 332       |               |                         |

Total Functions: 2977 functions within 206 exchanges

Note. \(^1\), \(^2\), \(^3\), \(^4\), \(^5\) are used in the Percent Total column indicate the relative ranking within all Message Functions. \(^1\), \(^2\), \(^3\), are used in Percent within Category is used to indicate the relative ranking within each category.
Within the Requesting category, the Requesting of Personal Information (34.14%) appeared most often, followed closely by Feedback (21.72%), Content (16.90%), and General Information (13.45%). Participants would normally inquire about personal information in the course of online dialogue. The exchange of personal information was more prevalent after suspensions in discourse or if there was an issue of importance to one or more of the participants, such as illness or personal issues that could emotionally affect a participant. This exchange of personal information suggests an emotional bonding among the participants forming as the project progressed. As shown in Table 11, the Student and Subject Matter Expert generated the most Reporting, Requesting, and Other functions in their messages. The frequency of functions by message flow type, which are shown in Table’s 12, 13, and 14, were consistent with the frequency of message flow categories as shown above in Table 10. There were no functions within the message flow types that showed deviation outside those shown in Table 10.

Comments made by the participants during their interviews reflected and agreed with what emerged during the analysis shown above. The participants all felt very satisfied with the outcomes of the project. This satisfaction can be seen in the absence of messages containing complaints and in both the length of time of the project and the amount of reporting that happened between the subject matter expert and student. When communications seemed to stall because of summer break or other schedule
interruptions, either the student or subject matter expert would get things going again. Each felt that the time spent communicating was very worthwhile. The analysis showed a broad range of discourse functions, which is supported by Laura’s comment, “More was going on than just mentoring on how to become a book editor.”
Table 11  
Total and Percentage of Categories Report, Request, Other by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
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<th>Requesting</th>
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<th>Other</th>
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<tr>
<td></td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>Facilitator to All</td>
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<td>9</td>
<td>0.03</td>
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<td>Facilitator to Student</td>
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<td>&gt;.01</td>
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<td>&gt;.01</td>
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<td>&gt;.01</td>
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Note. 1, 2, 3 are used to indicate the relative ranking within each category column.
### Table 12a
Total Frequency and Percentage of Reporting Functions by Message Flow

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<th>PI</th>
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<tr>
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<td>6</td>
<td>5</td>
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*Note.* ¹, ², ³ are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 12b  
Total Frequency and Percentage of Reporting Functions by Message Flow

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<th>IOE</th>
<th>Resc</th>
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Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 13a
Total Frequency and Percentage of Requesting Functions by Message Flow

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<tr>
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Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
### Table 13b
Total Frequency and Percentage of Requesting Functions by Message Flow

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*Note.* Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources; Feed = Feedback.
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*Note.* OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining; OA = Other Apology.
Table 14b
Total Frequency and Percentage of Other Functions by Message Flow

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<th>OT</th>
<th>OC</th>
<th>OA</th>
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</table>

Note. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining; OA = Other Apology.
The Medicine team began communicating in February, 1998 and exchanged messages so for four months. The match was requested by David, a classroom teacher and technology coordinator for a small central Texas Independent School District (ISD). He had been in the education field for twelve years and was in his second year as technology coordinator. He holds two degrees from Baylor University, one of which is in Computer Information Systems. He is responsible for the Independent Study class for senior students. The aim of the Independent study class is to give the students the opportunity to research a field of interest before going to college. This is, he suggests, “just in case they might change their mind once they start, wasting time and money.” He is also responsible for maintaining the school’s Web site. David can be considered an accomplished Internet user. David was not available to provide input on the Medicine team’s discourse.

David requested a match for Debbie, an 18-year-old student who was interested in learning more about medicine, especially the area of anesthesiology. Debbie was very active in church, sports, and the advanced placement classes offered at her school. She was very limited in her computer access time to send electronic mail as part of her project work. It was not clear exactly how limited her Internet and electronic mail access was, though. It appears that she did not have access to the Internet or electronic mail away from school. Debbie can be termed a “beginner” in both Internet
access and electronic mail use. Debbie had a presentation to make during the semester for one of her classes and was hoping to use this telementoring project to help her with materials and content for that presentation. Debbie was not available for comment on the discourse analyzed.

Selected for the electronic team was Dr. Mordon, an anesthesiologist living in St. Louis, Missouri. He graduated from the University of Oklahoma with a B.S. in Zoology, then spent six years in the Navy as a pilot. After his military service, he attended the University of Texas Health Sciences Center in San Antonio for his M.D. Upon completion of his residency in anesthesiology, he stayed on as an assistant professor of anesthesiology for about three years. This was the second Electronic Emissary team on which he had served, and the first with an individual student protégé. Dr. Mordon was available for comment on the analysis, but due to his busy schedule, had limited time for such conversation.

The Medicine project lasted fourteen (14) weeks and included only thirty-five (35) messages exchanged. This was a very short project and the amount of content exchanged was very small and limited in scope. The student and subject matter expert exchanged the most messages in the team, representing almost 70% of the exchanges. Table 15 shows the number of messages exchanged by the participants. The teacher’s participation in the match was limited to only two messages sent. The first message from the teacher was a personal introduction, covering his background and interests.
The last message contained comments relative to the requested project evaluation. Messages from the facilitator (25%) mainly covered administrative issues, such as an inaccurate electronic mail address being used in the first two weeks and, later, sending many messages attempting to correct the lack of project structure and content exchange between the student and subject matter expert. Halfway through the project, the facilitator experienced a serious injury which removed her from being an active participant. She was able to start using electronic mail again toward the end of the project. The subject matter expert felt the length of the project was defined by the date of the student’s class presentation. Once the presentation was over, the online project was completed for Debbie.

Table 15
Frequency of Message Exchanges by Participants in Medicine Team

<table>
<thead>
<tr>
<th>Participant</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>2</td>
<td>5.6%</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>11</td>
<td>30.6%</td>
</tr>
<tr>
<td>Student</td>
<td>14</td>
<td>38.9%</td>
</tr>
<tr>
<td>Facilitator</td>
<td>9</td>
<td>25.0%</td>
</tr>
</tbody>
</table>
Table 16 shows that the student and subject matter expert sent most of the messages, with the facilitator sending messages to all participants. Other message flow types occurred in less than five percent of the exchanges. It should be noted that several message flow types were not represented.

When looking at mean word use in messages, there were no definable patterns discerned. All the messages sent had about the same mean word length, within 150 words of each other.

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>7</td>
<td>19.40%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>1</td>
<td>2.80%</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>2</td>
<td>5.60%</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>2</td>
<td>5.60%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>8</td>
<td>22.20%</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>1</td>
<td>2.80%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>1</td>
<td>2.80%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>11</td>
<td>30.60%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>1</td>
<td>2.80%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Teacher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Teacher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>1</td>
<td>2.80%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Exchanges 35
Table 17 shows message flow types, and Figure 13 shows the messages exchanged per week. From this information it can be seen that there was no real pattern established during the project. A participant would submit a message and one or more of the other participants may or may not have responded back to it. Week ten showed the greatest number of messages exchanged, when the student and subject matter expert tried to communicate about a deadline Debbie had to meet for her presentation, yet they never really got in touch with one another. When asked about this, the subject matter expert simply commented that there was no organization to the communications and that he was frustrated by the lack of clearly requested information. He felt that the student was assuming he knew what was happening and that she needed to send more general information in order to have him better understand and address her needs. Reduced Internet access, limited experience in using electronic mail in this manner, and the demands upon the student, a graduating senior, probably explain Debbie’s limited interactions with her mentor.
### Table 17
Number of Message Flow Types shown by Week in Medicine Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
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<tr>
<td>Facilitator to Student</td>
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<tr>
<td>Facilitator to Teacher</td>
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<tr>
<td>Subject Matter Expert to Facilitator</td>
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<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
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</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Subject Matter Expert to Teacher</td>
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<td>Subject Matter Expert to Teacher/Student</td>
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<tr>
<td>Student to Facilitator</td>
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<tr>
<td>Student to Subject Matter Expert</td>
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<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<td>Student to Subject Matter Expert/Facilitator</td>
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<td>Student to Subject Matter Expert/Teacher</td>
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<tr>
<td>Student to Teacher</td>
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<tr>
<td>Teacher to Facilitator</td>
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<td></td>
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<tr>
<td>Teacher to Subject Matter Expert</td>
<td>1</td>
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<td>Teacher to Subject Matter Expert/Student</td>
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<tr>
<td>Teacher to Student</td>
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<td></td>
</tr>
</tbody>
</table>

**Total Number of Messages Sent each Week**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
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<td>0</td>
<td>2</td>
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<td>0</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Tables 18 and 19 show the frequencies of message functions occurring during the match. Functions of a Reporting nature were by far the most common type of speech acts exchanged, by a factor of almost three times greater than Requesting and Other function categories combined. Reporting of General Information (31.96%) and Personal Information (29.38%) were the most frequently used Reporting functions, followed closely by Content Information (22.16%). Since so few messages which contained Content
Information were exchanged, the more general types of Reporting functions are seen more often. This is also shown in Table 21, which shows the breakdown of Reporting function by message flow type. Requesting of General Information (40.74%), Content Information (29.63%), and Feedback (18.52%) were the most frequently occurring Requesting functions. The Student requested more content information than was provided by the Subject Matter Expert. The large number of General Information requests reflects the numerous messages sent by the participants trying to get information about what was needed or what was happening. An interesting trend shown in Table 20 is that the Facilitator, while not fully active during the match, still used a wider range of message functions than the other participants, with the highest use of Requesting functions used by all participants. These messages to all users sent by the Facilitator typically reported information to correct problems that were arising during the discourse.

Table 18
Frequencies of Message Flow Categories in Medicine Team

<table>
<thead>
<tr>
<th>Message Flow Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td>194</td>
<td>73.48%</td>
</tr>
<tr>
<td>Requesting</td>
<td>27</td>
<td>10.23%</td>
</tr>
<tr>
<td>Other</td>
<td>43</td>
<td>16.29%</td>
</tr>
</tbody>
</table>
Table 19
Frequencies of Message Functions by Message Category in Medicine Team

<table>
<thead>
<tr>
<th>Message Category/Function</th>
<th>Frequency</th>
<th>Percent Total</th>
<th>Percent within Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reporting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>43</td>
<td>16.29%³</td>
<td>22.16%³</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>2</td>
<td>0.76%</td>
<td>1.03%</td>
</tr>
<tr>
<td>General Information</td>
<td>62</td>
<td>23.48%¹</td>
<td>31.96%¹</td>
</tr>
<tr>
<td>Personal Information</td>
<td>57</td>
<td>21.59%²</td>
<td>29.38%²</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>28</td>
<td>10.61%</td>
<td>14.43%⁴</td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>2</td>
<td>0.76%</td>
<td>1.03%</td>
</tr>
<tr>
<td><strong>Total of Reporting Functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>194</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Requesting**                     |           |               |                         |
| Content Information                | 8         | 3.03%         | 29.63%²                 |
| Procedural Information             | 1         | 0.38%         | 3.70%                   |
| General Information                | 11        | 4.17%         | 40.74%¹                 |
| Personal Information               | 1         | 0.38%         | 3.70%                   |
| Ideas/Opinions/Emotions            | 1         | 0.38%         | 3.70%                   |
| Resource                           |           |               |                         |
| Feedback                           | 5         | 1.89%         | 18.52%³                 |
| **Total of Requesting Functions**  |           |               |                         |
| Total                              | 27        |               |                         |

| **Other**                          |           |               |                         |
| Salutation                         | 27        | 10.23%        | 62.79%¹                 |
| Planning                           | 0         | 0.00%         | 0.00%                   |
| Thanking                           | 12        | 4.55%         | 27.91%²                 |
| Complaining                        |           |               |                         |
| Apology                            | 4         | 1.52%         | 9.30%                   |
| **Total of Other Functions**       |           |               |                         |
| Total                              | 43        |               |                         |
| **Total Functions**                | 264       |               |                         |

**Note.** ¹,²,³ are used in the Percent Total column to indicate the relative ranking within all Message Functions. ¹,²,³ are used in Percent within Category to indicate the relative ranking within each category.
Table 20
Total and Percentage of Categories Report, Request, Other by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Reporting</th>
<th></th>
<th>Requesting</th>
<th></th>
<th>Other</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>Facilitator to All</td>
<td>43</td>
<td>0.22(^3)</td>
<td>12</td>
<td>0.44(^1)</td>
<td>15</td>
<td>0.36(^2)</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>11</td>
<td>0.06</td>
<td></td>
<td></td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>4</td>
<td>0.02</td>
<td>3</td>
<td>0.11</td>
<td>3</td>
<td>0.07</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>9</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>70</td>
<td>0.36(^1)</td>
<td>5</td>
<td>0.19(^3)</td>
<td>3</td>
<td>0.07</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>1</td>
<td>0.01</td>
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<tr>
<td>Student to Facilitator</td>
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</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>31</td>
<td>0.16(^3)</td>
<td>7</td>
<td>0.26(^2)</td>
<td>16</td>
<td>0.38(^1)</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>5</td>
<td>0.03</td>
<td></td>
<td></td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Teacher</td>
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<tr>
<td>Student to Teacher</td>
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</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>1</td>
<td>0.01</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
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<td>0.09</td>
<td></td>
<td></td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
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<tr>
<td>Teacher to Student</td>
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<td></td>
</tr>
<tr>
<td>Total of Functions</td>
<td>194</td>
<td>27</td>
<td>42</td>
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</tr>
</tbody>
</table>

Note. \(^1\), \(^2\), \(^3\) are used to indicate the relative ranking within each category column.
Within Reporting of Functions by Message Flow (Table 21), 86% of Reporting of Content was sent by the Subject Matter Expert. The Facilitator also reported information quite frequently, two of the highest Reporting functions reporting of General Information (52%) and Ideas/Opinions/Emotions (25%). The Subject Matter Expert reported Personal Information most often (39%) followed by the Teacher (26%). The Teacher’s reporting of Personal Information was completely contained in the first of two messages sent. The Student did not report much Personal Information – only six (12%) functions coded. The Student had low or no reporting of the following speech acts: Content (14%), General Information (18%), Personal Information (18%), Resources (0%), and Feedback (0%).

Requesting Functions by Message Flow (Table 22) shows, as with Reporting functions, that the Facilitator used a more diverse array of Requesting functions and had the highest frequency of General Information (63%) and Feedback (60%) requests. The student had the most requests for Content, at 63%. The Facilitator had the second highest requesting of Content at 38%, when she was asking Dr. Mordon about her recent surgery. The student showed low or no use of Procedures (0%), Personal Information (0%), General Information (9%), and Resources (0%). The teacher did not send requests. Table 23 shows the rate of Other Functions by Message Flow. The Facilitator showed the highest reporting of all of these functions.
While the student did receive information from the subject matter expert for her presentation, this project had serious problems in communications, as was reflected in the analysis and the interviews with Dr. Mordon. The subject matter expert reported that he “was unsure of exactly what Debbie had in mind for a presentation.” He felt that electronic mail did not meet the student’s needs; more “real-time communications” might have assisted her better.

The teacher reported the following in his written evaluation of the match. He felt that he needed a better explanation of what is to be expected from the Electronic Emissary participants. He felt that the Emissary project, after contacting him, should have followed up before the match was begun to provide information. Normally, the facilitator sends information to each participant discussing how the Electronic Emissary functions. There is no record in the discourse if the facilitator had provided this information or not. If there was information sent to the teacher, it would have been before the discourse began and thus no record would be recorded and available for review. It seems from his comments that the teacher expected the subject matter expert and facilitator to do the project work with the student. He comments that:

The initial contact was very slow and sparse. I had trouble understanding my part as to what I should be doing. Then the change of facilitators and the "dropping of the ball" to make contact with Dr. Mordon didn’t help the match.
The subject matter expert felt that the lack of discourse of this match was a result of poor planning and problems with communications. He felt the student was not prepared to communicate with him, but just wanted a better source of information than might be found in the library or from her teacher. Once the presentation was completed, the project for her was finished. Dr. Mordon also felt that Debbie was very busy with her senior year in high school and her online interactions were a very low priority in her overall agenda.

In the end, the project was successful because Debbie completed her senior presentation and graduated. It is unknown if she went into medicine as her field of study in college. The teacher and subject matter expert both expressed frustration about the lack of sufficient communications about the project. This seems to be tied generally to a lack of time they spent communicating more than any other factor. The overall project goal of preparing the student for a presentation was not generally expressed until late into the discourse and the deadline for working on it was never discussed until week ten when the student was posting panicked messages trying to get information and responses from the subject matter expert. It is apparent from the discourse and the nature of the message flow that all parties had exceedingly busy schedules and that this hampered the amount and quality of discourse the participants could create.
## Table 21a
### Total Frequency and Percentage of Reporting Functions by Message Flow

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<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
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**Note.** Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 21b
Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
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<th>Message Flow Type</th>
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<th>PI</th>
<th>IOE</th>
<th>Resc</th>
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</table>

Note. 1,2,3 are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 22a
Total Frequency and Percentage of Requesting Functions by Message Flow

<table>
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<tr>
<th>Message Flow Type</th>
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<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
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</table>

Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 22b
Total Frequency and Percentage of Requesting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
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Note. \(^1,\(^2,\(^3\) are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 23a
Total Frequency and Percentage of Other Functions by Message Flow

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<td>Teacher to Subject Matter Expert</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Teacher to Student</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
Table 23b
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>O S</th>
<th>O P</th>
<th>O T</th>
<th>O C</th>
<th>O A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.33</td>
<td></td>
<td>0.42</td>
<td></td>
<td>0.33</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.07</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Facilitator to Student</td>
<td>0.07</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td></td>
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<tr>
<td>Subject Matter Expert to Facilitator</td>
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</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
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<tr>
<td>Subject Matter Expert to Student</td>
<td>0.04</td>
<td>0.08</td>
<td></td>
<td></td>
<td>0.33</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
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<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
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<td></td>
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<td></td>
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<tr>
<td>Student to Facilitator</td>
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<td>Student to Subject Matter Expert</td>
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<td>0.33</td>
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<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>0.08</td>
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<tr>
<td>Student to Subject Matter Expert/Teacher</td>
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<td></td>
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<tr>
<td>Student to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each Function column. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
Clouds

The Clouds team was formed in September, 1998, and communicated until August, 1999. The project was begun by Mary, a high school teacher in Dallas, Texas. Mary had previously been a 6th grade elementary school teacher and had been involved in several Electronic Emissary Projects involving classroom students. This was the first time she had arranged a match for an individual student. Mary began the project to help her student Rylana, a fifth year senior, graduate. Mary can be considered a well-educated Internet user. Mary was available for comment on this analysis.

Rylana can be classified as an “at risk” student. Rylana was not always in school and was dealing with several personal and emotional problems that kept her from communicating with Corbun, the subject matter expert, at times during the match. Mary had the following to say about Rylana:

She (Rylana) was working actually off and on. She would go through real emotional lows, where she was still working, but she would say, "Nobody wants to work with me," or "I need this," or "have this," or whatever but, or "Well, Corbun doesn't want to talk to me." I would encourage Rylana to get back with Corbun, then she would and it usually turned out pretty positive.
Mary set this match up as an independent study project for Rylana. Rylana did graduate from high school and the last Mary heard was that Rylana was working at the Dallas Science Place and was hoping to start at one of the local universities soon to study science. Since Rylana had always been curious about science, Mary had felt that a collaboration with Corbun would help her to find a job working in this field. Rylana was not available for comment on the analysis.

Mary had initially set “clouds” as the topic of study for this project. She had used this focus previously with Corbun and her 6th grade class and felt comfortable with the topic and how to handle it. However, as the match evolved, no real project came out of the discourse. Rylana initially sent electronic mail to Corbun and he suggested a few projects that could be done. Rylana, over the time of the project, did address one or two of those suggested topics, but none of them were fully explored.

Corbun is an expert in airborne studies of tropospheric/stratospheric clouds and aerosols. He was working at the National Center for Atmospheric Research at the time of the project with Rylana. He is currently teaching at a university in Mexico. He is a cloud physicist who studies the processes that govern the evolution of clouds. He had, at the time of the project, tutored high school students for over five years. Corbun had been involved in past Emissary matches and had served as a mentor for Mary and one of her elementary school classes. Corbun can be considered an expert
user of the Internet who knows how to communicate well with electronic mail. When Corbun was asked to comment on the project, he said that didn’t feel as if it was as successful as previous projects with Mary, because there was no actual project completed by the end of the period of communication exchanges. Also he felt that the time Mary was able to spend with the project was much more limited at the high school level than when she was at the elementary school level. When asked about his discourse with Rylana, he made the following comment:

I think that I was just another male authority figure for her. I mean authority, not from "authoritarian," but authority as in somebody that she could talk to both as a professional that is out there doing the work and also as a friend that she can talk to about her personal problems. From time to time she would let me know what was going on in her life, what she wanted to do. I would just try to offer some type of feedback to her and encourage her to continue what she was doing.

When asked about the communications between Rylana and Corbun, Mary made this statement:

Rylana was a pretty severe case, so it’s probably hard to tell about the communications, but what they had, that was going on, was fantastic. It was hard for her to communicate with anyone, so it was like electronic mail can do, you can talk to somebody you don't have to look at. They can't see you and so you don't feel like they judge you. It can just be a really positive thing, I think, particularly for students who were having the sort of problems that she was having.
When asked to further comment on Corbun’s role in the match Mary said:

He (Corbun) was pretty much an inspiration for her (Rylana). No matter what was going on she would always get really positive feedback from him, which was very helpful, and at the time, probably the only positive feedback that she was getting.

In the more than fifty-one (51) weeks of discourse, the Coulds team exchanged 135 electronic mail messages. As seen in Table 24 the Student (34.1%), Subject Matter Expert (31.9%), and Facilitator (29.6%) sent the most messages. The Teacher was not very involved in the online discourse, with only six (4.4%) of the messages sent in the exchanges. The Facilitator was very active in this team, beyond the purpose of facilitation of the project, which will be described later. The largest number of messages (66%) were sent from the Subject Matter Expert and the Student. The Student sent 23.7% of her messages to the Subject Matter Expert. The most often-seen message flow types were Subject Matter Expert to Student (17.78%), Student to Subject Matter Expert (13.33%), Student to Facilitator (11.11%), Student to Subject Matter Expert/Facilitator (10.37%), and Facilitator to Student (10.37%). The Student initiated the majority of the exchanges. Table 25 shows the frequency of message flow displayed in the discourse.
Table 24
Frequency of Message Exchanges by Participants in Clouds Team

<table>
<thead>
<tr>
<th>Participant</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>6</td>
<td>4.4%</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>43</td>
<td>31.9%</td>
</tr>
<tr>
<td>Student</td>
<td>46</td>
<td>34.1%</td>
</tr>
<tr>
<td>Facilitator</td>
<td>40</td>
<td>29.6%</td>
</tr>
</tbody>
</table>
Table 25  
Frequency of Message Flow Types in the Clouds Team

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>11</td>
<td>8.15%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td>6</td>
<td>4.44%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>5</td>
<td>3.70%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>1</td>
<td>0.74%</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>14</td>
<td>10.37%</td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>1</td>
<td>0.74%</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>2</td>
<td>1.48%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>8</td>
<td>5.93%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>2</td>
<td>1.48%</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>24</td>
<td>17.78%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>1</td>
<td>0.74%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>7</td>
<td>5.19%</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>15</td>
<td>11.11%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>18</td>
<td>13.33%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>14</td>
<td>10.37%</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>4</td>
<td>2.96%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>1</td>
<td>0.74%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>1</td>
<td>0.74%</td>
</tr>
</tbody>
</table>

Total Exchanges 135

Note. ¹,²,³ are used to indicate the relative ranking.
Table 26 shows the message flow by mean words used in the exchanges. All of the exchanges were approximately the same size, except for Facilitator to Subject Matter Expert/Student. This message flow type had a number of messages slightly larger than the other flow types. However, this flow type had only five messages, not that much more than the other flow categories that had higher number of messages exchanged, but with lower mean word use.

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Mean Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>377.64</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td>371.33</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>677.00</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>178.00</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>256.21</td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>169.00</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>290.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>374.13</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>445.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>577.67</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>352.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>194.14</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>146.60</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>303.28</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>176.93</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>387.00</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>560.00</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>244.00</td>
</tr>
<tr>
<td>Mean of all exchanges</td>
<td>341.160</td>
</tr>
</tbody>
</table>
The participants exchanged electronic mail thirty (58.8%) weeks out of the fifty-one weeks of the project. Figure 14 shows the exchange activity by week. The longest break was for 5 weeks during weeks 37 through 43. There seem to have been two reasons for this pause. The student was removed from electronic mail access while she dealing with a personal issue and the subject matter expert was making a trip during that period. The week 44 exchange was initiated by the facilitator followed by the subject matter expert’s in response. The student resumed communications in week 46, two weeks later. Exchanges during weeks 44 and 45 were among the facilitator, subject matter expert, and teacher.

Figure 14. Discourse Activity by Week for Clouds Team
Tables 27a and Table 27b show exchanges by message flow type over the first 100 messages (23 weeks). With the exception of a low number (2 messages) of Teacher-initiated exchanges during this period, all the message flow types were represented. The Student limited herself to sending messages to the Subject Matter Expert and Facilitator, while the Facilitator and Subject Matter Expert used a greater variety of message flow types during the project.

Table 27a  
Number of Message Flow Types shown by Week in Clouds Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
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</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
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<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Facilitator to Teacher/Student</td>
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<tr>
<td>Facilitator to Teacher</td>
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<tr>
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<td>Subject Matter Expert to Teacher</td>
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<tr>
<td>Total Number of Messages Sent each Week</td>
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<td>5</td>
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<td>17</td>
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</table>

219
Table 27b
Number of Message Flow Types shown by Week in Clouds Team

<table>
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<tr>
<th>Message Flow Type</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
</tr>
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<tbody>
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<td>Facilitator to All</td>
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<td></td>
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<tr>
<td>Facilitator to Subject Matter Expert</td>
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<td></td>
<td>2</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
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<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
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<td>1</td>
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<tr>
<td>Facilitator to Student</td>
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<td>Facilitator to Teacher/Student</td>
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<td>Facilitator to Teacher</td>
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</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
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<td></td>
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</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of Messages Sent each Week</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>
When looking at the frequency of message function categories shown in Table 28, Reporting (78.69%) was by far the most frequently used message function, followed by Requesting (8.52%) and Other (12.79%). Reporting was used almost four times more than the other categories. Looking at the breakdown of each category by functions, as seen in Table 29, Reporting General Information (39.67%) was the most often-used message function. The other four most frequently represented subclassifications of functions were Reporting Ideas/Opinions/Emotions (14.97%), Reporting Personal Information (13.66%), and Other Salutation (10.16%). Reporting of Content Information was only used 6.7% of the time. No Requesting functions were used more than 5%, with Requesting General Information (4.92%) being the most often-used Requesting function. Further examination of the total types of messages functions by message flow type, shown in Table 30, indicates that in Reporting, the Subject Matter Expert to Student flow pattern (24%) occurred most frequently, followed by Facilitator to Student (11%) and Student to Facilitator (10%). Most of the Requesting was done by the Facilitator to the Student (27%), followed by Student to Facilitator (18%), Subject Matter Expert to Student (12%), and Facilitator to Subject Matter Expert/Student (12%). Other functions flowed from Facilitator to Student (24%), Facilitator to All (13%), and Student to Facilitator (11%). There was no use of Complaining in any of the exchanges. This suggests that the participants were mostly using the Reporting functions in their communications, and that only a small amount of Requesting generated a lot of the Reporting. Reporting was initiated spontaneously by the participants
as things happened to them and as they came across content that they felt was appropriate to the discourse. The Reporting of Content was low because this match became more of a personally-focused mentoring group, helping the student with larger issues than just content-related science study.

Table 28
Frequencies of Message Flow Categories in Clouds Team

<table>
<thead>
<tr>
<th>Message Flow Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td>720</td>
<td>78.69%</td>
</tr>
<tr>
<td>Requesting</td>
<td>78</td>
<td>8.52%</td>
</tr>
<tr>
<td>Other</td>
<td>117</td>
<td>12.79%</td>
</tr>
</tbody>
</table>
Table 29  
Frequencies of Message Functions by Message Category in Clouds Team

<table>
<thead>
<tr>
<th>Message Category/Function</th>
<th>Frequency</th>
<th>Percent Total</th>
<th>Percent within Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reporting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>62</td>
<td>6.78%</td>
<td>8.61%</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>5</td>
<td>0.55%</td>
<td>0.69%</td>
</tr>
<tr>
<td>General Information</td>
<td>363</td>
<td>39.67%1</td>
<td>50.42%1</td>
</tr>
<tr>
<td>Personal Information</td>
<td>125</td>
<td>13.66%3</td>
<td>17.36%3</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>137</td>
<td>14.97%2</td>
<td>19.03%2</td>
</tr>
<tr>
<td>Resource</td>
<td>26</td>
<td>2.84%</td>
<td>3.61%</td>
</tr>
<tr>
<td>Feedback</td>
<td>2</td>
<td>0.22%</td>
<td>0.28%</td>
</tr>
<tr>
<td><strong>Total of Reporting Functions</strong></td>
<td>720</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Requesting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>3</td>
<td>0.33%</td>
<td>3.85%</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>1</td>
<td>0.11%</td>
<td>1.28%</td>
</tr>
<tr>
<td>General Information</td>
<td>45</td>
<td>4.92%</td>
<td>57.69%1</td>
</tr>
<tr>
<td>Personal Information</td>
<td>11</td>
<td>1.20%</td>
<td>14.10%3</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>5</td>
<td>0.55%</td>
<td>6.41%</td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>13</td>
<td>1.42%</td>
<td>16.67%2</td>
</tr>
<tr>
<td><strong>Total of Requesting Functions</strong></td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salutation</td>
<td>93</td>
<td>10.16%4</td>
<td>79.49%1</td>
</tr>
<tr>
<td>Planning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thanking</td>
<td>11</td>
<td>1.20%</td>
<td>9.40%</td>
</tr>
<tr>
<td>Complaining</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apology</td>
<td>13</td>
<td>1.42%</td>
<td>11.11%2</td>
</tr>
<tr>
<td><strong>Total of Other Functions</strong></td>
<td>117</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Functions</strong></td>
<td>915</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. 1, 2, 3, 4 are used in the Percent Total column indicate the relative ranking within all Message Functions. 1, 2, 3, are used in Percent within Category is used to indicate the relative ranking within each category.
Table 30  
Total and Percentage of Categories Report, Request, Other by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Reporting</th>
<th></th>
<th>Requesting</th>
<th></th>
<th>Other</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Total</td>
<td>Total</td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Facilitator to All</td>
<td></td>
<td>54 0.08</td>
<td>5 0.06</td>
<td>15 0.13²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td></td>
<td>36 0.05</td>
<td>2 0.03</td>
<td>11 0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td></td>
<td>22 0.03</td>
<td>9 0.12³</td>
<td>9 0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td></td>
<td>10 0.01</td>
<td></td>
<td>1 0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td></td>
<td>81 0.11²</td>
<td>21 0.27¹</td>
<td>28 0.24¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td></td>
<td>13 0.02</td>
<td></td>
<td>2 0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td></td>
<td>11 0.02</td>
<td>1 0.01</td>
<td>3 0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td></td>
<td>36 0.05</td>
<td>2 0.03</td>
<td>4 0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td></td>
<td>6 0.01</td>
<td>1 0.01</td>
<td>1 0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td></td>
<td>175 0.24¹</td>
<td>9 0.12³</td>
<td>8 0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td>11 0.02</td>
<td></td>
<td>2 0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
<td>51 0.07</td>
<td>2 0.03</td>
<td>1 0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
<td>70 0.10³</td>
<td>14 0.18²</td>
<td>13 0.11³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td></td>
<td>55 0.08</td>
<td>5 0.06</td>
<td>9 0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td></td>
<td>48 0.07</td>
<td>6 0.08</td>
<td>9 0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td>30 0.04</td>
<td>1 0.01</td>
<td>1 0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td></td>
<td>7 0.01</td>
<td></td>
<td>1 0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
<td>4 0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total of Functions</td>
<td></td>
<td>720 78 117</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. ¹,²,³ are used to indicate the relative ranking within each category column.
Tables 31, 32, and 33 show the breakdown of message functions by flow types. All Message Flow types displayed Reporting of General Information and all but one included Reporting Ideas/Opinions/Emotions. Reporting Content was most often used by the Subject Matter Expert in communications with the Student (69%), and Student to Facilitator (16%).

The Facilitator, at 40%, generated the most Reporting of Procedures.

Reporting General Information was done by the Facilitator when addressing the Student (14%) and Subject Matter Expert to Student (14%) equally. This was followed by Facilitator to All at eleven percent (11%). Reporting of Personal Information occurred mostly in messages sent by the Subject Matter Expert to the Student (46%), with Student to Facilitator (11%) generating the next greatest amount. Reporting of Ideas/Opinions/Emotions occurred in the messages sent from Facilitator to Student (20%), Subject Matter Expert to Student (13%), and Student to Subject Matter Expert/Facilitator (12%) flow types. Reporting of Resources occurred in messages from the Subject Matter Expert to the Student/Teacher in 77% of the functions coded. The Facilitator to Subject Matter Expert/Student, Facilitator to Student, and Student to Subject Matter Expert/Facilitator all equally displayed Requesting of Content. Requesting of General Information was most often displayed in Facilitator to Student (36%) and Student to Facilitator (27%) messages. Requesting of Ideas/Opinions/Emotions was used most Student to Facilitator (60%), and Student to Subject Matter Expert messages (40%). The Facilitator used 38% of
the Other Salutations, 45% of the Other Thanking and 31% of the Other Apology message functions noted – more than any other team member.

While the team did not produce a completed project, it is obvious from the participants’ responses that the positive impact upon Rylana’s self-confidence and self-esteem were enormous. This communications exchange provided her with emotional support that allowed her, eventually, to graduate from high school. Both the subject matter expert and facilitator took on mentoring roles with the student at different times in the discourse. The facilitator was very active in the discourse beyond the handling of problems or issues within the project. In fact, the facilitator can be seen, when looking at the use of message functions, as an active participant in the project. When the discourse would appear to end, the subject matter expert, teacher, or facilitator would start the communications again, the student would respond, and the dialogue would continue. Since the discourse was open-ended, the student seemed to benefit most from the sustained communications with the other participants, rather than the previously-planned project work.
Table 31a
Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>3</td>
<td>40</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td>26</td>
<td>2</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>12</td>
<td>3</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>1</td>
<td>50</td>
<td>2</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>2</td>
<td>8</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>1</td>
<td>7</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>21</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>5</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>43</td>
<td>50</td>
<td>57</td>
<td>18</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>6</td>
<td>21</td>
<td>9</td>
<td>2</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>10</td>
<td>31</td>
<td>14</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>33</td>
<td>13</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>23</td>
<td>8</td>
<td></td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>1</td>
<td>18</td>
<td>5</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 31b
Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.05</td>
<td></td>
<td>0.11</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td>0.07</td>
<td>0.02</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.03</td>
<td>0.02</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>0.20</td>
<td>0.14</td>
<td>0.02</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>0.40</td>
<td>0.02</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>0.20</td>
<td>0.02</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>0.06</td>
<td>0.01</td>
<td>0.08</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>0.01</td>
<td>0.04</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>0.69</td>
<td>0.14</td>
<td>0.46</td>
<td>0.13</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
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<td></td>
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<tr>
<td>Subject Matter Expert to Teacher/Student</td>
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<td>0.06</td>
<td>0.07</td>
<td>0.01</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
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<td>0.09</td>
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</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 32a
Total Frequency and Percentage of Requesting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
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<td></td>
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<td></td>
<td></td>
<td>4</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
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<td>6</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
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<td></td>
<td></td>
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</tr>
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</tr>
<tr>
<td>Facilitator to Teacher</td>
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</tr>
<tr>
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<td>1</td>
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<td>Student to Facilitator</td>
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<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
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<td>4</td>
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<td>Teacher to Facilitator</td>
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<tr>
<td>Teacher to Subject Matter Expert</td>
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<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
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</table>

Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 32b
Total Frequency and Percentage of Requesting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
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<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.33</td>
<td>0.13</td>
<td>0.09</td>
<td></td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
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<td>0.36</td>
<td>0.18</td>
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<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
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<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
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<td></td>
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</tr>
<tr>
<td>Subject Matter Expert to Student</td>
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<td></td>
<td></td>
<td>0.23</td>
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</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>0.02</td>
<td>0.09</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Student to Facilitator</td>
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<td>Student to Subject Matter Expert</td>
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<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>0.33</td>
<td>0.09</td>
<td>0.09</td>
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<td></td>
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<tr>
<td>Teacher to Facilitator</td>
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<td>0.08</td>
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</tr>
<tr>
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<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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Table 33a
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>OS</th>
<th>OP</th>
<th>OT</th>
<th>OC</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
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<td></td>
<td></td>
<td>2</td>
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<td>8</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>9</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
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<td></td>
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</tr>
<tr>
<td>Facilitator to Student</td>
<td>22</td>
<td>2</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
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<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
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<td>1</td>
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<td></td>
<td>1</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
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<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
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<td>1</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
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<tr>
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<td>Teacher to Subject Matter Expert</td>
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</tr>
</tbody>
</table>

Note. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
Table 33b
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>OS</th>
<th>OP</th>
<th>OT</th>
<th>OC</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.14</td>
<td></td>
<td></td>
<td></td>
<td>0.15</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert</td>
<td>0.09</td>
<td></td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.10</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
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</tr>
<tr>
<td>Facilitator to Student</td>
<td>0.24</td>
<td></td>
<td>0.18</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td>0.08</td>
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<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>0.02</td>
<td></td>
<td>0.09</td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
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<td></td>
<td>0.09</td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>0.01</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Student to Facilitator</td>
<td>0.12</td>
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<td>0.15</td>
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<tr>
<td>Student to Subject Matter Expert</td>
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<td></td>
<td>0.09</td>
<td></td>
<td>0.15</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>0.08</td>
<td></td>
<td>0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
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<td></td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each Function column. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
Arthur

The Arthur project began in September, 1995, and ended officially as an Electronic Emissary-sponsored project in January, 1997. Since then, both the student and subject matter expert have stayed in very close contact with each other. This is a unique match in the sense that the student, at the time of the start of the project, was nine years of age working with a subject matter expert who was seventy-four years old. The project was begun at the request of the student’s parents because she had academic interests that were outside her school’s curriculum. The proposed project focused upon how the legend of King Arthur came to be and what persons or events in history may have served as models for the legend of Arthur and the Knights of the Round Table.

At the time, Bridget was a gifted student in the 4th grade in Connecticut. She had read about Arthur and several of the knights’ adventures and, showing a sincere interest, wanted to further her study. Her parents proposed that the project might also include additional reading assignments to form the basis of discussion. The “Teacher” for this match was Bridget’s father. He posted to the project four times, when he needed to let Dr. Johnson, the subject matter expert, know that Bridget would be occupied or unavailable.
Dr. Johnson is an English Professor Emeritus at the University of Arizona and an expert on the topics of Chaucer, medieval literature, and the historical and legendary aspects of King Arthur. He has many years of teaching experience at the University level and some experience in working with young people.

Dr. Johnson was available for communication to add information to this analysis. When asked to comment on the abilities of Bridget as a student he had the following to say:

Bridget is special. She is very young, but evidently the brightest kid in her class. She was a good student, still is a good student, and used her dictionary. When I told her to write down words that she didn't understand and I would explain them to her even if the dictionary couldn't, and so that's how we got along for a year or two. She did all the reading I asked her to, and I did all the explaining that she needed.

Repeated attempts to contact Bridget and her family for this study were unsuccessful. Attempts by Dr. Johnson to reach Bridget and her family also resulted in no response.

One-hundred and twenty-one (121) exchanges occurred during the course of the project with eighty-six (86) exchanges between the Subject Matter Expert and Student, representing 71% of the total messages sent. Tables 34 and 35 show the frequencies of messages sent among the
participants and the message flow types present in these exchanges. The “Teacher,” who is also the parent in this team, sent only a total of four messages over the period of the discourse. Yet it was evident that the parent was active in working with Bridget on her exchanges, and kept abreast of the process in face-to-face interaction. Thus, while the Teacher message frequency is low for this project, the participation of the Teacher/Parent was quite substantial, even though it was reflected only indirectly in the discourse. The Subject Matter Expert felt that Bridget’s parents were very crucial to the success of the project since they provided her with suggested materials to be read or reviewed. Three of the four messages sent by the parent let Dr. Johnson know that Bridget was occupied or not available during a particular week.

The most evident message flow types were Subject Matter Expert to Student (27.27%), Student to Subject Matter Expert (23.14%), and Facilitator to Subject Matter Expert/Student (12.40%). 71% of the exchanges were between the Student and Subject Matter Expert – a significant amount of communications in the discourse. The Facilitator sent the greatest variety of message flow types. The Subject Matter Expert mostly sent messages directed toward the Student and Facilitator (35.5%). The Student directed most of her messages to the Subject Matter Expert and Facilitator (27.2%). Not unexpectedly, the Facilitator directed her messages to the Subject Matter Expert and Student.
Table 34
Frequency of Message Exchanges by Participants in Arthur Team

<table>
<thead>
<tr>
<th>Participant</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher (Parent)</td>
<td>4</td>
<td>3.3%</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>51</td>
<td>42.1%</td>
</tr>
<tr>
<td>Student</td>
<td>35</td>
<td>28.9%</td>
</tr>
<tr>
<td>Facilitator</td>
<td>31</td>
<td>25.6%</td>
</tr>
</tbody>
</table>

Table 35
Frequency of Message Flow Types in the Arthur Team

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>9</td>
<td>7.44%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>15</td>
<td>12.40%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>1</td>
<td>0.83%</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>5</td>
<td>4.13%</td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>1</td>
<td>0.83%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>7</td>
<td>5.79%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>10</td>
<td>8.26%</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>33</td>
<td>27.27%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>1</td>
<td>0.83%</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>1</td>
<td>0.83%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>28</td>
<td>23.14%</td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td>1</td>
<td>0.83%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>5</td>
<td>4.13%</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>3</td>
<td>2.48%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>1</td>
<td>0.83%</td>
</tr>
</tbody>
</table>

Total Exchanges 121
Examining the mean word usage in messages by message flow type (Table 36), only two types had below-mean word use. All other message flow types contained approximately average mean word length.

Table 36
Message Flow by Mean Words in Messages Sent in the Arthur Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Mean Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>225.33</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>193.53</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>112.00</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>129.80</td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>272.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>125.29</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>192.10</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>413.33</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>65.00</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>32.00</td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td>281.00</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>342.86</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>321.40</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>51.67</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>72.00</td>
</tr>
<tr>
<td>Mean words of all exchanges</td>
<td>282.76</td>
</tr>
</tbody>
</table>
Figure 15 shows the distribution of messages sent over the length of the project by week. There were a total of seventy-seven (77) weeks of message exchange. Messages were sent during thirty-eight (38) weeks or 49.35% of the total project period. Most of the exchanges were sent during the first fifty-two (52) weeks of the project. The last several weeks of the exchange contained few messages and little project content.

**Figure 15.** Discourse Activity by Week for Arthur Team
Table 37 shows the first forty-seven (47) weeks of activity of the project representing the first 100 messages exchanged. The Facilitator sent over one-third (35.4%) of her messages during the first six weeks of the project. The discourse indicated she helped get the project started and then provided information and general help as it progressed, but was much less active after week six. The Student and Subject Matter Expert had a fairly constant exchange up until week fifty-two (52), although Table 37 only shows through week forty-seven (47). There was a pause during weeks seven through ten. No explanation for this was found in the discourse and the Subject Matter Expert could not recall the reason for the pause. After this initial pause in communications, no pauses longer than two weeks occurred until week fifty-two.
<table>
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<tr>
<th>Message Flow Type</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<th>11</th>
<th>12</th>
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<tbody>
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<td>Facilitator to All</td>
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<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
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<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
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<tr>
<td>Facilitator to Student</td>
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</tr>
<tr>
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<tr>
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<td>1</td>
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<tr>
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<td>Student to Facilitator/Teacher</td>
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<td>Student to Subject Matter Expert/Facilitator</td>
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<tr>
<td>Teacher to Facilitator</td>
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<td>Teacher to Subject Matter Expert/Facilitator</td>
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Table 37b  
**Number of Message Flow Types shown by Week in Arthur Team**

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<th>28</th>
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<td>Facilitator to Subject Matter Expert/Teacher</td>
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<td>Facilitator to Student</td>
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<td>Subject Matter Expert to Facilitator</td>
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<td>Subject Matter Expert to Facilitator/Student</td>
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<tr>
<td>Student to Facilitator/Teacher</td>
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<tr>
<td>Student to Subject Matter Expert</td>
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<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
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<tr>
<td>Teacher to Facilitator</td>
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<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
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<tr>
<td>Total Number of Messages Sent each Week</td>
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</table>
### Table 37c
#### Number of Message Flow Types shown by Week in Arthur Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>29 30 31 32 33 34 35 36 37 38 39 40 41 42</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>1</td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
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</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
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</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>1 2 2 1 2</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>1 2 1 1 1</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Teacher</td>
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<tr>
<td>Teacher to Facilitator</td>
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</tr>
<tr>
<td>Teacher to Subject Matter Expert/Teacher</td>
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<tr>
<td>Total Number of Messages Sent each Week</td>
<td>0 1 0 0 1 0 0 6 3 0 0 2 1 3</td>
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</table>
Table 37d
Number of Message Flow Types shown by Week in Arthur Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Week</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>43</td>
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<td>46</td>
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<td></td>
<td>47</td>
</tr>
<tr>
<td>Facilitator to All</td>
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<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
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</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>1</td>
</tr>
<tr>
<td>Facilitator to Student</td>
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<tr>
<td>Facilitator to Teacher/Student</td>
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<td>1</td>
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<tr>
<td>Subject Matter Expert to Student</td>
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<tr>
<td>Subject Matter Expert to Teacher</td>
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<tr>
<td>Student to Facilitator</td>
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<tr>
<td>Student to Facilitator/Teacher</td>
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<td>Student to Subject Matter Expert</td>
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<td>Student to Subject Matter Expert/Facilitator</td>
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<tr>
<td>Teacher to Facilitator</td>
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<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
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<td>Total Number of Messages Sent each Week</td>
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</table>
The examination of functions, as shown in Tables 38 and 39, reveals that the Reporting category was the most used, at 87.38%, followed by Other (6.74%) and Requesting (5.89%). Reporting functions were favored in communications by the participants by a factor of almost seven times more than Requesting and Other functions combined. The top Reporting Functions were Content Information (38.17%), General Information (25.24%), Personal Information (12.68%), and Ideas/Opinions/Emotions (9.95%). The most frequently used requesting messages were Content Information (6%) and General Information (1.33%). These were some of the least frequently occurring functions as well. Other Salutations were used 5.34% of the time and Other Thanking occurred during 8.5% of the communications. It is very interesting to note that Other functions were used slightly more than Requesting by the participants. The reason for this was that all participants used Other Salutation and Other Thanking functions throughout the discourse.

When looking at message functions by message flow types (Table 40) we get a much clearer understanding of who is generating which message function types. All participants used Reporting functions in their message flow types. The Subject Matter Expert used 47% of the Reporting functions when communicating with the Student, while the Student generated 23% of the reporting functions. The Student to Subject Matter Expert message flow produced 60% of the Requesting functions. The Subject Matter Expert only
used Requesting functions in 28% of the messages coded. The Facilitator used the most Other functions in her discourse. This information continues to match the trends revealed above, showing that the primary communications occurred between the Subject Matter Expert and Student.

Table 38
Frequencies of Message Flow Categories in Arthur Team

<table>
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<tr>
<th>Message Flow Category</th>
<th>Frequency</th>
<th>Percentage</th>
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<tr>
<td>Reporting</td>
<td>1440</td>
<td>87.38%</td>
</tr>
<tr>
<td>Requesting</td>
<td>97</td>
<td>5.89%</td>
</tr>
<tr>
<td>Other</td>
<td>111</td>
<td>6.74%</td>
</tr>
</tbody>
</table>
### Table 39
Frequencies of Message Functions by Message Category in Arthur Team

<table>
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<th>Frequency</th>
<th>Percent Total</th>
<th>Percent within Category</th>
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<tr>
<td>Content Information</td>
<td>629</td>
<td>38.17%</td>
<td>43.68%</td>
</tr>
<tr>
<td>Procedural Information</td>
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<td>0.90%</td>
</tr>
<tr>
<td>General Information</td>
<td>416</td>
<td>25.24%</td>
<td>28.89%</td>
</tr>
<tr>
<td>Personal Information</td>
<td>209</td>
<td>12.68%</td>
<td>14.51%</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>164</td>
<td>9.95%</td>
<td>11.39%</td>
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<td>Resource</td>
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<td>0.30%</td>
<td>0.35%</td>
</tr>
<tr>
<td>Feedback</td>
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<td>0.24%</td>
<td>0.28%</td>
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<tr>
<td><strong>Total of Reporting Functions</strong></td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>functions within 121 exchanges</td>
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<td></td>
</tr>
<tr>
<td><strong>Requesting</strong></td>
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<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>56</td>
<td>3.40%</td>
<td>57.73%</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>1</td>
<td>0.06%</td>
<td>1.03%</td>
</tr>
<tr>
<td>General Information</td>
<td>22</td>
<td>1.33%</td>
<td>22.68%</td>
</tr>
<tr>
<td>Personal Information</td>
<td>9</td>
<td>0.55%</td>
<td>9.28%</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>3</td>
<td>0.18%</td>
<td>3.09%</td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>6</td>
<td>0.36%</td>
<td>6.19%</td>
</tr>
<tr>
<td><strong>Total of Requesting Functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>97</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>functions within 121 exchanges</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salutation</td>
<td>88</td>
<td>5.34%</td>
<td>79.28%</td>
</tr>
<tr>
<td>Planning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thanking</td>
<td>14</td>
<td>0.85%</td>
<td>12.61%</td>
</tr>
<tr>
<td>Complaining</td>
<td>3</td>
<td>0.18%</td>
<td>2.70%</td>
</tr>
<tr>
<td>Apology</td>
<td>6</td>
<td>0.36%</td>
<td>5.41%</td>
</tr>
<tr>
<td><strong>Total of Other Functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>111</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>functions within 121 exchanges</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1648</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>functions within 121 exchanges</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* 1, 2, 3, 4, 5 are used in the Percent Total column to indicate the relative ranking within all Message Functions. 1, 2, 3, are used in Percent within Category to indicate the relative ranking within each category.
Table 40  
Total and Percentage of Categories Report, Request, Other by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Reporting</th>
<th>Requesting</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>%</td>
<td>Total</td>
</tr>
<tr>
<td>Facilitator to All</td>
<td>54</td>
<td>0.04</td>
<td>12</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>119</td>
<td>0.08</td>
<td>4</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>5</td>
<td>&gt;.01</td>
<td>4</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>27</td>
<td>0.02</td>
<td>1</td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>11</td>
<td>0.01</td>
<td>2</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>43</td>
<td>0.03</td>
<td>2</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>86</td>
<td>0.06</td>
<td>7</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>681</td>
<td>0.47</td>
<td>16</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>3</td>
<td>&gt;.01</td>
<td>2</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>1</td>
<td>&gt;.01</td>
<td>1</td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td>13</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>336</td>
<td>0.23</td>
<td>55</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>50</td>
<td>0.03</td>
<td>3</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>5</td>
<td>&gt;.01</td>
<td>2</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>4</td>
<td>&gt;.01</td>
<td></td>
</tr>
<tr>
<td>Total of Functions</td>
<td>1438</td>
<td>91</td>
<td>111</td>
</tr>
</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each category column.
Breaking it down further by each message function type, as shown in Tables 41, 42, and 43, we see further information on how Reporting, Requesting, and Other functions are used. The Subject Matter Expert used the most Reporting of Content Information (70%), Reporting of Procedures (69%), Reporting of Personal Information (30%), and Reporting of Ideas/Opinions/Emotions (41%), when communicating with the student. The Subject Matter Expert and Student used the same amount of Reporting of General Information (24%), Reporting of Resources (20%), and Reporting Feedback (25%) when communicating with each other. The Student used Requesting of Content the most (82%) when messaging the Subject Matter Expert. Requesting of General Information was most used by the Subject Matter Expert when messaging the Student (45%) followed by the Student messaging the Subject Matter Expert (32%). The Requesting of Ideas/Opinions/Emotions was done equally by the Facilitator, Subject Matter Expert, and Student.

When the Subject Matter Expert was asked why the communications lasted as long as it did, he responded that it was because he and Bridget discussed more than just the initial focus of Arthurian legend, moving into other myth figures and legends over the course of the project. Another reason is that the student brought additional readings and interests to him, which he would discuss with her. In fact, because of the open-endedness of the discourse, Dr. Johnson became a true mentor to Bridget. The analysis above shows that during the project, the frequency of the exchanges
lessened, but the subject matter expert and student both continued to display a high level of Reporting and Requesting functions, indicating healthy exchanges of ideas and concepts.

Table 41a

Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>3</td>
<td>37</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>84</td>
<td>20</td>
<td>12</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>13</td>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>17</td>
<td>14</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>12</td>
<td>1</td>
<td>33</td>
<td>22</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>439</td>
<td>9</td>
<td>101</td>
<td>67</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td>12</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>142</td>
<td>2</td>
<td>98</td>
<td>62</td>
<td>31</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>33</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 41b
Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.09</td>
<td>0.04</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.20</td>
<td>0.10</td>
<td>0.07</td>
<td>0.20</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>0.03</td>
<td>0.03</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>0.04</td>
<td>0.07</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>0.02</td>
<td>0.08</td>
<td>0.08</td>
<td>0.11</td>
<td>0.11</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>0.70</td>
<td>0.69</td>
<td>0.24</td>
<td>0.30</td>
<td>0.41</td>
<td>0.20</td>
<td>0.25</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>0.01</td>
<td></td>
<td></td>
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<tr>
<td>Student to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.25</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.23</td>
<td>0.15</td>
<td>0.24</td>
<td>0.30</td>
<td>0.19</td>
<td>0.20</td>
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</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>0.05</td>
<td>0.01</td>
<td>0.03</td>
<td>0.02</td>
<td>0.40</td>
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<tr>
<td>Teacher to Facilitator</td>
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<td></td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.01</td>
</tr>
</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
### Table 42a
**Total Frequency and Percentage of Requesting Functions by Message Flow**

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>2</td>
<td>4</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>46</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.09</td>
<td>0.11</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>0.05</td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>0.05</td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>0.04</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>0.09</td>
<td>1.00</td>
<td>0.27</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Student to Facilitator/Teacher</td>
<td></td>
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</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.82</td>
<td>0.32</td>
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<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>0.05</td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* 1, 2, 3 are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 43a
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>OS</th>
<th>OP</th>
<th>OT</th>
<th>OC</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>13</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td></td>
<td>9</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td></td>
<td></td>
<td>24</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
Table 43b
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>OS</th>
<th>OP</th>
<th>OT</th>
<th>OC</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.11</td>
<td></td>
<td></td>
<td>0.67&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.15&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.07</td>
<td></td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>0.02</td>
<td></td>
<td></td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td>0.14&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Student</td>
<td>0.10&lt;sup&gt;3&lt;/sup&gt;</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>0.27</td>
<td>0.29&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.33&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator/Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.22&lt;sup&gt;1&lt;/sup&gt;</td>
<td>0.36&lt;sup&gt;1&lt;/sup&gt;</td>
<td>0.50&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert/Facilitator</td>
<td>0.02</td>
<td>0.07</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each Function column. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
The Forecast project began in February, 1997, and continued for sixteen (16) weeks until May, 1997. The match had been requested by Alvin, a teacher in New Jersey. He teaches Earth Science and Chemistry honors classes in addition to being a mentor to two independent study students. Alvin is a graduate of Rutgers University with a B.S. in Earth and Atmospheric Science. At the time of the project, he had been teaching high school for more than ten years. In 1995, he began work on a M.A. degree in Earth Science Instruction and Curriculum and was approaching graduation during this match. Alvin can be considered an expert Internet and technology user. It should be noted that at the time of the project, this teacher was in the midst of formalizing procedures for how his students could access an electronic mail program so that they might communicate directly during their lunch, study hall, or after-school time. It is not clear from the discourse or the reports how much access the student had during the project. It would seem that the student had limited access to the Internet and electronic mail at school and no access from his home.

The purpose of the project was to allow one of Alvin’s independent study students, William, to talk about his work in forecasting; specifically, William wanted to talk about a study between two different weather forecasting models. William was a senior and was close to graduation at the time of the project. During the discourse, he talked about his concerns about the mild New Jersey winter affecting his forecasting work. He was hoping to

Forecast
get input from the subject matter expert to help him with his final project on this topic and to help him with the problems he was facing. Neither Alvin nor William were available for this study, to comment on the analysis of their communication.

Dr. Renner is a professional meteorologist and works at the Forecast Systems Lab, National Oceanic and Atmospheric Administrations (NOAA). He conducts scientific research on numerical weather forecasting. He is an expert Internet user, with access at both home and work. Dr. Renner had been involved in a previous classroom-based Electronic Emissary Project, but he had no prior K-12 teaching experiences. He felt that the previous classroom group communications was a much better project than this one. He suggested during his interview that the limited scope of this project was probably the reason for the short and choppy discourse.

The Forecast participants shared only forty (40) exchanges during the sixteen (16) weeks of the project’s duration. Table 44 shows the frequency of the exchanges among the participants. The Subject Matter Expert (30%), Student (27.5%), and Facilitator (25%) were equally active, with only seven (17.5%) messages sent by the Teacher.
Table 44
Frequency of Message Exchanges by Participants in Forecast Team

<table>
<thead>
<tr>
<th>Participant</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>Student</td>
<td>11</td>
<td>27.5%</td>
</tr>
<tr>
<td>Facilitator</td>
<td>10</td>
<td>25.0%</td>
</tr>
</tbody>
</table>

When examining the Message Flow frequencies shown in Table 45, it becomes apparent that Student to Subject Matter Expert (26.32%) exchanges were most frequent. Facilitator to All messages (23.68%) were the second most popular message flow type, followed by Subject Matter Expert to Student (18.42%). The Facilitator generated a number of messages sent to All participants. These messages discussed project setup, several electronic mail addressing problems, and apparent lack of activity during the project. The Student only messaged the Facilitator once. The rest of his messages were directed to the Subject Matter Expert. The Teacher communicated in the most diverse way with regard to message flow types, but those flow types were used relatively infrequently since the teacher sent few messages.
Table 45
Frequency of Message Flow Types in the Forecast Team

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>9</td>
<td>23.68%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>1</td>
<td>2.63%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>2</td>
<td>5.26%</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>7</td>
<td>18.42%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>2</td>
<td>5.26%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>1</td>
<td>2.63%</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>1</td>
<td>2.63%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>10</td>
<td>26.32%</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>2</td>
<td>5.26%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>2</td>
<td>5.26%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>1</td>
<td>2.63%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>1</td>
<td>2.63%</td>
</tr>
<tr>
<td>Teacher to Student</td>
<td>1</td>
<td>2.63%</td>
</tr>
</tbody>
</table>

Total Exchanges 40

The analysis of message flow by mean words in messages does not yield much information, nor does it reveal any pattern other than that all the messages were of approximately the same length. The two lowest mean word counts are found in message flow types, with only one or two messages being exchanged. These are shown in Table 46.
Table 46
Message Flow by Mean Words in Messages Sent in the Forecast Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Mean Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>296.89</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>112.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>49.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>129.29</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>117.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>153.00</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>83.00</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>96.50</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>129.00</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>61.00</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>61.00</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>146.00</td>
</tr>
<tr>
<td>Teacher to Student</td>
<td>41.00</td>
</tr>
<tr>
<td>Mean of all exchanges</td>
<td>146.20</td>
</tr>
</tbody>
</table>

Figure 16 and Table 47 show the team’s activity by week. Participants exchanged messages during thirteen (13) of the sixteen (16) weeks of the project, or 81% of the length of the learning activity. The greatest number of exchanges occurred during the second week, getting communications started and the project organized. The Facilitator sent 50% of her messages during the first three weeks of the project, addressing these organizational issues. The Teacher sent all but one message during the first six weeks of the project. The Subject Matter Expert and Student exchanged most of their messages
regularly until week twelve (12), when the student stopped sending messages. The student stopped exchanging messages because his projects were coming to conclusion toward the end of the school year. Communications during the last four weeks of the project were concerned with reaching closure on the project evaluation.

Figure 16. Discourse Activity by Week for Forecast Team
### Table 47a
**Number of Message Flow Types shown by Week in Forecast Team**

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total Number of Messages Sent each Week</td>
<td>4</td>
<td>9</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
### Table 47b
#### Number of Message Flow Types shown by Week in Forecast Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>15</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>16</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>1</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>2</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td></td>
</tr>
</tbody>
</table>

| Total Number of Messages Sent each Week | 15   16 |

Tables 48, 49, and 50 show message flow categories and functions used by this team of participants. Reporting functions (74.49%) were the most frequently appearing, followed by Other (25.51%) and Requesting (5.35%). Reporting of Content Information (36.21%), Reporting of General Information (23.05%) and Other Salutations (13.17%) were the most often-used functions. Requesting functions appeared in 3% or less of all messages exchanged by the members of this team. Reporting (24%) and Requesting
(31%) functions were used most often by the Facilitator. Student to Subject Matter Expert messages used 22% of the total Reporting functions and 23% of the total Requesting functions. It is unusual in an Electronic Emissary team to have the facilitator using the most functions during a discourse. This was a result of the facilitator trying to get project-related communications going, because not very many messages were being exchanged between the student and the subject matter expert.

Table 48
Frequencies of Message Flow Categories in Forecast Team

<table>
<thead>
<tr>
<th>Message Flow Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td>181</td>
<td>74.49%</td>
</tr>
<tr>
<td>Requesting</td>
<td>13</td>
<td>5.35%</td>
</tr>
<tr>
<td>Other</td>
<td>49</td>
<td>20.16%</td>
</tr>
</tbody>
</table>
### Table 49
Frequencies of Message Functions by Message Category in Forecast Team

<table>
<thead>
<tr>
<th>Message Category/Function</th>
<th>Frequency</th>
<th>Percent Total</th>
<th>Percent within Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reporting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>88</td>
<td>36.21%(^1)</td>
<td>48.62%(^1)</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>3</td>
<td>1.23%</td>
<td>1.66%</td>
</tr>
<tr>
<td>General Information</td>
<td>56</td>
<td>23.05%(^2)</td>
<td>30.94%(^2)</td>
</tr>
<tr>
<td>Personal Information</td>
<td>10</td>
<td>4.12%</td>
<td>5.52%</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>17</td>
<td>7.00%</td>
<td>9.39%(^3)</td>
</tr>
<tr>
<td>Resource</td>
<td>7</td>
<td>2.88%</td>
<td>3.87%</td>
</tr>
<tr>
<td>Feedback</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total of Reporting Functions</strong></td>
<td>181</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Requesting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>2</td>
<td>0.82%</td>
<td>15.38%(^3)</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>0</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>General Information</td>
<td>3</td>
<td>1.23%</td>
<td>23.08%(^2)</td>
</tr>
<tr>
<td>Personal Information</td>
<td>1</td>
<td>0.41%</td>
<td>7.69%</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>1</td>
<td>0.41%</td>
<td>7.69%</td>
</tr>
<tr>
<td>Resource</td>
<td>1</td>
<td>0.41%</td>
<td>7.69%</td>
</tr>
<tr>
<td>Feedback</td>
<td>6</td>
<td>2.47%</td>
<td>46.15%(^1)</td>
</tr>
<tr>
<td><strong>Total of Requesting Functions</strong></td>
<td>13</td>
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<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salutation</td>
<td>32</td>
<td>13.17%(^3)</td>
<td>65.31%(^1)</td>
</tr>
<tr>
<td>Planning</td>
<td>1</td>
<td>0.41%</td>
<td>2.04%</td>
</tr>
<tr>
<td>Thanking</td>
<td>15</td>
<td>6.17%(^4)</td>
<td>30.61%(^2)</td>
</tr>
<tr>
<td>Complaining</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apology</td>
<td>1</td>
<td>0.41%</td>
<td>2.04%</td>
</tr>
<tr>
<td><strong>Total of Other Functions</strong></td>
<td>49</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Functions</strong></td>
<td>243</td>
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</tbody>
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Note. \(^1,^2,^3,^4,^5\) are used in the Percent Total column indicate the relative ranking within all Message Functions. \(^1,^2,^3\), are used in Percent within Category is used to indicate the relative ranking within each category.
<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Reporting</th>
<th></th>
<th>Requesting</th>
<th></th>
<th>Other</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>Facilitator to All</td>
<td>43</td>
<td>0.24(^1)</td>
<td></td>
<td>4</td>
<td>0.31(^1)</td>
<td>15</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>3</td>
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<td></td>
<td>2</td>
<td>0.15</td>
<td>2</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>6</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
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<td>0.32</td>
<td></td>
<td>2</td>
<td>0.15</td>
<td>6</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
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<td>2</td>
<td>0.15</td>
<td>2</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>2</td>
<td>0.01</td>
<td></td>
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</tr>
<tr>
<td>Student to Facilitator</td>
<td>5</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>39</td>
<td>0.22(^2)</td>
<td></td>
<td>3</td>
<td>0.23(^2)</td>
<td>19</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>3</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>3</td>
<td>0.02</td>
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<td></td>
<td>3</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>3</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>4</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Total of Functions</td>
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<td></td>
<td>13</td>
<td></td>
<td>49</td>
<td></td>
</tr>
</tbody>
</table>

**Note.**\(^1,^2,^3\) are used to indicate the relative ranking within each category column.
Tables 51, 52, and 53 show additional information on the patterns of message flow by function revealed in this analysis. These patterns directly reflect the trends described above.

Table 51a
Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>6</td>
<td>61</td>
<td>10</td>
<td>42</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Facilitator to All</td>
<td>33</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>48</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>7</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>32</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 51b
Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.59</td>
<td></td>
<td>0.47</td>
<td>0.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.04</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td>0.09</td>
<td></td>
<td>0.06</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>0.55</td>
<td></td>
<td>0.30</td>
<td>0.18</td>
<td>0.57</td>
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<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>0.08</td>
<td>0.07</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>0.04</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>0.01</td>
<td>0.33</td>
<td>0.20</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.36</td>
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<td>0.02</td>
<td>0.30</td>
<td>0.12</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>0.33</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>0.02</td>
<td>0.10</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>0.05</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>0.05</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
### Table 52a
**Total Frequency and Percentage of Requesting Functions by Message Flow**

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Subject Matter Expert to Facilitator**

| Subject Matter Expert to Student           | 1    |      |      |      |     |      | 1    |
| Subject Matter Expert to Teacher           | 1    |      |      |      |     |      | 1    |
| Subject Matter Expert to Teacher/Student   |      |      |      |      |     |      | 1    |

**Student to Facilitator**

| Student to Subject Matter Expert           | 1    |      |      | 1    |     |      | 1    |

**Teacher to Facilitator**

| Teacher to Subject Matter Expert           |      |      |      |      |     |      | 1    |
| Teacher to Subject Matter Expert/Facilitator |      |      |      |      |     |      | 1    |
| Teacher to Subject Matter Expert/Student   |      |      |      |      |     |      | 1    |
| Teacher to Student                         |      |      |      |      |     |      | 1    |

**Note.** Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 52a
Total Frequency and Percentage of Requesting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.33</td>
<td></td>
<td>0.50 (^1)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.33</td>
<td></td>
<td>0.17</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>0.33</td>
<td>0.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>0.17</td>
<td></td>
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<td>Teacher to Subject Matter Expert</td>
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<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
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<tr>
<td>Teacher to Student</td>
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</tr>
</tbody>
</table>

Note. \(^1,2,3\) are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 53a
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>OS</th>
<th>OP</th>
<th>OT</th>
<th>OC</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>12</td>
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<td>2</td>
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<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>2</td>
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<td></td>
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<td>Subject Matter Expert to Facilitator</td>
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<td>Subject Matter Expert to Student</td>
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<tr>
<td>Subject Matter Expert to Teacher</td>
<td>2</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
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<td></td>
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<tr>
<td>Student to Facilitator</td>
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<td>Student to Subject Matter Expert</td>
<td>9</td>
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<td>Teacher to Facilitator</td>
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<td>Teacher to Subject Matter Expert</td>
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<td>Teacher to Subject Matter Expert/Facilitator</td>
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<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
Table 53b
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>O S</th>
<th>O P</th>
<th>O T</th>
<th>O C</th>
<th>O A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to All</td>
<td>0.38(^1)</td>
<td>1.00</td>
<td>0.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Student</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Subject Matter Expert to Facilitator</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>0.16(^3)</td>
<td>0.07</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.28(^2)</td>
<td>0.60(^1)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>0.03</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>0.03</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>0.03</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** \(^1,^2,^3\) are used to indicate the relative ranking within each Function column. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
Although this team exchanged more than ten exchanges regarding the curriculum-related topic, and thus was technically a “successful” project it cannot be described as having generated a very rich discourse. However, the teacher felt that the project was a success and reported the following in the project review:

The project was a success. The student gained a greater understanding of the topics discussed than could have been acquired from the teacher. Reasons for this included the teacher’s limited knowledge in this particular area (relative to the subject matter expert) and more importantly limited time on the part of the teacher. The subject matter expert "filled the gap" where the student was enabled to discuss, collaborate with the subject matter expert on a more extensive scale than was available with the teacher. Additionally, the subject matter expert provided an additional perspective that would not have been available with the teacher.

When asked to comment about his thoughts on the project, the subject matter expert reported the following:

The student wasn’t really interested in forecast modeling, he just wanted me to check some photos for his project. Pretty much, William asked questions and I would try to just answer to the best of my ability. Every time he asked me something I tried to answer with my best knowledge, that’s all. There was not much mentoring happening.
The subject matter expert felt that the combination of lack of direct teacher interaction and the pressure of the student being a senior nearing graduation kept this project limited to discussion only of the final project and its completion, with little outside discussion. Since the topic was so narrow, dealing with the specifics of photo analysis, the discourse was likewise narrow in breadth and depth.

It is apparent that the participants had vastly different concepts and expectations as to how the project was going to evolve. Dr. Renner used his previous telementoring work with a classroom that he thought was very successful as a basis of expectations and Alvin needed an expert to provide information to a student in need of expert support. While William completed his project, the satisfaction level of the participants was not very high at the end of the period of communication exchanges.
EE-Scifair

The EE-Scifair project began in February, 1999, and lasted thirteen (13) weeks, until May, 1999. The purpose of the project, as outlined in the request filed at the Emissary’s Website, was to arrange telementoring to assist José both in better understanding weather phenomena and in getting ready for the Science Fair on Friday, April 23, 1999. The match was requested by Sheila for her son, José, who was nine years of age at the time of the communications. Sheila is the mother of four and currently homeschools all of her children. She had previously been a kindergarten teacher. José had shown an interest in science from an early age. Sheila had this to say about José’s background in science:

I want to give you an idea of the science background José has had, as it is a little out of the ordinary for a 2nd grader. This interest in science was one reason I decided to homeschool him because I taught kindergarten and I knew it would be a long time before he began learning much on science. He has incredible comprehension skills that complement his study of all subjects. José became mesmerized with Bill Nye the Science Guy when he was 2 and 1/2. By age 3, we were doing simple science experiments, and at age four he wanted to know all about human anatomy.
Delanna, a meteorologist employed with Meteorological Service Canada (Canada’s equivalent to the U.S. National Weather Service), was selected as the Subject Matter Expert. She had been a meteorologist for fifteen years and had done her B.S.C. in Meteorology at the University of Alberta in Edmonton. She then worked in Toronto for seven years before transferring to Vancouver, BC. She is married, with two boys, ages 11 and 6, and lives on the beach in a small town just south of Vancouver. She can be considered a knowledgeable Internet user and has experience in teaching her two children. All three participants were available for comments on the discourse generated by the EE-Scifair team.

During this project, the Teacher/Parent (Sheila) sent the most messages (43.2%), followed by the Subject Matter Expert (29.7%), the Facilitator (21.6%), and the Student (5.4%). The Student sent only two out of the thirty-seven (37) messages exchanged. He sent a message during each of the first and last weeks of the project. Tables 54 and 55 show the frequency of messages sent during the project. The discourse developed in such a way that Sheila became the primary participant, representing both teacher and student. This occurred because Sheila was unhappy with the information Delanna was providing at first, and wanted a higher level of dialogue with the subject matter expert in order for her to provide information for José. The subject matter expert and teacher/parent had different concepts about what information should be provided and presented to the student.
Table 54
Frequency of Message Exchanges by Participants in EE-Scifair Team

<table>
<thead>
<tr>
<th>Participant</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher (Parent)</td>
<td>16</td>
<td>43.2%</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>11</td>
<td>29.7%</td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>5.4%</td>
</tr>
<tr>
<td>Facilitator</td>
<td>8</td>
<td>21.6%</td>
</tr>
</tbody>
</table>

Table 55
Frequency of Message Flow Types in the EE-Scifair Team

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>6</td>
<td>16.22%²</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>2</td>
<td>5.41%</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td>2</td>
<td>5.41%</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>2</td>
<td>5.41%</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>6</td>
<td>16.22%²</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>1</td>
<td>2.70%</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>2</td>
<td>5.41%</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>2</td>
<td>5.41%</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>9</td>
<td>24.32%¹</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>4</td>
<td>10.81%³</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>1</td>
<td>2.70%</td>
</tr>
</tbody>
</table>

Total Exchanges 37
The most frequently occurring message flow pattern was Teacher to Subject Matter Expert (24.32%). Facilitator to Subject Matter Expert/Teacher and Subject Matter Expert to Teacher were both used 16.22% of the time. This further illustrates the predominating information flow pattern between Teacher/Parent and Subject Matter Expert for this team.

The mean word use by message flow type, shown in Table 56, reveals that all messages, despite their origins and destinations, were close to the average mean length of 239.27 words. No marked variations in mean word use is seen in the exchanges for this team.

Table 56
Message Flow by Mean Words in Messages Sent in the EE-Scifair Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Mean Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>161.00</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>151.50</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td>242.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>308.00</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>408.67</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>266.00</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>124.50</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>263.00</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>230.22</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>204.50</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>101.00</td>
</tr>
<tr>
<td>Mean of all exchanges</td>
<td>239.27</td>
</tr>
</tbody>
</table>
During the thirteen (13) weeks of communications, only four (4) weeks showed inactivity. The team was active 69% of the total project time. This is shown in Figure 17 and Table 57. As discussed above, the student participated directly during the first and the last week of the project. The parent/teacher stopped sending exchanges in week ten (10), which occurred after the date of the Science Fair.

Figure 17. Discourse Activity by Week for EE-Scifair Team
Table 57
Number of Message Flow Types shown by Week in EE-Scifair Team

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

Facilitator to Subject Matter Expert/Teacher 1
Facilitator to Teacher 1
Subject Matter Expert to Facilitator/Teacher 1
Subject Matter Expert to Student 1
Subject Matter Expert to Teacher 4
Subject Matter Expert to Teacher/Student 1
Student to Subject Matter Expert 1
Teacher to Facilitator 1
Teacher to Subject Matter Expert 2
Teacher to Subject Matter Expert/Facilitator 3
Teacher to Subject Matter Expert/Student 1
Total Number of Messages Sent each Week 8

Tables 58 and 59 show the speech functions used in the exchanges. Reporting (74.66%) was the most frequently used message function category. Requesting (15.36%) and Others (9.97%) were used much less frequently than Reporting. Reporting of Content (23.45%), General Information (20.75%), and Reporting Ideas/Opinions/Emotions (13.48%) were the most frequently-appearing reporting functions. Much less frequently used were Other Salutation (6.74%) and Requesting Feedback (6.47%). All other functions were used less than 6% of the time with many less than 2%. The use of Other Salutations and Other Thanking was very low.
Table 60 shows additional information about message flow type with totals in each category. The Teacher sent the most Reporting of Functions at 39% and did the most Requesting at 42%. The Subject Matter Expert used Reporting functions 25% of the time in communications with the Teacher, and the Facilitator used Requesting functions 35% of the time. Tables 61, 62, and 63 show the further breakdown of message flow type by individual functions. The Subject Matter Expert sent 45% of the messages reporting content, the Teacher sent 40%. The Teacher reported the most General Information (47%), the Facilitator reported General Information 17% of the time. The Teacher reported Personal Information (48%) almost twice as much as the Subject Matter Expert, Student, and Facilitator combined. The Subject Matter Expert used Reporting Resources 90% of the time. Requesting of Content was used most by the Teacher at 74%. These numbers further substantiate the observation that the Parent/Teacher was playing the roles of both Teacher and Student in this team.

Table 58
Frequencies of Message Flow Categories in EE-Scifair Team

<table>
<thead>
<tr>
<th>Message Flow Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td>277</td>
<td>74.66%</td>
</tr>
<tr>
<td>Requesting</td>
<td>57</td>
<td>15.36%</td>
</tr>
<tr>
<td>Other</td>
<td>37</td>
<td>9.97%</td>
</tr>
</tbody>
</table>
Table 59
Frequencies of Message Functions by Message Category in EE-Scifair Team

<table>
<thead>
<tr>
<th>Message Category/Function</th>
<th>Frequency</th>
<th>Percent Total</th>
<th>Percent within Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reporting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>87</td>
<td>23.45%(^1)</td>
<td>31.41%(^1)</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>1</td>
<td>0.27%</td>
<td>0.36%</td>
</tr>
<tr>
<td>General Information</td>
<td>77</td>
<td>20.75%(^2)</td>
<td>27.80%(^2)</td>
</tr>
<tr>
<td>Personal Information</td>
<td>27</td>
<td>7.28%</td>
<td>9.75%</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>50</td>
<td>13.48%(^3)</td>
<td>18.05%(^3)</td>
</tr>
<tr>
<td>Resource</td>
<td>30</td>
<td>8.09%</td>
<td>10.83%(^4)</td>
</tr>
<tr>
<td>Feedback</td>
<td>5</td>
<td>1.35%</td>
<td>1.81%</td>
</tr>
<tr>
<td><strong>Total of Reporting Functions</strong></td>
<td><strong>277</strong></td>
<td><strong>Percent Total</strong></td>
<td><strong>Percent within Category</strong></td>
</tr>
<tr>
<td><strong>Requesting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>23</td>
<td>6.20%</td>
<td>40.35%(^2)</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>1</td>
<td>0.27%</td>
<td>1.75%</td>
</tr>
<tr>
<td>General Information</td>
<td>6</td>
<td>1.62%</td>
<td>10.53%(^3)</td>
</tr>
<tr>
<td>Personal Information</td>
<td>2</td>
<td>0.54%</td>
<td>3.51%</td>
</tr>
<tr>
<td>Ideas/Opinions/Emotions</td>
<td>1</td>
<td>0.27%</td>
<td>1.75%</td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>24</td>
<td>6.47%(^5)</td>
<td>42.11%(^1)</td>
</tr>
<tr>
<td><strong>Total of Requesting Functions</strong></td>
<td><strong>57</strong></td>
<td><strong>Percent Total</strong></td>
<td><strong>Percent within Category</strong></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salutation</td>
<td>25</td>
<td>6.74%(^4)</td>
<td>67.57%(^1)</td>
</tr>
<tr>
<td>Planning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thanking</td>
<td>7</td>
<td>1.89%</td>
<td>18.92%(^2)</td>
</tr>
<tr>
<td>Complaining</td>
<td>1</td>
<td>0.27%</td>
<td>2.70%</td>
</tr>
<tr>
<td>Apology</td>
<td>4</td>
<td>1.08%</td>
<td>10.81%(^3)</td>
</tr>
<tr>
<td><strong>Total of Other Functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** \(^1,2,3,4,5\) are used in the Percent Total column indicate the relative ranking within all Message Functions. \(^1,2,3\), are used in Percent within Category is used to indicate the relative ranking within each category.
Table 60
Total and Percentage of Categories Report, Request, Other by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Reporting</th>
<th></th>
<th>Requesting</th>
<th></th>
<th>Other</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>25</td>
<td>0.09</td>
<td>20</td>
<td>0.35</td>
<td>4</td>
<td>0.11</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>7</td>
<td>0.03</td>
<td>2</td>
<td>0.04</td>
<td>4</td>
<td>0.11</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td>5</td>
<td>0.02</td>
<td>2</td>
<td>0.04</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>17</td>
<td>0.06</td>
<td>2</td>
<td>0.04</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>68</td>
<td>0.25</td>
<td>2</td>
<td>0.04</td>
<td>6</td>
<td>0.16</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>10</td>
<td>0.04</td>
<td>1</td>
<td>0.03</td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>10</td>
<td>0.04</td>
<td>5</td>
<td>0.09</td>
<td>3</td>
<td>0.08</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>24</td>
<td>0.09</td>
<td>1</td>
<td>0.02</td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>77</td>
<td>0.28</td>
<td>9</td>
<td>0.16</td>
<td>9</td>
<td>0.24</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>31</td>
<td>0.11</td>
<td>15</td>
<td>0.26</td>
<td>4</td>
<td>0.11</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>3</td>
<td>0.01</td>
<td>3</td>
<td>0.05</td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>Total of Functions</td>
<td>277</td>
<td></td>
<td>57</td>
<td></td>
<td>37</td>
<td></td>
</tr>
</tbody>
</table>

Note. $^1,^2,^3$ are used to indicate the relative ranking within each category column.
<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>13</td>
<td>4</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>27</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>13</td>
<td>36</td>
<td>13</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>7</td>
<td>1</td>
<td>17</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 61b  
Total Frequency and Percentage of Reporting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>0.172</td>
<td>0.152</td>
<td>0.162</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>0.01</td>
<td>0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td>0.03</td>
<td>0.04</td>
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</tr>
<tr>
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<td>0.02</td>
<td>0.03</td>
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<tr>
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<td>0.04</td>
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<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
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<td>0.01</td>
<td>0.07</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.06</td>
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<tr>
<td>Teacher to Facilitator</td>
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<tr>
<td>Teacher to Subject Matter Expert</td>
<td>0.153</td>
<td>0.471</td>
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<tr>
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<td>0.08</td>
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<td>0.10</td>
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</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
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<td>0.04</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* 1, 2, 3 are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 62a
Total Frequency and Percentage of Requesting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>5</td>
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<td></td>
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<td></td>
<td>15</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
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<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
Table 62b
Total Frequency and Percentage of Requesting Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>Cont</th>
<th>Proc</th>
<th>GI</th>
<th>PI</th>
<th>IOE</th>
<th>Resc</th>
<th>Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>0.83</td>
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<td></td>
<td>0.63</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>0.50</td>
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<td></td>
<td></td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.50</td>
<td>0.04</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.13</td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>0.48</td>
<td>1.00</td>
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<td></td>
<td>0.17</td>
<td></td>
<td>0.08</td>
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<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.13</td>
</tr>
</tbody>
</table>

Note. 1, 2, 3 are used to indicate the relative ranking within each Function column. Cont = Content; Proc = Procedure; GI = General Information; PI = Personal Information, IOE = Ideas/Opinions/Emotions; Resc = Resources, Feed = Feedback.
<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>OS</th>
<th>OP</th>
<th>OT</th>
<th>OC</th>
<th>OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
### Table 63b
Total Frequency and Percentage of Other Functions by Message Flow

<table>
<thead>
<tr>
<th>Message Flow Type</th>
<th>O S</th>
<th>O P</th>
<th>O T</th>
<th>O C</th>
<th>O A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator to Subject Matter Expert/Teacher</td>
<td>0.12</td>
<td>0.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>0.04</td>
<td>0.29</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Facilitator/Teacher</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Student</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher</td>
<td>0.24</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject Matter Expert to Teacher/Student</td>
<td>0.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student to Subject Matter Expert</td>
<td>0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>1.00</td>
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<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert</td>
<td>0.20</td>
<td>0.43</td>
<td>0.25</td>
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</tr>
<tr>
<td>Teacher to Subject Matter Expert/Facilitator</td>
<td>0.08</td>
<td>0.14</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher to Subject Matter Expert/Student</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** 1, 2, 3 are used to indicate the relative ranking within each Function column. OS = Other Salutations; OP = Other Planning; OT = Other Thanks; OC = Other Complaining, OA = Other Apology.
When the subject matter expert and teacher/parent were asked about this trend, they provided differing views on the matter. Both agreed that they did not understand what the expectations of the other were. The Facilitator seemed to be unable, during the short duration of the project, to correct the problem and get things on track before the Science Fair deadline. Once the Fair had occurred, the teacher simply left the team and moved on to other issues in her homeschooling.

The subject matter expert reported the following when asked about the project:

The purpose of the project, as outlined in the project request, was to set up a match in order to help José better understand weather and get ready for the Science Fair in April. What was outlined in the project request and what the discourse turned out to be was different. Almost immediately into this match, Sheila took over the roles of the Teacher, Parent, and Student of the match. José had only two exchanges with me. I felt that Sheila really wanted me to help her define a curriculum instead of working with José with his Science Fair project. I just didn’t feel, as the project continued, that I could help.
When the teacher/parent was asked to comment on the project she had the following remarks to make:

The first thing I need to get started is a scope/sequence that outlines the topics and order of our study of atmosphere and weather. I knew some general topics/facts that should be covered, but don't believe I have a sequential, well-rounded game plan. When I asked Delanna to help fill these in, she felt that the materials I was asking for were too complex for José. I tried to explain to her that she can tell me the information and I would make sure José would comprehend it. I asked Delanna if she could sort this out and give me some basic facts and a logical order in which to study them. It just seemed that we just never got on the same page.

In the end, Shiela felt that José did benefit from the project, but Delanna felt that her impact on the student was minimal.
Primary Patterns

The case studies discussed in this chapter have described the analysis of discourse from six Electronic Emissary teams that involved individual student participants. During the analysis of the discourse and the subsequent interviews of the available participants, several primary patterns emerged that were common among the projects. These patterns affected the project in various degrees, from very little to calamitous. These primary patterns will be discussed in more detail in the next chapter.

In the six instances examined, there were two distinctive types of projects. The projects studied were either deadline-based or open-ended. As it turned out, half the projects were deadline-based and the other half were open-ended. The impact these distinct project settings had on the outcome of the discourse was significant. All of the deadline-based projects held discourse for less than sixteen weeks. The open-ended matches created diverse, rich discourses which continued over an extended period of time. The open-ended discussions evolved into mentoring relationships, while the project-specific matches remained question-and-answer kinds of dialogs. The participants in the shorter, project-based matches were less satisfied with their experiences than the participants in teams displaying open-ended communications.
When examining message functions and speech acts used in teams’ communications, another primary pattern discovered was the lack of consistent patterns across the projects. Yet while there were no large patterns across the projects, there were patterns observable within each project. These patterns became more distinct during interviews with the available participants. This was the primary reason that a multiple case study format was selected for this report of findings. The analysis previously discussed in this chapter covered those patterns revealed in individual projects. One small pattern which emerged, when looking at the messages exchanged by week, was that decreases in activity occurred during school holidays. Also, information Reporting and Requesting were the more prevalent function categories used by the majority of the team members. Yet there were no consistent patterns in all the individual category functions (i.e. Reporting General Information, Requesting Content, etc).

The differential in ages in the students involved in a project and the influence of the student’s age and level of competition from other distraction that had an impact on the project outcome was another pattern seen. Some of the most sporadic communications came from 17- and 18-year-old students who were attending high school. The younger students in this study were more available for open-ended discourse and had the time to sustain the communications if a personal connection was made with the subject matter expert.
Problems arising from both technical and non-technical issues, that caused either interruption of communications or the inability to communicate effectively, was also a pattern that influenced discourse. It was not surprising that issues surrounding electronic mail were most of the problems that impeded discourse. If a participant did not have the ability to communicate concepts and ideas in writing, using a keyboard for electronic mail, this created difficulties. When a participant had limited access to computers to use to send electronic mail, this caused problems with discourse. Since electronic mail is the main communications tool used in the Electronic Emissary Project, any problems with electronic mail, computer availability, Internet access, or ability to use electronic mail has a major impact on teams’ interaction. Non-technical problems typically focused on issues surrounding project management and communications skills. If the necessary pre-project management was not completed adequately, then these projects tended to have more problems during their discourse.

The last primary pattern to discuss is that of the shifting roles of the participants as a project’s discourse developed. Participants usually began with certain fixed roles, but as the discourse developed and the longer it lasted, they took on other or additional roles. When primary roles were present in a project, the discourse was very successful. When one or more of the roles was absent from the discourse, the project, while still technically successful, suffered in some form. The types of roles and who filled them are discussed in more detail in the next chapter.
This chapter has described the analysis of discourse from six Electronic Emissary teams. The patterns described were drawn from discourse analysis of message functions/speech acts and message flow, as outlined first in Harris and Jones (1995) and discussed in depth in Chapter 3. Analyzing the discourse of these teams revealed a wide range of communications that can take place within the Electronic Emissary Projects. Communications range from question and answer delivery of information to open-ended discussion’s, evolving into mentoring relationships. To enrich the description of the discourse analysis, interviews of the participants were conducted. These interviews pointed out the effects that participants’ schedules can have on their communication habits, how different age groups have different priorities and schedules, how technical circumstances influenced communications, and how participants’ roles shifted throughout the course of the project. The themes and experiences gleaned from the informants’ interviews were used to add depth to the discourse analysis. The next chapter will discuss in more detail the primary patterns identified above.
CHAPTER 5: CONCLUSIONS AND IMPLICATIONS

This chapter will discuss the implications revealed from the analysis of the six telementoring projects involving individual students described in the previous chapter. While the situations and experiences of the participants in each team discussed are unique, there are some patterns that have emerged from analysis of the on-line discourse and conversations with the informants. These patterns include:

• Projects with deadlines vs. open-ended discussions
• Message functions and their use in communications
• Age as a factor
• Unanticipated problems
• Important roles of participants

During the analysis of the discourse and the subsequent interviews of available participants, these primary patterns emerged as common among the projects. Some of the patterns that will be discussed are demonstrated in several projects to various degrees, from very little to calamitous. Other patterns reveal interactions that impacted the level of content-related discourse and project satisfaction among the various participants.
Projects with Deadlines vs. Open-Ended Discussions

In the six projects examined, there were two distinct types of endeavor. One type of project had a focused deadline and a predetermined outcome, expressed by the requestor. In this category can be placed the work of three teams: Medicine, Forecast, and EE-scifair. The other type of project was more open-ended and its discussion was more akin to online question or discussion forums. In this category are three teams’ work: Books, Clouds, and Arthur.

These distinct contexts for interactions had unique reverberations within each project. The open-ended projects created diverse, rich discourses which continued over an extended period of time. Books held discourse for 177 weeks, Clouds for 51 weeks, and Arthur for 77 weeks. In all of these, the student and subject matter expert made personal connections and had profound mentoring experiences. The deadline-based projects held discourse no longer than 16 weeks for the teams examined in this study. The open-ended discussions evolved into mentoring relationships while the deadline-oriented communications primarily remained question-and-answer dialogs.
When examining message functions, however, there were no discernible patterns between the open-ended and deadline-oriented projects. This will be discussed in more detail below. There were differences in the numbers of exchanges made and the numbers of functions used. The open-ended projects generated more messages and showed a larger variety of message functions in their discourse. This would be expected from discourses that supported longer interactions. The projects with firm deadlines had very sporadic exchange frequencies among the participants, depending on who is involved on the team. One drawback to the deadline-specific projects is that if there are any problems at the beginning or if the student has limited access to electronic mail, there is little chance for the flow of discourse to get set up and going before it is over. This was the situation in both the Forecast and Medicine projects. EE-scifair had a good message flow for a short-lived project, but the challenges created with the stress of the impending deadline at the science fair and the lack of adequate time to get everyone to understand each other well, strained the communications between the subject matter expert and teacher/parent.

When examining the comments offered by the various informants presented in this study, additional support for the positive aspects of having a longer, sustained discourse that is open-ended and not project-deadline oriented is found. Joan, the student in the Books team, attributed her choice of English as her major in college to her positive experiences in her Electronic
Emissary-sponsored communications. Rylana, of the Clouds team, graduated from high school and now works at a science museum and wants to study science in college, according to her teacher, Mary.

The participants in the shorter, single-activity projects were less satisfied with their experiences than the participants in teams displaying open-ended communications. This can be seen in each of the three short-lived projects. Dr. Mordon, of the Medicine team, was not pleased with the dialog and felt that the short duration of the project was just one of many reasons for his dissatisfaction. Dr. Renner reported frustration in his Forecast project. The teacher/parent in EE-scifair was not pleased with the level of discourse from the subject matter expert. EE-Scifair had the highest Other Complaining functions (0.27%), more than any other match in this study. The students in these three teams completed their work, but it does not appear that they gained meaningful experiences from their projects. They were able to use the subject matter expert as a source of reference material, and then they moved on.

While participants’ levels of satisfaction varied from one team to the next, all of the projects in this study produced some form of positive outcome for student participants. However, there were frequencies of interaction ranging from sporadic to almost constant, thus making the difference one of intensity of discourse rather than quality of outcome. The longer-lived projects had more time to develop communications, thus
increasing the overall potential for productive outcomes from discourse. The short-term or deadline-oriented projects had no real chance to reach a pace of communication that might attain richer discourse. It might be possible to improve the discourse among the short-term or deadline-oriented projects if the teams had more specific planning time available before the discourse began and had not depended on project planning to develop naturally during the discourse of the match.

Message Functions and Their Use in Communications

When examining message function use by team, no consistent patterns emerged. Table 64 compares the percentage frequency of message functions by each project studied. This was not unexpected, since a similar set of pilot projects (Jones, 1994; 1995; 1996; Jones & Amill, 1996) which focused on determining message patterns that occurred for student groups and individuals in the telementoring environment of the Electronic Emissary Project showed similar results. In those pilot projects (which examined three years of discourse), no consistent patterns could be discerned from analysis of message flow and function by participants. This very lack of consistent patterns is the primary reason this research was defined as a multiple case study focusing on the discourse analysis of messages with the addition of interviews of the available participants in order to discover other emergent patterns in the discourse of the projects studied. Although there were no
repeated patterns in message function and flow across teams, the research on these types of telementoring projects is important so that other patterns besides those of message function and message flow might be explored. As discussed in the introduction, the need to better understand these types of exchanges is considerable, as the Internet and other telecommunication media become ever more commonplace and affordable. It is important to understand these individualized exchange dynamics as presented in this research. Treating the study as individual case studies was the best method with which to fully detail and describe the projects selected and reveal the patterns found.
<table>
<thead>
<tr>
<th>Message Functions</th>
<th>Books</th>
<th>Medicine</th>
<th>Clouds</th>
<th>Arthur</th>
<th>Forecast</th>
<th>EE-Scifair</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percent Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reporting Information</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Information</td>
<td>38.73%</td>
<td>16.29%</td>
<td>6.78%</td>
<td>38.17%</td>
<td>36.21%</td>
<td>23.45%</td>
</tr>
<tr>
<td>Procedural Information</td>
<td>1.58%</td>
<td>0.76%</td>
<td>0.55%</td>
<td>0.79%</td>
<td>1.23%</td>
<td>0.27%</td>
</tr>
<tr>
<td>General Information</td>
<td>14.58%</td>
<td>23.48%</td>
<td>39.67%</td>
<td>25.24%</td>
<td>23.05%</td>
<td>20.75%</td>
</tr>
<tr>
<td>Personal Information</td>
<td>12.03%</td>
<td>21.59%</td>
<td>13.66%</td>
<td>12.68%</td>
<td>4.12%</td>
<td>7.28%</td>
</tr>
<tr>
<td>Idea/Opinion/Emotion</td>
<td>10.14%</td>
<td>10.61%</td>
<td>14.97%</td>
<td>9.95%</td>
<td>7.00%</td>
<td>13.48%</td>
</tr>
<tr>
<td>Resource</td>
<td>0.91%</td>
<td>2.84%</td>
<td>0.30%</td>
<td>2.88%</td>
<td>8.09%</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>1.14%</td>
<td>0.76%</td>
<td>0.22%</td>
<td>0.24%</td>
<td>1.35%</td>
<td></td>
</tr>
<tr>
<td>Requesting Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td>1.65%</td>
<td>3.03%</td>
<td>0.33%</td>
<td>3.40%</td>
<td>0.82%</td>
<td>6.20%</td>
</tr>
<tr>
<td>Procedural Information</td>
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<td>0.38%</td>
<td>0.11%</td>
<td>0.06%</td>
<td>0.27%</td>
<td></td>
</tr>
<tr>
<td>General Information</td>
<td>1.31%</td>
<td>4.17%</td>
<td>4.92%</td>
<td>1.33%</td>
<td>1.23%</td>
<td>1.62%</td>
</tr>
<tr>
<td>Personal Information</td>
<td>3.33%</td>
<td>0.38%</td>
<td>1.20%</td>
<td>0.55%</td>
<td>0.54%</td>
<td></td>
</tr>
<tr>
<td>Idea/Opinion/Emotion</td>
<td>0.97%</td>
<td>0.38%</td>
<td>0.55%</td>
<td>0.18%</td>
<td>0.41%</td>
<td>0.27%</td>
</tr>
<tr>
<td>Resource</td>
<td>0.03%</td>
<td></td>
<td>0.41%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>2.12%</td>
<td>1.89%</td>
<td>1.42%</td>
<td>0.36%</td>
<td>2.47%</td>
<td>6.47%</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salutation</td>
<td>8.50%</td>
<td>10.23%</td>
<td>10.16%</td>
<td>5.34%</td>
<td>13.17%</td>
<td>6.74%</td>
</tr>
<tr>
<td>Planning</td>
<td>0.03%</td>
<td></td>
<td></td>
<td></td>
<td>0.41%</td>
<td></td>
</tr>
<tr>
<td>Thanking</td>
<td>1.91%</td>
<td>4.55%</td>
<td>1.20%</td>
<td>0.85%</td>
<td>6.17%</td>
<td>1.89%</td>
</tr>
<tr>
<td>Complaining</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.18%</td>
<td>0.27%</td>
</tr>
<tr>
<td>Apology</td>
<td>0.71%</td>
<td>1.52%</td>
<td>1.42%</td>
<td>0.36%</td>
<td>0.41%</td>
<td>1.08%</td>
</tr>
<tr>
<td>Total of Coded Functions</td>
<td>2977</td>
<td>264</td>
<td>915</td>
<td>1648</td>
<td>243</td>
<td>371</td>
</tr>
</tbody>
</table>
Several patterns do emerge from other information gained from discourse analysis. When looking at the messages exchanged by week, there were decreases in activity during school holidays. This was seen in previous pilot studies, as was the fact that messages aimed at Information Reporting and Requesting were the more prevalent functions used by the most of the team members. The only function consistently used more than Requesting functions was Other Salutations, which was due to the fact that all the projects examined in this study tended to use greetings in a majority of their messages.

It is interesting to note that by just looking at the message functions used in the discourse, without examining the other aspects of the data analysis, there is no way to tell which teams had participants with satisfactory or dissatisfactory experiences in their discourse.

Table 65 details the percentage frequencies of message flow types by team. There are no dominant patterns discerned, except that the longer-lived discourses have a higher frequency of exchanges between the Student and Subject Matter Expert (with the Subject Matter Expert typically sending slightly more of the exchanges and using a wider range of functions). This was also noted in the previous pilot projects. One additional pattern was seen in the deadline-oriented projects: that the Facilitator sends a higher percentage of messages to All than in the longer-lived projects. The
explanation for this (in the projects studied in this research) was that the facilitator sent numerous messages trying to either project-plan or restart discourse after the project had begun.

Table 65
Percentage Frequency of Message Flow Types by Team

<table>
<thead>
<tr>
<th>Message Functions</th>
<th>Team</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Books</td>
</tr>
<tr>
<td>Facilitator to All</td>
<td>7.80%</td>
</tr>
<tr>
<td>Facilitator to SME</td>
<td>0.50%</td>
</tr>
<tr>
<td>Facilitator to SME/Student</td>
<td>2.80%</td>
</tr>
<tr>
<td>Facilitator to SME/Teacher</td>
<td>0.74%</td>
</tr>
<tr>
<td>Facilitator to Student</td>
<td>0.50%</td>
</tr>
<tr>
<td>Facilitator to Teacher/Student</td>
<td>0.74%</td>
</tr>
<tr>
<td>Facilitator to Teacher</td>
<td>2.90%</td>
</tr>
<tr>
<td>SME to Facilitator</td>
<td>2.50%</td>
</tr>
<tr>
<td>SME to Facilitator/Student</td>
<td>0.50%</td>
</tr>
<tr>
<td>SME to Facilitator/Teacher</td>
<td>0.74%</td>
</tr>
<tr>
<td>SME to Student</td>
<td>22.30%</td>
</tr>
<tr>
<td>SME to Teacher</td>
<td>5.80%</td>
</tr>
<tr>
<td>SME to Teacher/Student</td>
<td>2.90%</td>
</tr>
<tr>
<td>Student to Facilitator</td>
<td>0.50%</td>
</tr>
<tr>
<td>Student to SME</td>
<td>12.60%</td>
</tr>
<tr>
<td>Student to SME/Facilitator</td>
<td>0.50%</td>
</tr>
<tr>
<td>Student to SME/Teacher</td>
<td>1.50%</td>
</tr>
<tr>
<td>Student to Teacher</td>
<td>7.80%</td>
</tr>
<tr>
<td>Teacher to Facilitator</td>
<td>4.40%</td>
</tr>
<tr>
<td>Teacher to SME</td>
<td>2.90%</td>
</tr>
<tr>
<td>Teacher to SME/Facilitator</td>
<td>0.74%</td>
</tr>
<tr>
<td>Teacher to SME/Student</td>
<td>14.60%</td>
</tr>
<tr>
<td>Teacher to Student</td>
<td>9.70%</td>
</tr>
</tbody>
</table>
Age as a Factor

Another factor to be examined is the age of the student as it relates to the type of project attempted. Considering this factor provides further insight into the types of discourse that occurred. Some of the most sporadic communications came from 17- and 18-year-old students, including Joan in the Books team. Students completing their senior year in high school had severe demands on their schedules and other issues limiting their commitment to regular online communications.

The Medicine, Forecast, Books, and Clouds projects had students who were seniors in high school, either during the exchange or at the end of the exchange. During the springtime of each project, as graduation approached, the communications from these students were limited, at best. Out of all the 17- and 18-year-old students, Joan communicated most regularly. Because of the nature of her disability, electronic mail is something she looks forward to doing as a primary means of communication. Even so, her communications slowed at the end of the project. With this said, the nine-year old student in EE-scifair showed infrequent communications, but appeared to be influenced by the schedule and communications style established by his mother. As noted in project analysis of the EE-scifair project, the parent took over the role of student and, as with the students above, once the science fair had taken place, communications dropped to zero and the project ended. The student on the Arthur team, an elementary and then, later, a middle school student, had no distractions as the high school students above had and her
discourse, although it is no longer conducted through the Electronic Emissary, still continues with her mentor. Additionally, as a result of her participation in this study and her establishment of a routine in her college schedule, Joan of the Books team has resumed correspondence with her telementor.

Both age and school grade are important aspects to be considered when forming a telementoring team. The younger students in this study were more available for open-ended discourse and had the time to sustain the communications if a personal connection had been made with the subject matter expert. The older students got into project-specific online discourse for help with an advanced topic, project, or presentation. But once those goals were attained, the student ended the discourse. In the project-specific discourse, the restricted schedules limited students’ continued activity and the narrow focus of the project limited the potential of the online connection with the subject matter expert.

For the projects studied in this research, the above analysis supports the premise that the activity of participants in a CMC environment can be affected more by personal priorities than any other factor. It shows that CMC communications are held as a lower priority than local or immediate commitments, such as going to the doctor, participating in a classroom field trip, or preparing for graduation. (Jones, 1994; 1995; 1996; Jones & Amill, 1996) This emerges in direct contrast to results of the Levin et al. (1989, 1992) and Smeltzer (1992) research as discussed in Chapter 2.
Age as a factor can be an important component to examine before a project is begun. Students in higher grades are possibly more occupied with outside activities and more restricted in the amount of time available to devote to project-related discourse. If the participants are aware of this issue before the discourse begins, they can plan the project to offset this potential risk.

Unanticipated Problems

This section will describe some of the unanticipated problems that came up during the selected projects. Some of the unanticipated problems seen in this study were simple, some complex, some technical, others non-technical. Most unanticipated problems concerned issues surrounding electronic mail.

Several tools are required to send and receive electronic mail: a computer, a connection to a network, electronic mail software, and communications software (D’ Souza, 1992). Until the user can compose an electronic mail message on a computer, connect to a network (i.e. the Internet), and then use software to send the message across the network, the user is not able to participate in electronic mail exchanges. Add to this the ability to communicate concepts and ideas in writing, using a keyboard.
Since electronic mail is the main communications tool used in the Electronic Emissary Project, any problems with electronic mail, computer availability, Internet access, or ability to use electronic mail has a major impact on a project. Other unanticipated problems include issues surrounding project management and communications skills.

Instead of listing the unanticipated problems by topic, I will talk about the unanticipated problems as I interpret them within the story of each match. Most of these unanticipated problems could have been avoided if the guidelines published by Sanchez and Harris (1996) were better considered during the planning phases of each project.

The Sanchez and Harris (1996, p. 59) guidelines include:

- A clear purpose and topic for the exchange at the beginning of communications
- A motivated student with active support for participation from adults
- A committed expert with a genuine interest in teaching
- Evidence of a developing personal friendship among expert, student(s), and teachers or parents involved
- Reliable access to electronic mail
- A clear goal for the project that is built into the curriculum
- Scheduling enough time at frequent intervals and adhering to the schedule
- Keeping lines of communications open between the teacher/parent and subject matter expert on how the student is reacting to the mentoring.
The Medicine team’s student, Debbie, had limited computer access time to send electronic mail and had very limited experience in using electronic mail. When Debbie first started communications, the subject matter expert, Dr. Mordon, did not respond well to her inadequacy in expressing herself in her electronic mail messages. In the first message she used all upper case characters and only thanked Dr. Mordon for his time. It took several more message exchanges before the subject matter expert finally got Debbie to tell him more about the project and more about herself. Based on these initial messages, the subject matter expert was given a poor impression of both Debbie and the project. His impression was reflected throughout the discourse. With her limited computer time, Debbie did not have enough time to prepare her responses to the messages that Dr. Mordon sent. Her messages were not very well formed and seemed to be the ideas that came to her mind during the short periods of time when she had access to the computer. The lack of participation by the team’s teacher was no help either, since there was no one around to plan the project.

Debbie had no experience in budgeting her time and had difficulty integrating her computer access periods into her busy school schedule. By the time she gave her presentation, communications with her telementor had completely broken down. In the tenth week, she panicked when she was unable to reach Dr. Mordon to get information she needed for her presentation. When the deadline came, she expected Dr. Mordon to just be
there when she needed him. But she had never informed Dr. Mordon of any of the deadlines of the project. It seemed that electronic mail sent to Dr. Mordon was sent merely because Debbie felt the teacher or someone else expected her to use his references in the final project. However, the fault cannot all be placed on the student. Dr. Mordon, I feel, could have done a better job of trying to reach out to Debbie and help with communications. In some of his electronic mail exchanges he may have come across as being gruff and impatient. The facilitator did try to set things right, but electronic mail alone was not enough for the task. As stated in the case study of the Medicine project, Debbie got some of the materials needed for her presentation, but no real discourse about anesthesiology took place. As it turned out, the facilitator was able to avail herself of the telementor’s expertise when, at one point during the project she suffered an accident that required surgery. The facilitator had more discourse with the anesthesiologist than did the student.

Most of the unanticipated problems in the Medicine project were from the ramifications of frustrated expectations. One example of this is that when the student had trouble communicating, the teacher expected the Electronic Emissary to handle more of the planning for the project and even the training of the student. The Electronic Emissary Project assumes that the participants have several prerequisite skills when they begin their discourse. Having a basic knowledge of how to use electronic mail is one necessary skill. Another unanticipated problem is that it appears the facilitator was not
active enough in the planning stages before the project began and, as a result, was unable to make a correction later in the process to improve the discourse. Contributing further to the problem was the subject matter expert’s perception of being disconnected from the team and that, in his alienation, he chose to remain silent. Although the project was technically “successful”, the correction of the above problems might have resulted in a much higher level of satisfaction for each of the team members.

The Forecast project had problems similar to those of the Medicine project, although not as severe as the ones discussed above. William (the student) had access to electronic mail, but he was restricted to access during class time only. At the beginning of the discourse, there was some discussion about the outcome of the project, but no clear deadlines or specific goals were defined. After starting the project, the teacher communicated a few times, but was not very involved, due to his busy schedule. As in the Medicine project, the teacher in the Forecast team expected the Electronic Emissary Project to be more responsible for the project management and overview. The team was lacking a support person for the student, which in this case would have been the teacher. The role of participants will be discussed later in this chapter.
Further complications arose in the Forecast project from the project proposal’s inaccuracy. Thus, when the subject matter expert entered the discourse, he was expecting to discuss a topic on forecasting, but was disappointed when he found out that he was only going to be providing basic information on the comparison of the photographic data of two different weather source systems. The subject matter expert, when interviewed, felt that the team never came to a decision on what the course of communications would be, but that each member tried to help to the best of his ability. Most of the problems in this match were rooted in the facilitator’s failure to do the up-front work required to make this project a higher quality one. As mentioned earlier, the short-term nature of the deadline-oriented projects requires the facilitator to put much more time into planning before the project begins and the teacher and subject matter expert become involved. In the Medicine and Forecast projects, it appears that the facilitator contacted the participants, requested the match, made some of the initial communications in the project, but then fought a losing battle trying to get the team on the right track.

The EE-Scifair team had a few unanticipated problems during the course of their project. This was yet another situation where a short-term project had problems stemming from insufficient project planning before the Electronic Emissary telementoring relationship was established. The project proposal really did not reflect the actual project concept that the teacher/parent had in mind for her student/son. The teacher had expectations well beyond the scope of what the Electronic Emissary Project
and the selected subject matter expert expected to provide. In fact, these expectations had no way of being met by the project. Neither did the subject matter expert expect the types of requests she got from the teacher. When she began to understand fully what the teacher/parent wanted, she attempted to explain what she could actually provide, but the teacher was not very open for discussion on the issue. From the interviews, the parent/teacher came across as having very strongly held beliefs on how things should be taught and presented to her home schooled children and was not willing to part from these easily. The subject matter expert at this time adopted an approach simply of answering the questions as best as she could. They continued to talk and the telementor gave the teacher/parent some useful information for her son, but the satisfaction level for all participants was lower than what might have been expected for what is considered by discourse analysis alone to be a “successful” project.

The Clouds, Arthur, and Books projects had some very minor unanticipated problems but, as discussed earlier in this chapter, these longer-lived projects had a much longer grace period to recover from mistakes and errors. These projects had an extended time to develop approaches and solutions to the issues listed in the suggested guidelines in Sanchez and Harris (1996). When problems arose in these projects, the participants had the time to correct them and continue with their discourse. Thus, any problems or unanticipated problems that did occur in these projects did not impact the overall discourse.
The EE-scifair, Medicine, and Forecast projects discussed in this section had unanticipated problems in the discourse because the projects missed one or more of the guidelines outlined by Sanchez and Harris (1996). If the guidelines are not met before a project begins, it can only reflect on the Electronic Emissary Project and the appointed facilitator. A project should not be started until everyone has a clear concept of what is happening. It is the responsibility of the facilitator to ensure that this take place. Adhering to the guidelines would eliminate many of the unanticipated problems found in projects and would have helped the teams discussed here.

**Important Roles of Participants**

In this analysis, several important team member roles emerged as being crucial to a project’s discourse. The roles can be described as The Support Person, The Information Person, The Question-Asking Person, and the Project Manager. When most or all of these roles were assumed among the members of a team described in this study, the discourse was very successful. When one or more of these roles were absent from the discourse, the projects, while still successful, experienced lower satisfaction among the participants, lower number of exchanges sent, and/or lower amount of content-related discourse.
The characteristics of groups and organizations is a theme discussed in CMC research. Riel (1990) identified several structures which lend themselves to the electronic communications medium that focus on participant roles and their needs. These structures include electronic mail lists, Internet chats, and other types of Internet-based communications systems. Based on these structures, Riel (1991) developed an analytic framework of participant structures to compare interaction within and across computer network communities. Since Riel’s research focused more on multi-participant telementoring, the factors cover group interactions such as network group, network task organization, response opportunities and obligations, coordination, and support. The roles of participants in this research are better defined to represent the roles which emerged in individual telementoring projects.

Another very interesting pattern seen in this research was that the roles in this study shifted between participants as the discourse developed. This will be discussed below. As each role is described, examples from the analysis will be given. Table 66 shows which roles were present or absent in the teams described in this study.
Table 66
Presence of Roles in projects

<table>
<thead>
<tr>
<th>Role</th>
<th>Books</th>
<th>Medicine</th>
<th>Clouds</th>
<th>Arthur</th>
<th>Forecast</th>
<th>EE-Scifair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support Person</td>
<td>Present</td>
<td>Not Present</td>
<td>Present</td>
<td>Present</td>
<td>Not Present</td>
<td>Present</td>
</tr>
<tr>
<td>Information Person</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Question Person</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Present</td>
<td>Not Present</td>
<td>Present</td>
<td>Present</td>
<td>Not Present</td>
<td>Not Present</td>
</tr>
</tbody>
</table>

The Support Person

As the name suggests, the support person is someone who supports the project and, as it turned out, this person did not necessarily need to be someone in the project. In the more successful teams, there was always someone who took on the role of the support person (usually a parent or guardian). In the long-lived projects of Books, Clouds, and Arthur, the support persons’ influence could be seen in the discourse. In Books, Joan’s parents were advocates for their daughter, especially when it came to accessing the materials that Laura, the subject matter expert, suggested. In one of her interviews, Laura commented that she did not realize how important a role Joan’s parents, especially her mother, played until they were well into the project. Laura felt that without parental support, Joan would not have been able to achieve as high a level of interaction as was manifest in the discourse.
The same was true for the Arthur project. Bridget’s parents initiated the project and, as can be seen from the several postings by her father, they kept a close eye on the conversation. While their participation is not as evident as Joan’s parents’ support, it is likely that they continued to provide support and motivation for Bridget during the project. In the Clouds project, the teacher, Mary, took on the support role, since Rylana had no family support. When Rylana felt that the communications were not going anywhere, Mary stepped in to lend her moral support. José, of the EE-scifair project, had the support of his mother as both parent and teacher. Although, as was discussed in the analysis, when the parent took over the role of the student, José’s participation became non-existent.

Both the Forecast and the Medicine projects clearly lacked a support person for the team. The students were left on their own to handle the discourse, apparently without the support of a parent or a teacher. As a result, both the facilitator and subject matter expert were left trying to fill this role without either of them consciously realizing that the role needed filling. The lack of a support role, while not halting communications in these two projects, seemed to have an impact on the discourse. Furthermore, the participants involved expressed less satisfaction with the project than those involved in projects with members in support roles.
The Information Person

Another important role is that of information provider. This role is not necessarily assigned to the subject matter expert exclusively, but can be filled by any one or more of the participants. Since all these projects were chosen because they had “successful” teams, then it follows that each of these projects had at least one information person involved. In past research, a project always failed when the flow of content information was never started. Usually this circumstance is a result of the subject expert’s not being contacted or not replying, or the subject matter expert’s failure to start the flow of information.

Information sharing can take on different types and forms depending on the projects. Information sharing can be focused, specialized, expert help, or it can be a more general forum of advice and/or consultation. Initially, in this study, it was the subject matter expert who first donned the mantle of information person and, over time, the role included other participants.

In the teams for Books and Clouds, we saw both the teacher and subject matter expert providing information to the student. In the Arthur, Medicine, Forecast, and EE-scifair projects, most information was provided by the subject matter expert. Facilitators initially communicated in the project management role but became more active in information-providing the longer the discourse lasted.
The Question-Asking Person

If no one asks questions, then there can be no mentoring of content information flow. As with the Information role above, without the student or other participants asking questions, no discourse takes place. Normally the facilitator kicks off the project with the first question, “Is everyone here?” From this simple query the discourse progresses, and with good planning and work the student becomes the primary question-asker. In the more healthy projects, all the participants become question askers and become involved with the discourse; even the facilitator can become involved. For the Books project, Joan was the primary question-asker. Her main question typically was “How does this review look?” For the Clouds project, those asking the questions were both the student and the subject matter expert. In the Arthur, Medicine, Forecast, and EE-scifair projects, the student directed most of the questions to the subject matter expert. Therefore, team discourse depends on having at least one participant ask questions.

The Project Manager

The role of project manager is a crucial one, but by itself it cannot save a project that is missing another major role. Hiltz, Kerr, and Johnson (1985) state that with some CMC systems, strong, active leadership must be present on-line to help organize and direct communications when discourse begins to wane and the users procrastinate. Once the team’s discourse is in progress,
the role of project manager can be filled by any of the participants, but initially the facilitator takes on the role of project manager.

Before a project’s electronic mail communications begin, the facilitator’s job is to work with the teacher and student(s) to plan their project. Planning usually involves the creation of realistic expectations, based on the circumstance that time to interact with the subject matter expert is limited to a semester or shorter time frame. The facilitator then introduces the individual participants to each other and ensures that all team members can send and receive electronic mail using the Emissary’s addressing system. If, during the course of a project, the flow of communications slows or stops, the facilitator determines why the exchanges have ceased. He or she then attempts to remedy the situation, be it a technical problem or some other challenge to address. The facilitator also tries to be prepared when team members have differing levels and types of expectations from the telementoring experience. This occurs, for example, when the teacher might expect the subject matter expert to be on-line more often, or if the subject matter expert expects the teacher and students to provide more than one-line questions to be answered. Problems like these, if not handled properly, can result in early termination of a project. One of the primary purposes of the facilitator in each Electronic Emissary Project is to try to resolve issues related to the medium, since not all participants have the necessary background to use electronic mail for pedagogical purposes without difficulty (Harris, O’Bryan, & Rotenberg, 1996).
All the facilitators in the projects studied here were responsible for more than one project. Typically the load for an Electronic Emissary facilitator is between five and twenty projects. At some point during the discourse, when the facilitator becomes occupied with something else (e.g. exams, studies, school breaks, personal issues), it is up to the other team members to take over the role of project manager. From reading some of the discourses, it seems that, as project manager, the facilitator did not do a significantly thorough job when setting up the projects. The issues that cropped up in the Forecast, EE-Scifair, and Medicine teams could possibly have been avoided or improved with more facilitator interaction and planning before the projects began.

Since the facilitators for the projects studied in this research are all graduate students, their involvement in the project diminishes as their semester schedule progresses. After they help with the setup and launch of the project, their activity decreases. Their primary job as the projects develop is to watch for unanticipated problems and signs of inactivity. If they see these indications, then they try to become more active to address these issues. As the active presence of the facilitator declines after the initial startup of the project, the role of project manager shifts to other participants. These role transferences are easiest seen in the longer-lived projects. In Clouds, the teacher became the project leader. In Books, all three of the participants took on various roles of project leadership as the project needed
In Arthur, the subject matter expert became the project leader, as the student wanted to change discourse direction. Since there was little or no teacher participation in the Forecast and Medicine projects, it was up to the student or subject matter expert to assume the project manager role. However, both of these projects were over before anyone took initiative and assumed the role. The sporadic message flow contributed to the subject matter expert’s sense of having no “ownership” of the project, and thus did not feel empowered to assume the role of project manager in order to incorporate changes for the better. In EE-scifair, the teacher/parent took over the role of project manager. Since, as project manager, she was not happy with the way the project was going, it ended when she stopped communications.

As I have discussed above, the four outlined roles of Supporter, Information Giver, Question-Asker, and Project Manager had considerable influence on the perceived success of the projects examined. When all roles were filled, participants were very positive about the telecollaboration. When one or more roles were not present, then perceptions were less positive.
Directions for Future Research

Several directions for future research arise from the information presented in this study. This section will discuss some of the potential areas of study that could be examined in the future. One of the most important issues to build on is to further examine the nature and complexity of the roles assumed by the individual participants during individual student matches as compared to the roles assumed in larger participant teams. A more in-depth examination of these roles by each type of match could yield important information. It would be helpful to gain a better understanding of the potential impact of the participants’ roles and how they change during discourse. Also, what is the importance of the various roles and do some influence the outcome of the discourse more than others? Would deploying additional resources of training and/or facilitation before communications improve the positive outcomes or heighten the quality of discourse of a match by influencing one or more of the important participants’ roles? Would these additional resources avoid potential procedural and/or perceptual problems of the media that arise early and frequently in some matches?

Since informants in telementoring teams today include both novice and experienced electronic mail users, their varying depths of understanding and usage of the electronic mail medium impact the perceived success and the extent of discourse that takes place during the life of a project. Additional research could examine whether a participant’s prior knowledge can be
gauged accurately before the communications begin. The question of whether it is beneficial to expand participants’ knowledge with training or materials beforehand, or have them develop it during the discourse, could be explored. Also, it would be helpful to find out if additional training of facilitators increases the successfulness of student matches.

One final area of future consideration is the changing role of technology. Do newer types of media improve the discourse of the participants using the methods established by the Electronic Emissary program? If so, how? While electronic mail has served the Electronic Emissary program well since its inception, are there technologies that provide a new platform for lowest common-denominator communications among participants? Electronic mail from the establishment of the Electronic Emissary program has provided a baseline communications technology widely available to all wishing to participate. Only now, nine years after the introduction of the Web as a consumer software product, has it begun to attain the existing and potential base of users to rival electronic mail accessibility. Would a Web-based bulletin board function as well as electronic mail accounts for telementoring?

There is one important methodological note to future researchers in this area. This study shows that the amount of time elapsing between the end of the project and the time of the interview is perceived by the informants to affect the quality of information they are able to provide at the
Researchers doing participant-centered interviews, as done in this study, are urged to conduct these interviews during or soon after the completion of the Electronic Emissary match being examined. This will ensure the highest possible degree of detailed information provided by the informants.

Conclusion

The communications between subject matter experts and individual students in electronic mail contexts has been the focus of the research presented in this dissertation. This one-on-one communication between subject matter experts and individual students has been assisted by the Electronic Emissary Project since February, 1993. As the Internet and other telecommunication media become more accessible and affordable for home use, educational exchanges involving individual students using electronic mail to communicate with subject matter experts are becoming more commonplace. This growth, coupled with the dramatic increase in student access to the Internet in the U.S., has made electronic communication between individual students and subject matter experts a practical and convenient activity whose educational antecedents are worthy of study. Therefore, it is relevant to understand these individualized exchange dynamics and thus gain insight into the information flow and other communications patterns of the projects studied and presented in this research.
This study presents information on how individual students and their subject matter experts communicated. In previous chapters, emerging themes and patterns from data analysis and subsequent participant interviews, characterizing communications between individual students and subject matter experts, were described in detail. The analyses of the discourse created by individual students and subject matter experts were interpreted and extended by interviews with the individuals participating, and are presented in this report of findings for possible use by interested parties (e.g. teachers, educational administrators, homeschooling parents) who are considering student-centered telecommunications as a way to enhance student learning in either home or classroom environments. Understanding the scope and depth of existing exchanges in these individual student-focused matches might result in a higher percentage of successful telementorships and a wider use of the medium by teachers and parents.

This study also fills an existing need for research specific to the Electronic Emissary Project. My interest in pursuing this research has been nurtured by my work on the design of the Emissary system since its initial conception and organization in 1992. This research represents the culmination of three previous pilot studies on various aspects of Emissary-related communications (Jones, 1996; 1995; 1994). Much of the published Emissary research to date has focused on groups of students communicating with experts. Research into teams with individual students allows a broader understanding of the Electronic Emissary Project as a whole.
Appendix A

Person as Instrument

This section will review my background relevant to mentoring, computer technologies, and their applications to education that may shape my perspectives while conducting the various aspects of the research study.

I have been using computers since junior high school (1977) and using telecommunications since my senior year in high school (1981). My experience with computers is closely linked to my amateur radio hobby. When I was learning amateur radio, I was mentored by older, more experienced radio operators in the hobby. During this time, I became friends with several technologists in Dallas who worked at MOSTEK. These engineers encouraged me to get involved with computers and helped me build my first Apple II clone computer.

Now, many years later, I have begun to realize that most of my learning experiences have occurred as a result of my having been mentored. This is true for most of the more positive educational and recreational experiences I have had in my life. I now find myself mentoring others in my area of expertise in the same way I was mentored when I was younger.
After determining that my “natural” talent lay in computers, and not in jazz music composition studies at the University of North Texas, Denton, Texas, I completed my BS in Computer Science in 1987. During my undergraduate studies in Denton, I worked at various levels within the Computer Science department — which included lab assistant, assistant research systems administrator, and finally research systems administrator — before moving along to work on my Masters of Science. While working as the assistant research systems administrator, I helped connect the Vax 11-780 BSD Unix system to the Internet (ARPANET) using a 300 baud telephone modem system calling into the Convex system in Dallas. Later, when I was the Research Systems Administrator, I helped install the first Ethernet network at the University.

While beginning my master’s degree in computer science, the Computer Science department split into two entities. The new Department of Computer Education and Cognitive Studies was formed, and many of the professors in the Computer Science department joined the new department. During this time, I found I was more interested in examining applications of both telecommunications and computers than in expanding my theoretical understanding of computer science. I found many of the more advanced computer science theory classes to be uninteresting. Also, those professors who seemed to be the most dynamic were joining the new department. To me, it made sense to align myself with the new department.
In 1985, while still in the Computer Science Department, I presented a paper at the 11th Annual Pacific Telecommunications Conference in Honolulu, Hawaii. While attending and presenting a paper on the wireless telecommunications technology appropriate for use in Pacific island settings, I came to the conclusion that Instructional Technology was the field I was interested in pursuing for my PhD. This resulted in my moving from an MS in Computer Science to an MS in Interdisciplinary Studies degree, which not only allowed me to stay in Computer Science, but also allowed me to place an additional focus on Computer Education and Research Statistics.

During this period of degree study, I worked on several very interesting educational telecommunication projects. One involved experiments focused on using packet radio technology over the ATS-3 satellite to provide a link between Pacific Islanders and the University of Hawaii library loan system. In 1988, the Texas Center of Educational Technology was formed and I joined as the lone research assistant to the Telecommunications and Informatics Lab.

In 1990, after the completion of my master’s degree I had the opportunity to study in England at the University of Surrey, in Guildford. This allowed me to change my focus of study for a brief period, yet again, to Satellite Engineering. During my work at UoSAT (University of Surrey Satellite), I worked on simulation software for low earth satellites. One of these types of satellites is used by VITA and HealthSat to provide health and
technology resource information to third world countries with low-cost portable ground stations using store-and-forward wireless electronic mail technology. I also worked on taking a developed English curriculum and moving it into a US context. The most interesting experience was the development of a power budget analysis software package that included a suite of software including orbital mechanics, ray tracing of the sun on the satellite structure, and simulating the power requirements and use of various instrument packages installed on the satellite. Much of this development was done in mentoring relationships with subject matter experts in their specific fields at UoSAT.

When I returned from England in 1991, I began my PhD studies at the University of Texas at Austin (UT) in the area of Instructional Technology. From my first semester at the University until 1995, I taught the EDC371 course, now titled Computing Tools for Educators. The course covered almost every major aspect of computer technology that might be encountered by teachers in the classroom, such as electronic mail, the Internet, Web pages, word processing, graphics, hypermedia, on-line conferencing, and much more.

Several of the courses I have taken at UT for my PhD program have influenced my research on the application of telecommunications in the classroom. These include Instructional Telecommunications, Qualitative Research: Naturalistic Inquiry, and Psychology of Computers in Education.

Before starting my studies at the University of Texas at Austin, my research background had been very quantitatively grounded. While taking the course in naturalistic inquiry, my thinking regarding research paradigms began to change. The directed research projects that followed shows this change in philosophy, since most of them are a mixture of qualitative and quantitative research. This dissertation is a result of the work of using qualitative methods to better reflect the nature of the information and participants being studied.

The second year I was at UT, I began to work with Dr. Judith Harris on what is now known as the Electronic Emissary project (http://www.tapr.org/emissary). We began with a review of the basic concept behind the project and, based on those discussions, I designed and coded the first version of the Emissary system. This version was housed on the TCET Internet server and was entirely Telnet based. Refinement over the following years has led to the current incarnation of the Web-based Emissary system, which is hosted by the Tucson Amateur Packet Radio Organization (http://www.tapr.org).
While the Electronic Emissary was being designed, I was enthused to be participating in the development of this type of telementoring system. I strongly believe that telementoring systems are beneficial classroom tools. Participants can benefit from the independence from time and geographic constraints that a telementoring or computer-mediated communications systems provides. Computer-based communications technologies also make it possible to extend the positive effects of cooperative learning by creating teams composed of participants who are in a variety of distant locations. The Electronic Emissary Projects blends the best part of technology and human interaction. The Emissary system automates selection and matching, and also provides a common, simple, and secure electronic mail interface for the participants to use during a match.

However, technology is not a solution in and of itself, and as a result the Emissary depends on human review and interaction at several layers of its operational structure. This interaction, I believe, provides the necessary key to handling situations the software was never programmed to handle, and provides an important human factor to the successful development of teams during their matches.
While I have been involved in most aspects of the Electronic Emissary, I have never facilitated a team as described in the study. The first semester of matches which Dr. Harris and I coordinated were unfacilitated. After that first semester, graduate students in the college were brought into the project to facilitate matches each semester.

While this is not a limitation, Emissary facilitation is an experience in which I have not fully been involved. However, to counterbalance this, the background I gained from conducting the three pilot studies (Jones, 1994; 1995; 1996) should increase the accuracy of my analysis of message function/speech acts. Due to my experiences with both sides of mentoring, my expertise in telecommunications and computer science, and my association with the Emissary since its inception, I have a unique perspective from which to interpret and analyze the data. I will need to pay special attention when generating and coding interview data, since I have had less previous experience with this approach than with other types of data generation.

Once the basic Electronic Emissary system was operational, I began to investigate research opportunities. The results are a series of pilot projects, articles, and presentations with others involved in the project. This work has led to the development of the current project study. Three pilot projects I conducted between 1993 and 1996 focused on determining message patterns that occurred for student groups and individuals in telementoring.
environments supported by the Electronic Emissary project. The most significant discovery was that no major repeatable patterns emerged between teams. This finding has led to the development of the current project study as being case-study based.

I anticipate that a few new observations will be made during this research. For example, I expect that the matches will be unique in the sense that although some minor patterns will be common between studied matches overall, no major patterns will emerge that are similar to the point of being repetitive between many different matches. I also suspect that matches in which participants exchange personal information early in the communications will have a better bonding and positive experience for participants throughout the match. Lastly, good exchanges will be considered to be those in which each participant (subject matter expert and student) feels that each has answered and participated in the exchange.

What I expect not to see in this research analysis is the emergence of significant patterns between this study and previous studies that show commonality of usage or use of message function and flow that could be used between many groups. The reason for my selection of the method of research used in this study is based on the fact that no major patterns emerged in the first three pilot studies. Thus, the use of case studies seems the best way to analyze the communications occurring between participants.
In conclusion, I believe that the findings of this research will add to existing knowledge about the types and methods of educational discourse and interchange that occur on-line. This information can then be used by interested parties (e.g., teachers, parents, educational administrators) who are considering student-centered telecommunications as a way to enhance student learning in either home or classroom environments. Understanding the scope and depth of existing exchanges in these individual student-focused matches might result in a higher percentage of successful telementorships and a richer use of the medium by teachers and parents.

This study will also fill an existing need for research specific to the Electronic Emissary Project. Much of the published Emissary research to date has focused on groups of students communicating with experts. Research into teams with individual students will allow a broader understanding of the Electronic Emissary Project as a whole. Possible communication differences between group and individual student teams may also emerge.

This research will enable readers to better understand the nature of individual Electronic Emissary student matches and to recognize the potential of similar exchanges. The methods to be used may help the reader transfer relevant findings to telementorships occurring locally.
Appendix B

Consent Forms

Each participant signed a consent form prior to their participation in this study. The consent form notified participants about the rights and responsibilities that would be associated with their roles. It also stated that participation of all informants in the study would be entirely voluntary and that informants would have the right to withdraw from the research at any time and without stating reasons for doing so.

Since at the onset of their Electronic Emissary participation each team gave written consent for the study, analysis, and follow-up interviews regarding their textual electronically-conducted dialogues, I felt that additional consent with respect to interviews was necessary in order to maintain the highest levels of trust between myself and the participants. Additional consent information was collected from all informants contacted.

The following consent forms were used in this study:
CONSENT FORM

A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts

You are invited to participate in a study of on-line mentoring that occurred during your Electronic Emissary experience as part of my dissertation research. My name is Greg Jones and I am a graduate student and one of the designers of the Electronic Emissary project at The University of Texas at Austin, Department of Curriculum and Instruction. I hope to learn more about the conversation that happened during your Emissary curriculum project. You were selected as a possible participant in this study because you have completed a successful one-student Emissary-supported interaction. You will be one of approximately seven teams’ members chosen to participate in this study. Each team is important, since learning more about your match’s conversation adds to the overall understanding of on-line electronic mentoring using the Emissary project.

If you decide to participate, I will need to spend from three to six telephone interviews with you regarding your Electronic Emissary activity. You may choose to decline at any time to answer questions asked during the research. There will be some materials electronically mailed to you before each interview to be reviewed. These emailed materials will contain information from the analysis of your mail exchanges. The interviews will focus on discussing the types of conversations you had during your Emissary match to give me your personal insight into these exchanges. In-person visits might be arranged, if my travel schedule allows and you agree.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. Before any information is collected, you will be asked to select an alias to be used to represent yourself in the study. This name will afford you complete confidentiality in the study. Audio tapes recorded during interviews will be erased at the completion of the study.

Participants in this study will receive a copy of the final report and should benefit from a better understanding of the communications that occurred during their Electronic Emissary match.

Your decision whether or not to participate will not affect your future relations with The University of Texas at Austin, the Electronic Emissary, or me. If you decide to participate, you are free to discontinue participation at any time. Simply contact me and you will be removed from the study.
You are making a decision whether or not to participate. Your signature indicates that you have read the information provided above and have decided to participate. You may withdraw at any time after signing this form, should you choose to discontinue participation in this study. Simply contact me and you will be removed from the study. There is no foreseeable risk involved with participating in this study. You may retain a copy of this consent form and this explanation about the nature of your participation and the handling of the information you supply.

If you have any questions, please ask me. If you have any additional questions later, I will be happy to answer them. I can be reached by e-mail at greg@tapr.org or by phone at (512) 331-9331. You can reach Judi Harris, PhD, my supervising professor, at jbharris@tenet.edu or by phone at (512) 471-5211.

You may keep a copy of this form.

________________________________________________________________________
Signature of Participant                   Date

________________________________________________________________________
Signature of Investigator                   Date

1 You are under no obligation to participate in the study. Your completing and returning the form will be taken as evidence of your willingness to participate and your consent to have the information used for purposes of the study.
CONSENT FORM

A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts

Your child is invited to participate in a study of on-line mentoring that occurred during his/her Electronic Emissary experience as part of my dissertation research. My name is Greg Jones and I am a graduate student and one of the designers of the Electronic Emissary Project at the University of Texas at Austin, Department of Curriculum and Instruction. I hope to learn more about the conversation that happened during his/her Emissary curriculum project. Your child was selected as a possible participant in this study because they have completed a successful one-student Emissary-supported interaction. Your child will be one of approximately seven teams’ members chosen to participate in this study. Each team is important, since learning more about your child’s conversation adds to the overall understanding of on-line electronic mentoring using the Emissary project.

If you decide to allow your child to participate, I will need to spend from three to six telephone interviews with your child regarding their Electronic Emissary activity. Your child may choose to decline at any time to answer questions asked during the research. There will be some materials electronically mailed to you and your child before each interview to be reviewed. These emailed materials will contain information from the analysis of your child’s electronic mail exchanges. The interviews will focus on discussing the types of conversations your child had during their Emissary match to give me your child’s personal insight into these exchanges. In-person visits might be arranged, if my travel schedule allows and you agree.

Any information that is obtained in connection with this study and that can be identified with your child will remain confidential and will be disclosed only with your permission. Before any information is collected your child will be asked to select an alias to be used to represent their information in the study. This name will afford your child complete confidentiality in the study. Audio tapes recorded during interviews will be erased at the completion of the study.

Participants in this study will receive a copy of the final report and should benefit from a better understanding of the communications that occurred during their Electronic Emissary conversation.
Your decision whether or not to allow your child to participate will not affect your future relations with The University of Texas at Austin, the Electronic Emissary, or me. If you decide to allow your child to participate, you or your child are free to discontinue participation at any time.\(^1\) Simply contact me and your child will be removed from the study.

You are making a decision whether or not to allow your child to participate. Your signature indicates that you and your child have read the information provided above and have decided to participate. You may withdraw at any time after signing this form, should you choose to discontinue participation in this study. Simply contact me and you will be removed from the study. There are no foreseeable risks involved with participating in this study. You and your child may retain a copy of this consent form which explains about the nature of your child’s participation and the handling of the information your child supplies.

If you have any questions, please ask me. If you have any additional questions later, I will be happy to answer them. I can be reached by e-mail at greg@tapr.org or by phone at (512) 331-9331. You can reach Judi Harris, Ph.D, my supervising professor, at jbharris@tenet.edu or by phone at (512) 471-5211.

You may keep a copy of this form.

______________________________ _______________
I agree to participate in this study.
Signature of Student Date

______________________________ _______________
Signature of Parent/Guardian Date

______________________________ _______________
Signature of Investigator Date

\(^1\) You are under no obligation to participate in the study. Your completing and returning the form will be taken as evidence of your willingness to participate and your consent to have the information used for purposes of the study.
CONSENT FORM

A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts

You are invited to participate in a study of on-line mentoring that occurred during your Electronic Emissary experience as part of my dissertation research. My name is Greg Jones and I am a graduate student and one of the designers of the Electronic Emissary Project at the University of Texas at Austin, Department of Curriculum and Instruction. I hope to learn more about the conversation that happened during your Emissary curriculum project. You were selected as a possible participant in this study because you have completed a successful one-student Emissary-supported interaction. You will be one of approximately seven teams’ members chosen to participate in this study. Each team is important, since learning more about your conversation adds to the overall understanding of on-line electronic mentoring using the Emissary project.

If you decide to participate, I will need to spend from three to six telephone interviews with you regarding your Electronic Emissary activity. You may choose to decline at any time to answer questions asked during the research. There will be some materials electronically mailed to you before each interview to be reviewed. These emailed materials will contain information from the analysis of your electronic mail exchanges. The interviews will focus on discussing the types of conversations you had during your Emissary match to give me your personal insight into these exchanges. In-person visits might be arranged, if my travel schedule allows and you agree.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. Before any information is collected you will be asked to select an alias to be used to represent your information in the study. This name will afford you complete confidentiality in the study. Audio tapes recorded during interviews will be erased at the completion of the study.

Participants in this study will receive a copy of the final report and should benefit from a better understanding of the communications that occurred during their Electronic Emissary conversation.

Your decision whether or not to participate will not affect your future relations with The University of Texas at Austin, the Electronic Emissary, or me. If you decide to participate, you are free to discontinue participation at any time. Simply contact me and you will be removed from the study.
You are making a decision whether or not to participate in this study. Your signature indicates that you have read the information provided above and have decided to participate. You may withdraw at any time after signing this form, should you choose to discontinue participation in this study. Simply contact me and you will be removed from the study. There are no foreseeable risks involved with participating in this study. You may retain a copy of this consent form which explains about the nature of your participation and the handling of the information you supplies.

If you have any questions, please ask me. If you have any additional questions later, I will be happy to answer them. I can be reached by e-mail at greg@tapr.org or by phone at (512) 331-9331. You can reach Judi Harris, Ph.D, my supervising professor, at jbharris@tenet.edu or by phone at (512) 471-5211.

You may keep a copy of this form.

__________________________________________ ______________________
I agree to participate in this study.                                Date
Signature of Student

__________________________________________ ______________________
Signature of Investigator                                Date

1 You are under no obligation to participate in the study. Your completing and returning the form will be taken as evidence of your willingness to participate and your consent to have the information used for purposes of the study.
ASSENT FORM

A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts

I agree to participate in a study about how students communicate on-line with Subject Matter Experts during an Electronic Emissary project. I understand that this study has been explained to my mother/father/guardian and that she or he has given their permission for me to participate. I understand that I may decide at any time that I do not wish to continue this study and that it will be stopped if I say so. Information about what I say and do will not be given to anyone else.

I understand that I will be asked questions about how I thought the conversation during my Electronic Emissary match occurred, helping Greg understand the dialog between me and the expert I talked with using electronic mail. I understand that I don’t have to answer all of the questions that Greg asks. I also understand that nothing bad or wrong will happen to me if I decide to stop my participation in this study at any time.

When I sign my name to this page I am indicating that this page was read to me and that I am agreeing to participate in this study. I am indicating that I understand what will be required of me and that I may stop the study at any time. If I wish to stop my involvement with the study, I will contact Greg via e-mail at greg@tapr.org or by phone at (512) 331-9331.

__________________________________________ __________________
Student’s Signature Date

__________________________________________ __________________
Parent/Guardian Signature Date

__________________________________________ __________________
Signature of Principal Investigator Date
Appendix C
Message Flow and Function

Message flow types represent the direction of the exchange between participants in an Electronic Emissary match. A flow type originates from one type participant and can be directed to one or more of the other types of participants. Message flow types such as Student to Subject Matter Expert, Teacher to Subject Matter Expert, or any of a number of other combinations are possible within a team. The process of coding messages for analysis begins with the assignment of a message flow type. Table C1 shows the possible message flow types encountered in this study.

Table C1:
Listing of Message Flow Types

<table>
<thead>
<tr>
<th>Facilitator</th>
<th>to</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator</td>
<td>to</td>
<td>Subject Matter Expert</td>
</tr>
<tr>
<td>Facilitator</td>
<td>to</td>
<td>Subject Matter Expert/Student</td>
</tr>
<tr>
<td>Facilitator</td>
<td>to</td>
<td>Subject Matter Expert/Teacher</td>
</tr>
<tr>
<td>Facilitator</td>
<td>to</td>
<td>Student</td>
</tr>
<tr>
<td>Facilitator</td>
<td>to</td>
<td>Teacher/Student</td>
</tr>
<tr>
<td>Facilitator</td>
<td>to</td>
<td>Teacher</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>to</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>to</td>
<td>Facilitator/Student</td>
</tr>
<tr>
<td>Subject Matter Expert</td>
<td>to</td>
<td>Facilitator/Teacher</td>
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<tr>
<td>Subject Matter Expert</td>
<td>to</td>
<td>Student</td>
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<tr>
<td>Subject Matter Expert</td>
<td>to</td>
<td>Teacher</td>
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<tr>
<td>Subject Matter Expert</td>
<td>to</td>
<td>Teacher/Student</td>
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<tr>
<td>Student</td>
<td>to</td>
<td>Facilitator</td>
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<tr>
<td>Student</td>
<td>to</td>
<td>Subject Matter Expert</td>
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<td>Student</td>
<td>to</td>
<td>Subject Matter Expert/Facilitator</td>
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<td>Student</td>
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<td>Subject Matter Expert/Teacher</td>
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<td>Student</td>
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<td>Teacher</td>
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<td>Subject Matter Expert/Facilitator</td>
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<td>Teacher</td>
<td>to</td>
<td>Subject Matter Expert/Student</td>
</tr>
<tr>
<td>Teacher</td>
<td>to</td>
<td>Student</td>
</tr>
</tbody>
</table>

343
Message function deals with the assignment of speech acts to each message. These speech acts can inform the researcher about the type of discourse that is being used in the exchanges. Each sentence within each message is classified one or more of the following message sentence category types: "Reporting Information," "Requesting Information," and/or "Other." Once sentence categories are assigned, the sentence is examined for apparent specific functions. Rueda’s (1992) 19 functions were tested in initial coding trials for perceived comprehensiveness and mutual exclusivity. They were amended and appended to form 21 functions and organized into Rueda’s original three category classes ("Reporting Information," "Requesting Information," and "Other"). The categories and their subsequent functions are shown in Table C2.
Table C2: Listing of Message Sentence Functions

Reporting Information
  Content Information
  Procedural Information (content-related "how-to" information)
  General Information
  Directions (non-content-related "how-to" information)
  Personal Information
  Ideas/Opinions/Emotions
  Resource (book, video, or other resource information)
  Feedback (non-content-related suggestions, evaluations, etc.)

Requesting Information
  Content
  Procedural Information (content-related "how-to" information)
  General Information
  Directions (non-content-related "how-to" information)
  Personal Information
  Ideas/Opinions/Emotions
  Resource (book, video, or other resource information)
  Feedback (non-content-related suggestions, evaluations, etc.)

Other
  Salutation (greetings and closings, not including signatures)
  Planning (project planning)
  Thanking
  Complaining
  Apology

The message categories are shown below with corresponding function examples taken from previous Electronic Emissary studies using this method. These examples were used during the training of the scorers. Many of these examples do encompass more than one function, but are examples of the function they detail.
Reporting Information

Content Information

In principle radio waves could be diffracted just like light, and if put through a prism the different frequencies (colors) could be separated out...

Procedural Information (content-related "how-to" information)

Trenchers [recipe]: 1. Dissolve yeast in warm water., 2. Combine ale, yeast, sugar, salt, and egg in a large bowl...

General Information

This is just a short message to touch base with you and your class so that we can begin to get organized before the formal project starts.

Directions (non-content-related "how-to" information)

If you are having e-mail problems, you might try checking the settings or check your password.

Personal Information

I am in my office M-F 8-5 EST and am reachable there directly by phone or e-mail during those times.

Idea/Opinion/Emotion

Great flick, even if the attitude kinda puts my trews in a bunch...Oh well. Its fun.

Resource (book, video, or other resource information)


Feedback (non-content-related suggestions, evaluations, etc.)

In regard to your question, we should send extra copies.
**Requesting Information**

**Content**

Can radio waves be diffracted (like light) or put through some kind of electronic "prism" to separate the waves (again, much like light)?

**Procedural Information (content-related "how-to" information)**

How did they take out the protein that the dinosaurs needed to survive and put it in their food to control the dinosaurs?

**General Information**

Let me know if [the messages] come through (that doesn't really make sense, does it?).

**Directions (non-content-related "how-to" information)**

Do you have suggestions on how to get that software working?

**Personal Information**

What kind of sports do you play?
Can we call you Annie?

**Idea/Opinion/Emotion**

What do you think about the movie last week?

**Resource (book, video, or other resource information)**

Do you have any books that would help?

**Feedback (non-content-related suggestions, evaluations, etc.)**

If the formatting of this text entry needs adjustment, please let me know.
Other

Salutation (greetings and closings, not including signatures)

Hello Barb -
Welcome.
Hey gang.

Planning (project planning)

For the first 5 days, I would like to continue exploring light and color, their properties and characteristics, special effects and interrelationships.

Thanking

Thanks for the great questions!

Complaining

The students didn’t like having their spelling and grammar corrected and are unhappy.

Apology

Please accept my apologies for the delay of this message.
Appendix D

Descriptive Analysis of Spring 1993 and Spring 1995
Electronic Emissary Individual Matches

December 5th, 1995

Greg Jones & Laura Amill

For: Dr. Harris

Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>350</td>
</tr>
<tr>
<td>Description of Analysis</td>
<td>350</td>
</tr>
<tr>
<td>Analysis Collection and Tools</td>
<td>351</td>
</tr>
<tr>
<td>Chapter 1</td>
<td></td>
</tr>
<tr>
<td>Spring, 1993</td>
<td>352</td>
</tr>
<tr>
<td>Number of Exchanges by Category, Function, and Message Flow</td>
<td>352</td>
</tr>
<tr>
<td>Exchange Counts of Message Flow by Function</td>
<td>355</td>
</tr>
<tr>
<td>Breakdown of Exchanges by Content Size and Participant Count</td>
<td>357</td>
</tr>
<tr>
<td>Frequency of Number of Exchanges, Message Flow, Function, &amp; Categories over Time</td>
<td>358</td>
</tr>
<tr>
<td>Chapter 2</td>
<td></td>
</tr>
<tr>
<td>Spring, 1995</td>
<td>369</td>
</tr>
<tr>
<td>Number of Exchanges by Category, Function, and Message Flow</td>
<td>369</td>
</tr>
<tr>
<td>Exchange Counts of Message Flow by Function</td>
<td>372</td>
</tr>
<tr>
<td>Breakdown of Exchanges by Content Size and Participant Count</td>
<td>374</td>
</tr>
<tr>
<td>Frequency of Number of Exchanges, Message Flow, Function, &amp; Categories over Time</td>
<td>375</td>
</tr>
</tbody>
</table>
Introduction

The following is an analysis of discourse which took place during the spring of 1993 and spring of 1995 as part of the Electronic Emissary Project. The Emissary Project provides a matching service between teachers and their students and subject matter experts. The flow of the messages between students, teachers, subject matter experts and project facilitators, in addition to individual message content and count, provide the body of the data for this analysis. A previous analysis of the spring 1993 data has been compiled for whole classroom/Subject Matter Expert matches (Harris and Jones, 1995). This analysis covers the discourse conducted between individual Students, Teachers, and Subject Matter Experts during the spring of 1993, and between individual Students, Teachers, Facilitators and Subject Matter Experts during the spring of 1995.

Description of Analysis

The process of analysis began in August, 1995, commencing with the gathering of individual student/SME matches from the Spring of 1993 and Spring of 1995 groups. This was necessary because the individual groups had not been culled out from the Spring of 1995 data, thus group matches and individual matches had to be separated. Once the individual matches were gathered an examination of the Spring, 1993, individual student matches began. Successful matches were based on at least 10 messages having been exchanged within the match. The first stage of analysis focused on the qualitative coding of each message obtained by category, function, and message flow. The process of coding message function was based on the 22 descriptors formulated by Harris and Jones during the summer of 1994 (Harris and Jones, 1995). The two researchers, Jones and Amill, met at the beginning of the analysis, agreed upon the coding method, and talked through several messages to reach a basic understanding of the types of codes. The two researchers began to code the messages individually, and then met periodically during the coding process.

to gain 100% agreement on the codes assigned to the messages. Once the 1993 Spring individual matches were coded, the same process was used to code the 1995 individual matches. The second half of the analysis process added message attributes (word, line, character length and date) for both the 1993 and 1995 data sets. After all coding was completed, the information was entered into a spreadsheet and prepared for analysis using SPSS. The entire process of coding and entry took approximately three-and-half months.

The above process yielded 13 successful groups with 247 messages exchanged during the Spring of 1993 and 10 successful groups with 216 messages during the Spring of 1995. The Spring of 1993 matches came entirely from one gifted and talented classroom with one supervising teacher. The Spring of 1995 matches represented a mixture of student/teacher participant sources with the majority of the matches coming from one classroom with one supervising teacher.

Since this analysis deals with two sets of individual matches, each group will be discussed in its respective chapter to follow. The following result chapters are based on the analysis of the preceding information. Two additional chapters display the data generated by the SPSS analysis. A disk with all data is attached to this report.

**Analysis Collection and Tools**

The Electronic Emissary Project utilizes several UNIX script/programs which handle message exchanges between participants, archive all message exchanges, and allow the facilitator/administrator to manage the system. When messages are sent to an emissary account, the incoming message is archived, basic information on the message’s date and other attributes is collected, and the message is then forwarded to the other emissary partner. In this way, all messages are available for review and analysis at the conclusion of each project period.

After coding on message flow and function was conducted by the researchers for the spring of 1993 and 1995 periods, the data was entered into SPSS along with the attributes of the message for final analysis. The tables and charts in the following chapters were arrived at by the use of SPSS and EXCEL.
Spring, 1993

Number of Exchanges by Category, Function, and Message Flow

During the fourteen-week period of the spring of 1993 individual matches, 247 messages were exchanged among the 13 matches. Table 2.1 presents the breakdown of the categories revealed for these emissary exchanges. Message exchanges can contain more than one type of category or function. Thus, the percentage of occurrences in all messages for function or category will not necessarily total 100%, because each function or category can occur in a message and thus the percentage is relative to each function or category across all messages. It is important to note that reporting occurred in every message except one message.

Table 2.1: Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting</td>
<td>475</td>
<td>99.6%</td>
</tr>
<tr>
<td>Other</td>
<td>231</td>
<td>91.9%</td>
</tr>
<tr>
<td>Requesting</td>
<td>131</td>
<td>38.5%</td>
</tr>
</tbody>
</table>

Table 2.2 compares message exchanges between each emissary group and the mean word size. The mean between groups ranged from 210.62 to 749.73 words. The number of total messages exchanged ranged between 15 and 26.

Table 2.2: Number of Exchanges and Mean Word

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Exchanges</th>
<th>Mean Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newage</td>
<td>26</td>
<td>280.15</td>
</tr>
<tr>
<td>Blackholes</td>
<td>24</td>
<td>224.37</td>
</tr>
<tr>
<td>Media</td>
<td>22</td>
<td>230.90</td>
</tr>
<tr>
<td>Genetics</td>
<td>19</td>
<td>749.73</td>
</tr>
<tr>
<td>Blues</td>
<td>19</td>
<td>229.57</td>
</tr>
<tr>
<td>Physics</td>
<td>19</td>
<td>222.89</td>
</tr>
<tr>
<td>Graphics</td>
<td>19</td>
<td>219.10</td>
</tr>
<tr>
<td>Biology</td>
<td>18</td>
<td>232.05</td>
</tr>
<tr>
<td>Documentary</td>
<td>17</td>
<td>362.35</td>
</tr>
<tr>
<td>Reincarnation</td>
<td>17</td>
<td>266.23</td>
</tr>
<tr>
<td>Biotech</td>
<td>16</td>
<td>246.50</td>
</tr>
<tr>
<td>Harmony</td>
<td>16</td>
<td>210.62</td>
</tr>
<tr>
<td>Daycare</td>
<td>15</td>
<td>302.20</td>
</tr>
</tbody>
</table>
Referring to the Reporting data listed in Tables 2.1, 2.3 and 2.5, 99.6% of the exchanges contained Reporting of Information. The Reporting of General Information, Idea/Opinion/Emotion, and Personal Information yielded the highest occurrence of Reporting. In contrast, Reporting of Content and Directions represented a mere 16.2% each of the actual exchanges, while the top three functions appeared in more than 52% of the messages. The following message flow groups generated on average 89% or more of the reporting: TEA->SME, SME->STU, and SME->TEA. The TEA->SME message flow type generated the greatest number of reporting of General Information, Personal Information, Procedures, Idea/Opinion/Emotion, Feedback, and Direction. It was interesting to note the high percentage of Reporting of Procedures by Teachers to Subject Matter Experts in this data set. The SME->STU message flow type generated the highest reporting of Content and Resource information amount the messages exchanged.

Tables 2.1, 2.3 and 2.5 indicate that 91.9% of the exchanges contained Other information. The Other category ranked second to Reporting for number of occurrences. Thanking was found in 53% of the messages and were primarily generated in the TEA->SME exchanges (62%). The TEA->SME message flow type was also responsible for 77% of the Planning function which occurred in 31.2% of the exchanges.

Requesting information comprised 38.5% of the exchanges with requests mostly initiated by Teacher/Student message flow types (TEA->SME, TEA/STU->SME, and STU->SME). In Requesting, the STU->SME message flow type originated 54% of Requesting Content, 50% of Requesting Procedures, 40% of Requesting Resources, and 36% of the Requests for Ideas/Opinions/Emotions. While the SME->STU message flow type originated 60% of the Requesting of Resources which was of interest as compared to only 40% of the requests coming from the Students. The SMEs in these matches were asking Students to send them information regarding resources related to the content area, which fell under this coding function. In all, the Students to SME message flow type represented the primary activity within this category. The highest occurrence of Requesting of General Information was by the TEA->SME at 43%. Requesting of Personal Information occurred only 12 times,
which represents 4.9% of the total messages and the SME->STU message flow generated 33% of the requests (4.9%).

Table 2.3: Functions

<table>
<thead>
<tr>
<th>Reporting</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>General Info</td>
<td>186</td>
<td>(75.3%)</td>
<td></td>
</tr>
<tr>
<td>Idea/Opinion/Emotion</td>
<td>151</td>
<td>(61.1%)</td>
<td></td>
</tr>
<tr>
<td>Personal Info</td>
<td>129</td>
<td>(52.2%)</td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td>40</td>
<td>(16.2%)</td>
<td></td>
</tr>
<tr>
<td>Direction</td>
<td>40</td>
<td>(16.2%)</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>19</td>
<td>(7.7%)</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>13</td>
<td>(5.3%)</td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>11</td>
<td>(4.5%)</td>
<td></td>
</tr>
</tbody>
</table>

589 occurrences 247 exchanges

<table>
<thead>
<tr>
<th>Other</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thanking</td>
<td>131</td>
<td>(53.0%)</td>
<td></td>
</tr>
<tr>
<td>Salutation</td>
<td>111</td>
<td>(44.9%)</td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td>77</td>
<td>(31.2%)</td>
<td></td>
</tr>
<tr>
<td>Apology</td>
<td>27</td>
<td>(10.9%)</td>
<td></td>
</tr>
<tr>
<td>Complain</td>
<td>7</td>
<td>(.2%)</td>
<td></td>
</tr>
</tbody>
</table>

353 occurrences within 247 exchanges

<table>
<thead>
<tr>
<th>Requesting</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>24</td>
<td>(9.7%)</td>
<td></td>
</tr>
<tr>
<td>General Info</td>
<td>44</td>
<td>(17.8%)</td>
<td></td>
</tr>
<tr>
<td>Idea/Opinion/Emotion</td>
<td>19</td>
<td>(7.7%)</td>
<td></td>
</tr>
<tr>
<td>Personal Info</td>
<td>12</td>
<td>(4.9%)</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>10</td>
<td>(4.0%)</td>
<td></td>
</tr>
<tr>
<td>Direction</td>
<td>8</td>
<td>(3.2%)</td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>5</td>
<td>(2.0%)</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>2</td>
<td>(0.8%)</td>
<td></td>
</tr>
</tbody>
</table>

124 occurrences within 247 exchanges

Table 2.4 contains the number of messages exchanged by message flow type. Six different combinations of Subject Matter Expert, Teacher, and Student exchanges occurred in the data set. The 1993 matches did not have facilitators, which explains the simpler number of message flow types. TEA->SME and SME->STU followed closely by SME->TEA originated the most exchanges at 48%, 18.2%, and 16.2%
respectively. Exchanges where students originated information (STU->SME and TEA/STU->SME) represented only 12% and 2% of the message flow. From these 14% of messages, Subject Matter Experts produced 45 messages (18.2%) in response to the 37 (14%) student messages.

Table 2.4: Message Flow

| 1) Subject Matter Expert → Teacher | 40 | 16.2% |
| 2) Subject Matter Expert → Students | 45 | 18.2% |
| 3) Subject Matter Expert → Teacher/Students | 5 | 2.0% |
| 4) Teacher → Subject Matter Expert | 120 | 48.0% |
| 5) Student → Subject Matter Expert | 32 | 12.0% |
| 6) Teacher/Student → Subject Matter Expert | 5 | 2.0% |

Exchange Counts of Message Flow by Function

Table 2.5 presents a comparison of the percentages of exchanges by message flow by function. Within each function column, the top three message flow types are ranked and indicated as such with a superscript. In order to simplify the reading of the tables, zeros are indicated by a single dot. Trends within the Other category indicate that Teacher and Student message flow types originated slightly more messages with Salutations (53%) and Apologies (52%). The Subject Matter Experts to Students offered the most Apologies (37%). Teachers provided more Thanks to the SME’s (66%) than did the Students (27%). Only one complaint was noted which was posted by a Subject Matter Expert.

In Reporting, Subject Matter Experts sent the most exchanges containing Content (93%) and Resource (100%) Information. Teachers by them self ranked first in several areas, including Reporting of General Information (56%), Personal Information (58%), Procedures (53%), Idea/Opinion/Emotion (34%), and Directions (63%). The only Reporting of Feedback was posted by the Teacher and was the very last message of the exchanges.
In Requesting, Teachers and Students (TEA->SME, TEA/STU->SME, STU->SME) and the SME message flow types (SME->TEA, SME->TEA/STU, SME->STU) produced exactly 50% each of Requests for General Information. The Subject Matter Experts message flow types (SME->TEA, SME->TEA/STU, SME->STU) requested more Personal Information (58%), Resources (60%), and Directions (75%). They seemed specifically interested in student activities and student-authored reports. One SME requested a student reading list so he could familiarize himself with the material to broaden the discussion.

**Table 2.5: Category/Functions by Message Flow Type**

<table>
<thead>
<tr>
<th>Category/Functions</th>
<th>Reporting</th>
<th>Request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SME-&gt;TEA</td>
<td>.14</td>
<td>.30</td>
</tr>
<tr>
<td>SME-&gt;STU</td>
<td>.30</td>
<td>.03</td>
</tr>
<tr>
<td>SME-&gt;TEA/STU</td>
<td>.03</td>
<td>.02</td>
</tr>
<tr>
<td>TEA-&gt;SME</td>
<td>.27</td>
<td>.56</td>
</tr>
<tr>
<td>STU-&gt;SME</td>
<td>.24</td>
<td>.12</td>
</tr>
<tr>
<td>TEA/STU-&gt;SME</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>General Info</td>
<td>.16</td>
<td>.30</td>
</tr>
<tr>
<td>Personal Info</td>
<td>.13</td>
<td>.25</td>
</tr>
<tr>
<td>Procedure</td>
<td>.11</td>
<td>.33</td>
</tr>
<tr>
<td>Content</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>I/O/E</td>
<td>.05</td>
<td>.25</td>
</tr>
<tr>
<td>Resource</td>
<td>.03</td>
<td>.05</td>
</tr>
<tr>
<td>Feedback</td>
<td>.19</td>
<td>.16</td>
</tr>
<tr>
<td>Dir</td>
<td>.18</td>
<td>.11</td>
</tr>
<tr>
<td>SME-&gt;TEA/STU</td>
<td>.04</td>
<td>.04</td>
</tr>
<tr>
<td>TEA-&gt;SME</td>
<td>.21</td>
<td>.21</td>
</tr>
<tr>
<td>STU-&gt;SME</td>
<td>.50</td>
<td>.50</td>
</tr>
<tr>
<td>TEA/STU-&gt;SME</td>
<td>.17</td>
<td>.17</td>
</tr>
</tbody>
</table>
Breakdown of Exchanges by Content Size and Participant Count

Table 2.6 shows the exchange size based on number of words in the exchange according to the message flow group. The number of exchanges by message flow type is shown to the right listed under “Cases.” It should be noted that each message includes a basic four line header which contains Date, From, Subject, and To fields. In past analysis these lines were included in the final word length analysis. For this analysis, a software program was developed to generate more accurate word length information per message which excludes these headers.

The range of message exchanges spanned between twenty-seven words to 3,819 words in size with the mean being 289.33 words with a standard deviation of 428.70. Subject Matter Experts posted the largest messages overall (678.88 mean words) with SME->STU, SME->TEA/STU, and TEA/STU->SME representing the top three message means (678.88, 603.60, and 305.40). Teacher and Student messages make up the bottom half of the message size mean with: TEA->SME, SME->TEA, and STU->SME (195.88, 182.95, and 173.31). Interestingly, whereas the Teacher sent the greatest number of messages, the Subject Matter Experts produced the largest volume (sum) of words.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Label</th>
<th>Sum</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Entire Population</td>
<td></td>
<td>71464</td>
<td>289.3279</td>
<td>428.7034</td>
<td></td>
<td>247</td>
</tr>
<tr>
<td>MFLOW 1</td>
<td>1</td>
<td>SME-&gt;TEA</td>
<td>7318</td>
<td>182.9500</td>
<td>155.5867</td>
<td>40</td>
</tr>
<tr>
<td>MFLOW 2</td>
<td>2</td>
<td>SME-&gt;STU</td>
<td>30550</td>
<td>678.8889</td>
<td>781.5642</td>
<td>45</td>
</tr>
<tr>
<td>MFLOW 3</td>
<td>3</td>
<td>SME-&gt;TEA/STU</td>
<td>3018</td>
<td>603.6000</td>
<td>811.4353</td>
<td>5</td>
</tr>
<tr>
<td>MFLOW 4</td>
<td>4</td>
<td>TEA-&gt;SME</td>
<td>23505</td>
<td>195.8750</td>
<td>203.0005</td>
<td>120</td>
</tr>
<tr>
<td>MFLOW 5</td>
<td>5</td>
<td>STU-&gt;SME</td>
<td>5546</td>
<td>173.3125</td>
<td>133.1021</td>
<td>32</td>
</tr>
<tr>
<td>MFLOW 6</td>
<td>6</td>
<td>TEA/STU-&gt;SME</td>
<td>1527</td>
<td>305.4000</td>
<td>109.4957</td>
<td>5</td>
</tr>
</tbody>
</table>
Frequency of Number of Exchanges, Message Flow, Function, and Categories over Time

Messages were exchanged over a 14-week period starting on February 14, 1993, and continuing until May 16, 1993. All student participants belonged to one gifted/talented class which met once a week. Their teacher coordinated the correspondence between individual students and the Subject Matter Experts. The following table and graph display the total of message exchanges for each weekly period. The week of March 1, 1993, contains zero exchanges, due to the outage of the UNIX system the emissary server was using. This outage ran between February 26 and March 10, 1993. The graph depicts an initial peak of activity the first week and is abruptly interrupted due to the breakdown in system communications, then spiking to twice the initial activity during Week 5. The decline and bottoming out of the messages during Week 8 could be attributed to the fact that students within the group were involved in a scholastic competition. Exchanges picked up and peaked for the second time during Week 9, and then experienced a downward slide as the project reached completion during Weeks 11 through 13. Week 14 contained concluding remarks between the participants as the projects were finished.

Table 2.7: Number of Exchanges by Week

<table>
<thead>
<tr>
<th>Week</th>
<th>Week Number</th>
<th>Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/14/93</td>
<td>Week 1</td>
<td>27</td>
</tr>
<tr>
<td>2/21/93</td>
<td>Week 2</td>
<td>14</td>
</tr>
<tr>
<td>2/28/93</td>
<td>Week 3</td>
<td>0</td>
</tr>
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<tr>
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<td>Week 14</td>
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</table>
Table 2.8 and its accompanying graph illustrate the message flow originated by the participants over the fourteen-week project duration. The message flow seems to correspond to the number of weekly exchanged seen in Tables 2.4 and 2.7. The student schedule was such that they were only able to send electronic mail messages to the Subject Matter Experts once or twice a week. This lack of activity seems to correspond with the level of response from STU->SME being slightly offset from the SME->STU messages over time. With the granulation of a weekly reporting period, this trend normally does not appear in other discourse analyses of emissary data.

An explanation for the large amount of TEA->SME messages could be related to the system crash which occurred during the week of March 1, 1993. As a result, the teacher sent several messages regarding lost exchanges. At least four TEA->SME messages were relayed as distributions to each participating Subject Matter Expert.
Table: 2.8: Message Flow over Time

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<th>SME-&gt;STU</th>
<th>SME-&gt;TEA/STU</th>
<th>TEA-&gt;SME</th>
<th>STU-&gt;SME</th>
<th>TEA/STU-&gt;SME</th>
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<td>11</td>
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</tbody>
</table>

Message Flow over Time
Table 2.9 shows the Reporting, Requesting, and Other category totals over time. Not surprisingly, the category activity parallels the message exchange activity overall. All three categories spiked during Week 5.

Upon examining a plot of each reporting function over the time in period of the project (Table 2.10a), we see when looking at Reporting functions, that General Information, Idea/Opinion/Emotion, and Personal Information follow the overall trend. In the Other category (Table 2.10c) Thanking, Salutations, and Planning dominated the trend, while Apology logged only 27 total instances. Only one Complaint was sent. Again, the function activity aligns almost directly with the message exchange activity, with Weeks 5, 6, and 9 exhibiting the most activity. Although overall activity is much lower than the other two categories, Requesting (Table 2.10b) indicates that General Information, Content, and Idea/Opinion/Emotion follow the trends consistently throughout the fourteen weeks. Requesting peaked during Weeks 5, 6, and 9.

Weeks 11, 12, and 13 contained zero messages. During Week 14, the last message sent by the Teacher to all the Subject Matter Experts contained a request for Feedback which explains the sudden rise in activity of all categories during the last week of the project, especially Feedback.
Table 2.9: Categories

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<th>Requesting</th>
<th>Other</th>
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</thead>
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Table 2.10a: Reporting Functions

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<th>Procedure</th>
<th>Content</th>
<th>I/O/E</th>
<th>Resource</th>
<th>Feedback</th>
<th>Direction</th>
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</table>

**Reporting Totals**

![Graph showing reporting totals over the weeks from 2/14/93 to 5/16/95 for General Info, Personal Info, Procedure, Content, I/O/E, Resource, Feedback, and Direction.]
Reporting Totals (Top Functions)

Week | Number
--- | ---
2/14/93 | 0
2/21/93 | 0
2/28/93 | 0
3/7/93 | 0
3/14/93 | 0
3/21/93 | 0
3/28/93 | 0
4/4/93 | 0
4/11/93 | 0
4/18/93 | 0
4/25/93 | 0
5/2/93 | 0
5/9/93 | 0
5/16/93 | 0

- **Content**
- **I/O/E**
- **Personal Info**
- **General Info**
### Table 2.10b: Requesting Functions

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<th>Resource</th>
<th>Feedback</th>
<th>Direction</th>
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**Requesting Totals**
Requesting Totals (Top Functions)

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Legend:
- General Info
- Content
- I/O/E
### Table 2.10c: Other Functions

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#### Other Totals

![3D Bar Chart](chart.png)
Spring, 1995

Number of Exchanges by Category, Function, and Message Flow

The ten groups in the Spring of 1995 matches generated 216 messages over a six month period. Since each group started and stopped at different times, seven day periods (weeks) are used in this analysis to indicate the relative position of exchanges within each individual project match. Thus, the first week of the group Aids was February 2, 1995, and the first week of the group Strings was May 25, 1995.

Table 3.1 shows the breakdown of the categories revealed for these Emissary exchanges. Message exchanges usually contain more than one type of category.

Table 3.1: Categories

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<th>Number</th>
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<tr>
<td>Requesting</td>
<td>104</td>
<td>48.1%</td>
</tr>
</tbody>
</table>

Table 3.2 exhibits the number of message exchanges by each emissary group and its corresponding mean word size. The mean between groups ranged from 191 to 514 words. The number of messages exchanged between groups ranged between 10 and 48.

Table 3.2: Number of Exchanges and Mean Word

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Exchanges</th>
<th>Mean Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthur</td>
<td>48</td>
<td>347.02</td>
</tr>
<tr>
<td>Aids</td>
<td>46</td>
<td>317.30</td>
</tr>
<tr>
<td>Numero</td>
<td>40</td>
<td>191.00</td>
</tr>
<tr>
<td>Euthanasia</td>
<td>21</td>
<td>296.33</td>
</tr>
<tr>
<td>Aids #2</td>
<td>13</td>
<td>289.23</td>
</tr>
<tr>
<td>Strings</td>
<td>13</td>
<td>514.00</td>
</tr>
<tr>
<td>Alcohol</td>
<td>11</td>
<td>375.63</td>
</tr>
<tr>
<td>Abortion</td>
<td>10</td>
<td>349.55</td>
</tr>
<tr>
<td>Dance</td>
<td>10</td>
<td>258.30</td>
</tr>
<tr>
<td>Software</td>
<td>10</td>
<td>249.60</td>
</tr>
</tbody>
</table>
Table 3.1 (Categories) and Table 3.4 (Reporting), indicate that 97.7% of the exchanges contained Reporting of Information, from the following top three ranked message flow types: SME->STU, SME->TEA and STU->SME. The reporting was produced mostly by the Subject Matter Expert message flow types. Table 3.1 and Table 3.4 (Other), also shows that 65.3% of the exchanges contained other information from the following top three ranked groups: TEA->SME, SME->STU, and SME->TEA. Requesting was noted in 48.1% of the exchanges from the following top three ranked message flow types: SME->STU, SME->TEA, and STU->SME (Tables 3.1 and 3.5). As in Reporting and Other, the Requesting exchanges originated mostly from the Subject Matter Expert.

Table 3.3 presents the individual messages functions within each category. Because category functions may occur more than once in a message, the functions counted result in a sum higher than the overall number of exchanges. Percentages for function type are relative to total occurrences of a function type in all exchanges (i.e. Reporting Personal Information 55 occurrences divided by 216 total exchanges equal 25.5% of the exchanges containing this function).

Present in over 60% of the messages, Reporting of General Information (70.4%), Idea/Opinion/Emotion (64.3%), and Content (30.1%) Information, displayed the highest incidents of reporting. Requesting of General (19.9%) and Content (17.1%) information appeared most frequently. Salutations (38.9%), Planning (31.9%), and Thanking (27.3%) made up the highest occurrence within the Other category. Notably, within the three categories of Reporting, Requesting, and Other, the Subject Matter Expert demonstrated the highest number of generated functions.
Table 3.3: Functions Found in Exchanges

**Reporting**

<table>
<thead>
<tr>
<th>Function</th>
<th>Occurrences</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Info</td>
<td>55</td>
<td>25.5%</td>
</tr>
<tr>
<td>Idea/Opinion/Emotion</td>
<td>140</td>
<td>64.8%</td>
</tr>
<tr>
<td>General Info</td>
<td>152</td>
<td>70.4%</td>
</tr>
<tr>
<td>Content</td>
<td>65</td>
<td>30.1%</td>
</tr>
<tr>
<td>Direction</td>
<td>40</td>
<td>18.5%</td>
</tr>
<tr>
<td>Procedure</td>
<td>1</td>
<td>.5%</td>
</tr>
<tr>
<td>Resource</td>
<td>22</td>
<td>10.2%</td>
</tr>
<tr>
<td>Feedback</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*475 occurrences 216 exchanges*

**Other**

<table>
<thead>
<tr>
<th>Function</th>
<th>Occurrences</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salutation</td>
<td>84</td>
<td>38.9%</td>
</tr>
<tr>
<td>Planning</td>
<td>69</td>
<td>31.9%</td>
</tr>
<tr>
<td>Thanking</td>
<td>59</td>
<td>27.3%</td>
</tr>
<tr>
<td>Apology</td>
<td>16</td>
<td>7.4%</td>
</tr>
<tr>
<td>Complain</td>
<td>3</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

*231 occurrences within 216 exchanges*

**Requesting**

<table>
<thead>
<tr>
<th>Function</th>
<th>Occurrences</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>37</td>
<td>17.1%</td>
</tr>
<tr>
<td>Direction</td>
<td>14</td>
<td>6.5%</td>
</tr>
<tr>
<td>Personal Info</td>
<td>15</td>
<td>6.9%</td>
</tr>
<tr>
<td>General Info</td>
<td>43</td>
<td>19.9%</td>
</tr>
<tr>
<td>Feedback</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>6</td>
<td>2.8%</td>
</tr>
<tr>
<td>Idea/Opinion/Emotion</td>
<td>16</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

*131 occurrences within 216 exchanges*

Table 3.4 exhibits the number of exchanges that occurred between the twelve different groups. SME->STU and STU->SME originated the most exchanges at 28.2% and 23.6% respectively. Subject Matter Experts generated a total of 48.1% while Teachers initiated 20.5% and Students accounted for 23.6% of the exchanges. Facilitators accounted for 7.9% of initiated message activity.
Table 3.4: Message Flow

1) Subject Matter Expert → Teacher 31 14.4%
2) Subject Matter Expert → Student 61 28.2%
3) Subject Matter Expert → Teacher/Student 5 2.3%
4) Teacher → Subject Matter Expert 39 18.1%
5) Student → Subject Matter Expert 51 23.6%
6) Teacher → Facilitator 4 1.9%
7) Teacher → Subject Matter Expert/Facilitator 1 0.5%
8) Subject Matter Expert → Facilitator 5 2.3%
9) Subject Matter Expert → Teacher/Facilitator 2 0.9%
10) Facilitator → Subject Matter Expert 1 .5%
11) Facilitator → Teacher 1 0.5%
12) Facilitator → Teacher/Subject Matter Expert 15 6.9%

Exchange Counts of Message Flow by Function

Table 3.5 displays a comparison of percentage exchanges by message flow by function. The top three message flow types for each function are tagged in rank order as indicated by a superscripted number. Trends within the Other category indicate that Subject Matter Experts originated more messages containing Salutations. Both the Teachers and Subject Matter Experts did Thanking, and Complaining throughout a nearly equal percentage of messages. The Students did the most Apologizing at 50%.

In Reporting, Subject Matter Experts conveyed the most exchanges in five out of eight functions listed in Table 3.5: Procedures, Content, Idea/Opinion/Emotion, Resources and Direction. Feedback was the exception because it did not appear in any exchange. Teachers and Students headed up General Information and Feedback. Students sent the most Reporting of Personal Information to Subject Matter Experts.

Within the Requesting category, Subject Matter Experts produced the majority of messages containing General Information, Personal Information, Idea/Opinion/Emotion, Resources and Directions. Two Requesting functions produced zero (0) exchanges within the specific functions of Procedures and Feedback. The Requesting of Content Information was primarily addressed by the STU->SME message flow.
which contained 73% of that function. Although the Subject Matter Experts generated the most requests for Resources, the SME->TEA and TEA->SME flows were exactly equivalent with each generating 33% of the requesting resources exchanges.

Table 3.5: Category/Functions by Message Flow Type

<table>
<thead>
<tr>
<th></th>
<th>Salutation</th>
<th>Planning</th>
<th>Thanking</th>
<th>Complain</th>
<th>Apology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SME-&gt;TEA</td>
<td>.10</td>
<td>.10³</td>
<td>.12³</td>
<td>.33¹</td>
<td>.13²</td>
</tr>
<tr>
<td>SME-&gt;STU</td>
<td>.40¹</td>
<td>.20²</td>
<td>.12³</td>
<td>.33¹</td>
<td>.13²</td>
</tr>
<tr>
<td>SME-&gt;TEA/STU</td>
<td>.02</td>
<td>.04</td>
<td>.</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>TEA-&gt;SME</td>
<td>.17³</td>
<td>.35¹</td>
<td>.42¹</td>
<td>.33¹</td>
<td>.13²</td>
</tr>
<tr>
<td>STU-&gt;SME</td>
<td>.21²</td>
<td>.09</td>
<td>.22²</td>
<td>.</td>
<td>.50¹</td>
</tr>
<tr>
<td>TEA/STU-&gt;SME</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>TEA-&gt;FAC</td>
<td>.02</td>
<td>.05</td>
<td>.05</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>TEA-&gt;SME/FAC</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>SME-&gt;FAC</td>
<td>.01</td>
<td>.03</td>
<td>.</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td>SME-&gt;TEA/FAC</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SME-&gt;STU/FAC</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAC-&gt;SME</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAC-&gt;TEA</td>
<td>.01</td>
<td>.02</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>FAC-&gt;TEA/SME</td>
<td>.05</td>
<td>.12</td>
<td>.02</td>
<td>.</td>
<td>.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>General Info</th>
<th>Personal Info</th>
<th>Procedure</th>
<th>Content</th>
<th>I/O/E</th>
<th>Resource</th>
<th>Feedback</th>
<th>Dir</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reporting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SME-&gt;TEA</td>
<td>.15³</td>
<td>.11³</td>
<td>1.00¹</td>
<td>.06³</td>
<td>.14²</td>
<td>.18²</td>
<td>.00</td>
<td>.13²</td>
</tr>
<tr>
<td>SME-&gt;STU</td>
<td>.20²</td>
<td>.31²</td>
<td>.63¹</td>
<td>.29¹</td>
<td>.36¹</td>
<td></td>
<td>.56¹</td>
<td></td>
</tr>
<tr>
<td>SME-&gt;TEA/STU</td>
<td>.02</td>
<td>.04</td>
<td>.02</td>
<td>.09³</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEA-&gt;SME</td>
<td>.24¹</td>
<td>.09</td>
<td>.29²</td>
<td>.20</td>
<td></td>
<td></td>
<td></td>
<td>.13²</td>
</tr>
<tr>
<td>STU-&gt;SME</td>
<td>.24¹</td>
<td>.36¹</td>
<td>.</td>
<td>.21³</td>
<td>.36¹</td>
<td></td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>TEA/STU-&gt;SME</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEA-&gt;FAC</td>
<td>.02</td>
<td>.</td>
<td>.</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEA-&gt;SME/FAC</td>
<td>.01</td>
<td>.</td>
<td>.</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SME-&gt;FAC</td>
<td>.02</td>
<td>.04</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SME-&gt;TEA/FAC</td>
<td>.01</td>
<td>.</td>
<td>.</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SME-&gt;STU/FAC</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAC-&gt;SME</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAC-&gt;TEA</td>
<td>.01</td>
<td>.</td>
<td>.</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAC-&gt;TEA/SME</td>
<td>.08</td>
<td>.05</td>
<td>.</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td>.10</td>
</tr>
</tbody>
</table>
Breakdown of Exchanges by Content Size and Participant Count

Table 3.6 indicates the exchange size based upon the number of words within the exchange according to the message flow group. In addition the exchange count is shown to the right listed under “Cases.” It should be noted that each message includes a basic four line header which contains Date, From, Subject, and To fields. In past analysis these lines were included in the final word length analysis. For this analysis, a software program was developed to generate more accurate word length information per message which excludes these headers.

Message exchanges ranged between 24 words to 2375 words in size with the mean being 308.64 words with a standard deviation of 304.29. Subject Matter Experts and Students sent the largest messages overall with SME->STU, SME->TEA/STU, and STU->SME representing the top three message means. The TEA->SME flow ranked fourth. The SME->STU flow produced the highest number of messages and the highest volume of words. FAC->SME, TEA->SME/FAC and FAC->TEA make up the bottom portion of the message size mean.
Table 3.6: Summaries of Number of Words By levels of Message Flow

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Label</th>
<th>Sum</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Entire Population</td>
<td>66667</td>
<td></td>
<td>308.6435</td>
<td>304.2876</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td>MFLOW</td>
<td>1</td>
<td>SME-&gt;TEA</td>
<td>7445</td>
<td>240.1613</td>
<td>166.7693</td>
<td>31</td>
</tr>
<tr>
<td>MFLOW</td>
<td>2</td>
<td>SME-&gt;STU</td>
<td>25907</td>
<td>424.7049</td>
<td>345.1395</td>
<td>61</td>
</tr>
<tr>
<td>MFLOW</td>
<td>3</td>
<td>SME-&gt;TEA/STU</td>
<td>3408</td>
<td>681.6000</td>
<td>964.8066</td>
<td>5</td>
</tr>
<tr>
<td>MFLOW</td>
<td>4</td>
<td>TEA-&gt;SME</td>
<td>9380</td>
<td>240.5128</td>
<td>178.2892</td>
<td>39</td>
</tr>
<tr>
<td>MFLOW</td>
<td>5</td>
<td>STU-&gt;SME</td>
<td>14964</td>
<td>293.4118</td>
<td>270.7901</td>
<td>51</td>
</tr>
<tr>
<td>MFLOW</td>
<td>7</td>
<td>TEA-&gt;FAC</td>
<td>662</td>
<td>165.5000</td>
<td>33.2816</td>
<td>4</td>
</tr>
<tr>
<td>MFLOW</td>
<td>8</td>
<td>TEA-&gt;SME/FAC</td>
<td>90</td>
<td>90.0000</td>
<td>.</td>
<td>1</td>
</tr>
<tr>
<td>MFLOW</td>
<td>9</td>
<td>SME-&gt;FAC</td>
<td>824</td>
<td>164.8000</td>
<td>143.3796</td>
<td>5</td>
</tr>
<tr>
<td>MFLOW</td>
<td>10</td>
<td>SME-&gt;TEA/FAC</td>
<td>425</td>
<td>212.5000</td>
<td>54.4472</td>
<td>2</td>
</tr>
<tr>
<td>MFLOW</td>
<td>12</td>
<td>FAC-&gt;SME</td>
<td>43</td>
<td>43.0000</td>
<td>.</td>
<td>1</td>
</tr>
<tr>
<td>MFLOW</td>
<td>13</td>
<td>FAC-&gt;TEA</td>
<td>124</td>
<td>124.0000</td>
<td>.</td>
<td>1</td>
</tr>
<tr>
<td>MFLOW</td>
<td>14</td>
<td>FAC-&gt;TEA/SME</td>
<td>3395</td>
<td>226.3333</td>
<td>257.1566</td>
<td>15</td>
</tr>
</tbody>
</table>

Total Cases = 216

Frequency of Number of Exchanges, Message Flow, Function, and Categories over Time

The project duration for each of the ten groups was over a 14-week period, yet because the beginning and ending dates were staggered for each group the data collection actually spanned a period of six months starting on February 2 and continuing through June 20, 1995. Because each group began and ended their exchanges on differing dates Table 3.7 does not indicate dates. In spite of the staggered chronology, the projects produced message flows with functions which appear to follow similar trends. Table 3.7 and its accompanying graph delineate the message exchanges for each project week. In the first major trend, message exchanges peaked during the first week (56 exchanges) of the project and then experienced a gradual decline through the fourth week (11 exchanges). Table 3.8 (Functions) indicates that the initial flurry of activity may be attributed to the the heightened amount of Requesting and Reporting of General Information, Personal Information, Directions, Salutations, Planning,and Thanking which naturally accompany new project implementation. Facilitator messages (8%) at the start of the projects did not add significantly to the first week message totals. It was first thought that the first week high message activity was due to facilitator activity,
which was not the case. During Weeks 5, 7, 9 and 11, messages increased to 14, 19, 19, and 12 respectively, with Weeks 6, 8, 10 and 12 dipping individually to 10, 9, 2, and 5 messages. The bottoming out during Week 10 is not readily attributable to any specific event since the groups did not run concurrently on the calendar. Perhaps the trend indicates a winding down of activity as Student Requests tapered and the projects drew to a close. The twelve messages during week 11 primarily contained Reporting General Information, Planning, and Thanking functions. Interestingly, more Thanking occurred during the first three weeks of the projects (34 instances) than during the final three weeks (2 instances). Complaints and Apologies were also noted primarily during the first weeks of the project and none were recorded during the final five weeks.
Table 3.7: Number of Exchanges by Week

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Exchanges Made</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>56</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>19</td>
</tr>
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<td>8</td>
<td>9</td>
</tr>
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<td>9</td>
<td>19</td>
</tr>
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<td>10</td>
<td>2</td>
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<td>11</td>
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<td>5</td>
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<tr>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
</tr>
</tbody>
</table>

Message Exchanges by Week

![Graph showing message exchanges by week](image-url)
Table: 3.8: Message Flow over Time

<table>
<thead>
<tr>
<th>Message Flow</th>
<th>Week #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>SME-&gt;TEA</td>
<td>11</td>
</tr>
<tr>
<td>SME-&gt;STU</td>
<td>14</td>
</tr>
<tr>
<td>SME-&gt;TEA/STU</td>
<td>3</td>
</tr>
<tr>
<td>TEA-&gt;SME</td>
<td>13</td>
</tr>
<tr>
<td>STU-&gt;SME</td>
<td>10</td>
</tr>
<tr>
<td>TEA/STU-&gt;SME</td>
<td>0</td>
</tr>
<tr>
<td>TEA-&gt;FAC</td>
<td>0</td>
</tr>
<tr>
<td>TEA-&gt;SME/FAC</td>
<td>0</td>
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Table 3.9: Categories over Time

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Report, Requesting, Other Totals
Table 3.10a: Reporting Functions

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Reporting Totals
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Anderson, S.E., & Harris, J.B. (1997). Factors associated with amount of use and benefits obtained by users of a statewide educational telecomputing network. Educational Technology Research and Development.


Rousseau, M.P. (1996). *Telecomputing experiences and perspectives of ten k-12 school principals who were infrequent users of a large statewide telecomputing network.* Unpublished dissertation proposal. The University of Texas at Austin, Austin, Texas.


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VITA

James Gregory Jones was born Denton, Texas on August 5, 1963, the son of Bill and Dorothy Jones. After completing his work at Denton High School, Denton, Texas, in 1982, he entered North Texas State University in Denton, Texas. He has been active in amateur radio since age fifteen and holds a Federal Communications Commission Advanced Amateur Radio license. He received the degree in Computer Science Computer Information from North Texas State University in 1987. In 1984 he was named Programmer of the Year by the University Programming Council, North Texas State University. He received a Masters of Science degree from the University of North Texas, Denton, Texas in 1991. Before beginning his studies at the University of Texas at Austin, he studied at the UoSAT Spacecraft Engineering Research Unit, Center for Satellite Engineering Research, University of Surrey, Guildford, Surrey, England. In September 1992 he entered the Graduate School of The University of Texas at Austin. He has been involved in education, teaching at both the University of North Texas, Denton, and the University of Texas, Austin; in industry working for Compaq Computers as an Advanced Communications Technology Planner, and as President of TAPR, a non-profit research and development group focused on wireless digital communications; and in research, having presented papers at numerous conferences since 1988 and authored several books covering topics such as wireless digital communications and educational telecommunications.

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This dissertation was typed by the author.