Computer-Mediated Communication (CMC) and English for Specific Purposes (ESP): An Investigation of the Use of Synchronous CMC to Meet the Needs of Computer Science Students

Volume I of II

by

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LIST OF ABBREVIATIONS

AIMS	Academic Information Management System
CALL	Computer-Assisted Language Learning
CBI	Content-Based Instruction
CMC	Computer-Mediated Communication
CSP	Computer Science Professional
e-JAD	Electronic Joint Application Design/Development
EAC	English for Academic Communication
EGAP	English for General Academic Purposes
EPC	English for Professional Communication
ESAP	English for Specific Academic Purposes
ESP	English for Specific Purposes
FLCAS	Foreign Language Classroom Anxiety Scale
FSI	Feasibility Study I
FSII	Feasibility Study II
INFOLAN2	Online Public Access Catalogue
ISD	Information Systems Development
IT	Information Technology
JAD	Joint Application Design or Development
MOO	Multi-User Object Oriented
MUD	Multi-User Dungeon
MUET	Malaysian University English Test
PSE	Proficiency Skills in English
RM	Ringgit Malaysia
RMC	Research Management Centre
SADM	Systems Analysis and Design Methods
SCK XXXX*	Code for Computer Science Modules
SCLI	Sustained-Content Language Instruction
SE	Software Engineering
SPM	Sijil Pelajaran Malaysia (Malaysia Certificate Education)
TBL	Task-Based Learning
UHB XXXX*	Code for English Language Modules
UTM	Universiti Teknologi Malaysia

*XXXX is a group of numbers which represent the module's academic year, number of credit hours and section.

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DECLARATION

I hereby declare that this thesis is entirely my original work and has not been submitted for any higher degree in another university.

The papers listed below were written for publication and presented at academic conferences during the period of the preparation of this thesis. Content from these papers has been adapted for use in the thesis.

Paper publication:

Shamsudin, S. (2003). Task-based activities for Computer Science ESL learners: Feasibility of using a group support system. In G. Richards (Ed.), *Proceedings for E-Learn 2003 World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education* (pp. 1772-1775). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Shamsudin, S., & Nesi, H. (2006). Computer-mediated communication in English for specific purposes: A case study with Computer Science students at Universiti Teknologi Malaysia. *Computer Assisted Language Learning,* 19(4&5), 317-339.

Paper presentation at conferences:

Shamsudin, S. (2003, November). *Task-based activities for Computer Science ESL learners: Feasibility of using a group support system.* The proceedings of the E-Learn 2003 World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education, Phoenix, Arizona, USA.

Shamsudin, S. (2003, December). *Task-based activities using chat: Investigation on the attitudes of Computer Science ESL learners.* Paper presented at the CULI's 5th International Conference on ELT in a Globalized World: Innovations & Applications, Bangkok, Thailand.

Shamsudin, S. (2005, February). *ESP task-based activities via chat environment: Effects on the development of specific oral communication skills of Computer Science ESL learners.* Paper presented at the 3rd International Student E-Ducation Without Borders Conference on E-Learning through the Eyes of the World, Abu Dhabi, United Arab Emirates.

Shamsudin, S. (2005, June). *Computer-mediated communication English for specific purposes (CMC ESP) tasks using sustained-content language instruction (SCLI).* Paper presented at the UCALL Conference on Developing a Pedagogy for CALL: Examples of Theory and Practice, Coleraine, Northern Ireland.

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ABSTRACT

The purpose of this research was to investigate whether synchronous computer-mediated communication (CMC) would be an effective tool to meet the English for specific purposes (ESP) needs of language learners. To this end, a single tertiary education institution in Malaysia was used as the context of the study. A preliminary investigation was conducted to analyze the present and target situation needs and lacks of Computer Science students at Universiti Teknologi Malaysia (UTM). This was followed by four consecutive studies which used the concurrent triangulation mixed methods approach: 1) Feasibility Study I, 2) Feasibility Study II, 3) a Main Study, and 4) a Follow-up Study.

The results of the preliminary investigation revealed that Computer Science students at UTM need training and practice in the specific communication skills of interviewing and group discussion for systems analysis and design for their current academic needs and future career as CSPs. In order to be successful CSPs, the students need to be competent in both face-to-face and electronic forms of communication which include synchronous CMC to elicit information or conduct group discussions such as joint application design (JAD) with their clients. The findings also indicated that Computer Science students and CSPs who graduated from local universities experienced problems articulating orally in English due to speech anxiety, lack of confidence and lack of practice. A set of tasks called CMC ESP tasks were designed and conducted via a synchronous CMC environment to address these needs and lacks. This research aims to investigate to what extent the use of synchronous CMC as a modality for CMC ESP tasks which is referred to as the CMC ESP method provides opportunities for the development of Computer Science students' interviewing and group discussion skills for systems analysis and design.

Prior to the Main Study, I conducted two feasibility studies to find out the practicality and suitability of using CMC tools and CMC task types with Computer Science students at UTM. Seventy-two second year Computer Science students participated in the first feasibility study and tested the practicality of using two synchronous CMC tools: 1) NetMeeting for computer-mediated written interaction and 2) Divace Duo for computer-mediated oral interaction. The results of this study suggested that it was logistically possible to use both synchronous CMC tools. The participants enjoyed using both tools equally but it was more feasible to use NetMeeting because it can simulate real-time text-based discussions and meetings which are common among CSPs, especially electronic JADs. NetMeeting is also easily accessible in all networked computer laboratories around UTM campus and enabled reliable data collection of students' chat interaction for feedback and analysis. NetMeeting was used in the Main Study.

Twenty-seven first year Computer Science students participated in the second feasibility study and tested the feasibility and usability of several CMC ESP task types for investigating the effects of the CMC ESP method on Computer Science students at UTM. These tasks were designed with reference to students' target needs and were sustained-content in terms of characteristics and learning opportunities they provided. A few changes were made to the tasks in response to feedback from the participants. The results of this study indicated that the proposed CMC ESP task types were suitable for investigating the effects of the CMC ESP method on Computer Science students at UTM, as they had the potential to afford positive effects on the participants.

I then conducted a longitudinal study. During the Main Study, an intact group of 32 first year Computer Science undergraduates were subjected to the CMC ESP method (treatment) as part the activities in their English for Academic Communication (EAC) module. The students were given pre- and post-treatment oral assessment to find out the short-term effect of the CMC ESP method on the development of their interviewing and group discussion skills for systems analysis and design. The findings from these instruments were triangulated with the results of pre- and post-treatment self-assessment attitude questionnaires and the analysis of the chat transcripts from the tasks. The results of the Main Study were encouraging. The participants achieved a significant gain in their overall oral performance and in terms of task fulfillment, language and communication ability in the oral assessment. The findings from the questionnaires and chat transcripts supported the results of the assessment. The participants seemed to have a positive attitude to the usefulness of synchronous CMC for language development and reducing speech anxiety. There was also a variety of evidence of language learning through examples of language related episodes and negotiation of meaning in the chat transcripts. This study therefore suggests that the CMC ESP method has the potential to develop Computer Science students' interviewing and group discussion skills for systems analysis and design.

A Follow-up Study was conducted four months later to investigate the long-term effects of the treatment on the Main Study participants' academic performance in their System Analysis and Design Methods (SADM) module. Twenty-seven of these participants registered for the module (the ESAP group). The project work for the module required them to be communicatively competent in the two skills they practised during the Main Study. The ESAP group's performance in the project work was compared with a control group (the EGAP group) of 29 students from the same cohort who had conducted general communicative tasks during the EAC module. The ESAP group performed significantly better than the EGAP groups in the first part of the project work (Project 1) but the results were reversed for the second part (Project 2). Possible reasons for these results are discussed.

With reference to the results of the Main Study and the Follow-up Study, this research concludes that the CMC ESP method seems to provide Computer Science students with the opportunity to develop specific interviewing and group discussion skills for systems analysis and design to meet their current academic needs and future needs as CSPs. It adds to the current body of research, indicating that the use of synchronous CMC can be of value when learning language for specific purposes.

CHAPTER 1

CONTEXT OF THE STUDY

1.0 Introduction

There are numerous methods and approaches to teaching second or foreign languages to language learners. The notion of method in language teaching refers to systematic ways of teaching based on theories of language and language learning. One of the most widely used language teaching approaches in the recent years is content-based instruction (CBI). It entails the teaching of language using content that is relevant to language learners (Brinton, 2003:201). Research on CBI is primarily concerned with face-to-face teaching instruction. However, not much research has been conducted in the context of CBI using computer-mediated communication.

Computer-mediated communication (CMC) is a form of "communication that takes place between human beings via a computer" (Herring, 1996:1). In the context of teaching and learning, it enables language learners with access to networked computers to communicate online either synchronously (same or real-time) or asynchronously (different time). There are various affordances of synchronous CMC as a pedagogical tool for language learning. (Affordances are the properties of the environment that determine how it can be used (Norman, 1988).) For example, by permitting delayed response, synchronous CMC provides language learners with conditions for planning, reflecting, noticing and repairing language production (Hudson & Bruckman, 2002; Kelm, 1992; Kroonenberg, 1994/1995; Lai & Zhao, 2006). By encouraging a slower, a more reflective and a less face-threatening approach to language learning, there is evidence to suggest that CMC helps to reduce learners' communicative anxiety (Arnold, 2002; Beauvois, 1998, 1999; Freiermuth, 1998; Kern, 1995), and facilitates language acquisition (de la Fuente, 2003; Smith, 2004) and language production (Beauvois, 1992, 1998, 1999; Chun, 1998; Kern, 1995). It may also provide an opportunity to rehearse online communication (Money, 1995/1996).

In spite of the various affordances of synchronous CMC, there has been little prior research into its significance for learning languages for specific purposes. Research on CMC focuses primarily on the use of CMC for teaching language for social purposes. The use of computer-mediated communication, however, is not normally discussed in CBI contexts, for example for the teaching and learning of English for specific purposes (ESP). The tasks set in synchronous CMC studies relating to language learning usually involve discussion of everyday issues (Chang, 2002; Hudson & Bruckman, 2002; L. Lee, 2002; Payne & Ross, 2005; Payne & Whitney, 2002; Tudini, 2003), or everyday decision making (Blake, 2000; Smith, 2003b, 2004). They rarely discuss issues of content that are related to the learners' area of study and they are not usually devised with reference to learners' academic and professional needs.

In summary, there is a need to examine the affordances of synchronous CMC in the context of learning languages for specific purposes. This study therefore aims to explore if synchronous CMC would be an effective tool to meet the specific needs of language learners. The context of the study is a single tertiary educational institution in Malaysia.

The following sections will highlight the Malaysian National Vision Policy which aspires to create a multi-skilled and strong workforce (see Section 1.1) and the English language programme at Universiti Teknologi Malaysia (UTM) (see Section 1.2). This is followed by a description of a preliminary investigation which identified the communication needs and lacks of Computer Science students at UTM (see Sections 1.3 and 1.4), the background of the study (see Section 1.5) and the purpose and significance of the study (see Section 1.6). The chapter ends with the outline of the thesis (see Section 1.7).

1.1 The Malaysian National Vision Policy

In tandem with the Malaysian government's National Vision Policy, that is, its Vision 2020 quest for a progressive and resilient nation, the Eighth Malaysian Plan comprises three main phases:

- Phase I - to shift the growth strategy from input-driven towards knowledge-driven output growth,
- Phase II - to accelerate structural transformation within the agriculture, manufacturing and services sectors,
- Phase III- to strengthen socio-economic stability

(Economic Planning Unit, 2001).

With reference to the first phase of the plan, the former Prime Minister of Malaysia, Dato' Seri Dr Mahathir Mohamed, who proposed Malaysia's Vision 2020 policy, stresses in his forward address to the Eighth Malaysian Plan that a strong human resources base is required to support the development of a knowledge-based economy (Economic Planning Unit, 2001). This entails producing resilient human resources that are multi-skilled and versatile.

Every higher educational institution in Malaysia aspires to fulfill the nation's goal in creating a multi-skilled and strong workforce. Local universities are striving to design and tailor academic curriculum and programmes which aim to produce human resources that are able to realize Malaysia's Vision 2020. Despite these efforts, the Human Resources Minister, Datuk Dr Fong Chan Onn, has suggested that "local universities should review their curriculum to produce graduates who are more marketable and do not require retraining by the Government" (Li, 2003). According to feedback obtained by the Ministry of Human Resources from employers, one of the major concerns of employers is the lack of fluency in English language communicative skills among local graduates. The other two problems identified are lack of knowledge in information and communication technologies and difficulty in fitting in as team players in the workplace.

In addressing the above problems, the government of Malaysia has allocated millions of Malaysian Ringgit (RM) to retrain fresh and unemployed graduates under the Unemployed Graduates Retraining Scheme. Part-time and full-time courses under the scheme extend from three to six months and graduates are paid RM500 a month during the training. The Ministry of Human Resources hope that the retraining programme will only be a short-term remedy. In the long-term, local universities are expected to review their curriculum to produce graduates who are able to meet the demands that are expected by the industries and employers.

1.2 The Universiti Teknologi Malaysia (UTM)

Among the efforts made by Universiti Teknologi Malaysia (UTM) to fulfill the nation's need for multi-skilled workforce is the launch of the University-Industry Technology Advancement Programme. This programme will provide the means for UTM to be a "SMART-LINK" between industries, higher educational institutions and private sectors, producing human resources as well as providing expertise and technology which are relevant to the needs of industry (UTM sebagai SMART-LINK, 1996). This form of partnership with industries would also make it possible for UTM to design academic programmes that are relevant to the needs of industry and consequently produce graduates who will be active participants in the nation's industrial development (Zaharuddin, 1997).

The Department of Modern Languages at UTM strongly supports the university's mission to produce human resources who are relevant to the needs of industry by constantly striving to improve the English language programme that it designs for UTM undergraduates. Currently, the Department of Modern Languages is offering an English language programme called the Reorganized English Language Programme to students in all ten faculties at UTM. This programme was initially introduced in the 1991/92 academic session as an integrated-skills programme that has an English for Specific Purposes (ESP) orientation.

At present, the Reorganized English Language Programme offers three different modules which are called Proficiency Skills in English (PSE), English for Academic Communication (EAC) and English for Professional Communication (EPC). The PSE module has been designed to integrate listening, speaking, reading and writing skills through the use of science and technology related English language materials with topics such as "Non-Motorized Vehicles", "Communicating through the Internet" and "The Mobile Phone". The EAC module focuses on the English language skills that are essential for academic success as university undergraduates. Amongst the skills taught are reading skills and strategies, extracting relevant information from written texts and reproducing them in the form of notes, writing essays based on the notes taken and conducting topic-based group discussions. Similar to the PSE module, the content of this module is based on general science and technology materials with topics such as "Electric Vehicles", "Laser", "Cancer" and "Benefits and Disadvantages of Technology". The last English language module, EPC, aims to prepare UTM students for communication at the workplace. It exposes them to the different stages of effective report writing and oral presentation skills through the use of materials with topics such as "Effects of Using Electronic Mail

Communication", "Copyright Piracy" and "Supply and Demand for Kelawar Cars". In short, although the Reorganized English Language Programme claims to be oriented towards ESP, its topics are very general, and they may be unlike the topics students write about in their department. The instructional materials are also general and not related to any specific discipline.

Attempts have been made by several members of the academic staff in the Department of Modern Languages to investigate ways of developing and improving the Reorganized English Language Programme. These efforts would help realise the department's vision to offer discipline-specific English language programmes for all the ten different faculties at UTM "differing in content, emphasis and instructional materials depending on the needs of the various faculties, but sharing similar theoretical orientations in language teaching and learning and curriculum design" (Abdul Raof, Hamzah, Abdullah, & Louis, 1997:1).

Between 1994 and 1997, a research project funded by UTM and the British Council was successfully conducted to design modules and materials to meet the specific communicative needs of Civil Engineering students at UTM (Abdul Raof et al., 1997; Abdullah, Louis, Abdul Raof, & Hamzah, 1995). The teaching programme that is the result of this project is called English for Civil Engineering. From 1995 to 1999, another piece of research which aimed to produce a faculty-specific programme for the Mechanical Engineering students was conducted by a team of language instructors from the Department of Modern Languages (Habil, 1996, 1997a, 1997b; Habil, Abdullah, Ismail, Seliman, & Azahar, 1999; Ibrahim, 1996; Seliman, 1997). The programme is called English for Mechanical Engineering. Evaluations and feedback for both programmes, obtained from the Civil and Mechanical Engineering students, their content area lecturers, and the language instructors revealed encouraging results (Abdul Raof et al., 1997; Habil et al., 1999).

The success of the English for Civil Engineering programme and the English for Mechanical Engineering programme implies that the English language programme at the tertiary level should use topics and materials that meet the specific needs of students in their area of study. The aim of this research was therefore to explore the technique of designing instructional materials that has the potential to meet the specific English language communicative needs of Computer Science students.

In order to prepare for this research, I set out to investigate the communication needs and lacks of Computer Science undergraduates in the Faculty of Computer Science and Information Systems at UTM through analysis of their present situation as Computer Science students, and their target situation as Computer Science professionals. My investigative methods included analysing findings from relevant prior research, conducting interviews with professionals and content lecturers, carrying out surveys of UTM Computer Science undergraduates and graduates, and reviewing literary texts in the field of software engineering and systems analysis and design methods. The subsequent sections of this chapter will discuss the results of this preliminary needs analysis.

1.3 Communication Needs and Lacks of Computer Science Professionals

1.3.1 Feedback from Industries in Malaysia

Empirical research in the area of Information Technology (IT) has revealed that IT industries in Malaysia have a higher preference for Computer Science or IT graduates who have good interpersonal or communication skills in comparison with other skills such as business and programming (Dahalin, Valida, & Hashim, 1994; Hashim et al., 1995). Although these industries prefer Computer Science or IT graduates who are communicatively competent, the Computer Science and IT programmes of eight public universities in Malaysia were found by Noordin (1998) to focus on developing the programming skills of future Computer Science professionals, and not to place much emphasis on developing their interpersonal or communication skills.

Malaysia often has to conduct international trade with English as the language of communication. Most IT companies in Malaysia are jointly owned with foreigners, totally owned by foreign investors or have to deal extensively with foreign business associates. The language of communication between Malaysian Computer Science professionals and their foreign employers and counterparts is very likely to be the English language so, local IT graduates who come from a medium of instruction in the Malay language would be at a disadvantage.

The need for excellent interpersonal and communication skills has been noted by Computer Science academics in Malaysia in view of the fact that negotiation with clients is an important aspect of the Computer Scientist's work (Bakar, 2003). The Computer Science professional's competency in English communication skills is especially important when dealing with English-speaking clients. However, according to Abdullah, Abdul Raof, Louis and Awang (1993), many companies in Malaysia have found that their employees who graduated from local institutions have not acquired sufficient communication skills to communicate effectively with English-speaking clients. Le Vasan's (1994) study also suggests that local graduates do not have good communication skills in English. Abdullah et al.'s (1993:64) survey indicates that English communicative deficiency among local graduates could lead to "difficulty in interfacing with English-speaking customers and missed trade opportunities".

There seems to be a mismatch between the needs of the employers and the training received by IT graduates in Malaysian public universities. The studies suggested that the current training provided by local universities in Malaysia fails to produce sufficient numbers of IT graduates who meet the requirements and expectations of the industries. An important need for effective communication skills in English is not being met.

1.3.2 Interviews with Computer Science Professionals

In March 2003 I conducted semi-structured interviews with twelve Computer Science professionals (CSPs) in Malaysia (see Appendix A1 for the interview questions). These CSPs were IT or information systems officers, systems or software engineers, systems or process analysts, system developers or project managers. They had at least a bachelors degree in IT or Computer Science and three to thirteen years of working experience with Malaysian private companies (n=7) or government agencies (n=5). The results supported the findings of the above studies that communication skills are important for CSPs. They highlighted the need for communicative competency, especially in English, as an essential skill for their profession.

The CSPs claimed that they often used English when interacting with the following types of participants: colleagues, upper level management, consultants, principal vendors or suppliers of hardware and software (such as IBM, Microsoft and CISCO), and clients from the private sectors (such as those in the banking, finance and medical profession). They used English to communicate with these people in various situations, such as during interview sessions, discussions, meetings or workshops with clients, and at formal or informal meetings with other CSPs. The form of communication could be either face-to-face or via technology. Technology-based communication is via chat environments, electronic mail (email), phone messaging (SMS), phone-conferencing or video-conferencing.

One of the main job specifications of these CSPs was to be involved in the process of developing or enhancing computer systems. The four fundamental phases in the systems development life cycle are: 1) planning; 2) analysis; 3) design; and 4) implementation (Dennis & Wixom, 2000:3). The analysis phase has been identified as the crucial stage of the systems development life cycle because it determines the extent to which the system meets the clients' needs. This stage involves a lot of interaction with clients and the use of effective communication skills to avoid misinterpretation or misinformation of requirements elicited from clients.

The communication skills that were highlighted by these CSPs as essential for effective computer systems analysis were the interviewing skills of eliciting and probing for information for computer systems development. They pointed out that IT personnel who are involved in the development of computer systems need to find out as much as possible about their clients' current work processes and requirements for a new or enhanced computerized system. For example, a computer systems project manager with ten years of working experience in the IT industry highlighted the importance of these skills during one interview, by stressing that:

> *When we talk to any clients, we always talk in terms of what we need to be able to articulate... we need to be able to request from the user what are the requirements ... we have to have good people who can ask questions that relate to the design that can probe and ask relevant questions to make sure that, although it's not a technical question, to remind them what are the things they do for their work* (CSP1).

Besides being skilful in getting information and requirements from clients, the CSPs interviewed added that their profession requires them to be able to ask for clarification concerning any of their client's documents, procedures or work processes, and request confirmation or verification of their client's work flow, system requirements and the proposed system design. Persuasive skills are also considered important, as iterated by a senior IT officer (with twelve years of working experience):

> *Once you deal with the users [clients], we need to buy in their commitment ... once you introduce something to the users or you want to change their practice, we need their commitment or else if we give them anything, they won't use it ... we need to understand their situation and then to propose the changes they have to make and then to get their involvement in what we propose to them.. it's a new idea ...*

> *when you introduce something to other people, there is a resistance, part of the change management process* (CSP2).

When asked about the communication problems in English that they experienced as computer systems developers, most of them agreed that at times they had encountered problems with requirements elicitation and *"difficulty asking the right question to obtain important or current information"* (CSP3) from clients. According to one experienced software engineer, this could be due to several factors such as not knowing how to ask the right questions:

> *Probably they ask the wrong question .. understanding is wrong, misunderstanding, probably not enough, the scope, not enough information, the information that they [clients] gave is not enough, so you understand like ten percent of the requirement and you code something else* (CSP4).

The interviewees added that such problems might also be caused by their inability to use the layman's terms to translate technical jargon into language that non-technical clients would be able to understand. Local Computer Science graduates who were familiar with Malay Computer Science terms would normally attempt to translate those terms into English when eliciting requirements from clients who understood English rather than Malay, since *"most IT materials that they [clients] refer to are in English"* (CSP1). If the Computer Science terms are not accurately translated into English, it can cause confusion for their clients and lead to problems in understanding the CSP's requests.

All the English oral communicative problems occurring during the crucial analysis stage of the systems development life cycle can cause major misinterpretation of users' requirements. The professionals cautioned that if requirements elicitation related problems kept recurring, the system being developed might not meet the clients' needs or might not solve the problem that had been identified with the current system. Eventually, this could necessitate massive rebuilding of the system which is costly as it wastes time and money as well as creating frustrated and unhappy clients.

Another common English oral communicative problem identified by the CSPs was their difficulty in explaining to their clients why certain changes or enhancements to the system cannot be done. They have to use a lot of examples to clarify some difficult and specialised concepts using non-technical terms. At times, they struggle to find the right word or expression to give clear explanations to their clients.

In order to reduce the frequency of communication breakdowns between CSPs and their clients, these professionals have to know the pragmatics of interacting with clients in particular situations. A careful choice of vocabulary and forms of words has to be made when interacting with clients in different situations to avoid or minimize misunderstandings, arguments, confusion and frustration. Users may not commit to the system, if they do not comprehend what is required from them or appreciate the explanations given to them.

Apart from the above list of causes of communication problems in English during the process of information elicitation, one of the CSPs interviewed stated that local Computer Science graduates in particular *"have difficulty articulating themselves well with clients in English to request user's requirements due to lack of confidence and lack of practice"* (CSP1). Several other IT officers who graduated from local universities asserted that although English oral communicative competency is important for their profession and career development, they lacked confidence when communicating in English. Among the reasons they claimed were that they felt inferior to those who were more fluent in English, thought that people would not understand what they were saying in English, were shy of speaking in English, were worried about making mistakes and had difficulty finding the right words or suitable forms of words to use when interacting with clients, superiors, consultants or vendors.

Computer Science graduates from UTM are particularly lacking in English oral communication skills according to a former Computer Science graduate of UTM who had worked for four years with one of the most successful private IT companies in Malaysia. He observed that they experienced difficulty when communicating with customers and senior management in comparison with other graduates who had been given training in the use of English for technical communication. Their employers had to allocate extra resources to provide them with intensive in-house English oral communication skills training.

1.3.3 Reviews on Software Engineering and Systems Analysis and Design Methods Literary Texts

These findings highlight the need for Computer Science undergraduates to be trained in various types of communication skills, to enable them to efficiently develop computer systems throughout the systems development life cycle in their roles as future IT professionals. These skills include information and requirements elicitation, probing for further information, asking for clarification of unclear work processes, and asking for opinions or verification of system designs. The importance of communication skills for CSPs who are involved in the analysis and design of computer systems has also been emphasized in the literature on software engineering (Pressman, 2001:274; Sommerville, 2001:125) and systems analysis and design methods (Dennis & Wixom, 2000:17; Dewitz, 1996:41; Hoffer, George, & Valacich, 2002:45; Kendall & Kendall, 2002:10).

Hoffer et. al. (2002:45) for example, advise that CSPs "must establish a good, open working relationship with clients early in the project and maintain it throughout by communicating effectively". This is particularly true when gathering information from clients through interviews (Dennis & Wixom, 2000:113-119; Hoffer et al., 2002:206-209; James, 1989; Kendall & Kendall, 2002:118-131) and joint application design or development (JAD) sessions (Dennis & Wixom, 2000:120-125; Dewitz, 1996:241-243; Hoffer et al., 2002:221-225; Kendall & Kendall, 2002:132-135) for systems analysis and design. JAD sessions are group discussion sessions or group meetings which involve a variety of participants: a facilitator, users, systems analysts and scribe(s) (CSPs who are skilled in capturing requirements, designing specifications and generating prototypes of reports, screens and processes such as program codes), working together to identify, document and approve systems requirements and design specifications (Dennis & Wixom, 2000:120-125; Dewitz, 1996:241-243; Hoffer et al., 2002:221-225; Kendall & Kendall, 2002:132-135).

Interviewing is considered by many CSPs as very important communication skill for the successful analyst. It is one of the most important techniques to elicit and probe for further information from users on how their organization and current system works with the aim of developing an improved system (James, 1989:85). "A large amount of time is spent interviewing users about their work and the information they use" in the early phase of an information systems project (Hoffer et al., 2002:45).

The ability to conduct effective JAD sessions is also important for CSPs. JADs are conducted "to overcome the communication gap between users and designers and thus reduce the time and effort devoted to identifying, documenting, and approving requirements and design specifications" (Dewitz, 1996:241). For example, CSPs would conduct group discussions or JAD sessions with clients to ask for clarification and verification of the clients' work process and systems requirements or to exchange opinions for the proposed systems design. "Creeping requirements" or new and changing user system requirements is one of the major problems throughout the systems development life cycle (Jones, 1996a:117). According to Jones (1996b:93), JAD sessions can help to reduce this problem by 50% and prevent the production of requirements which might lead to problems during the systems development life cycle. They also help to create "more user identification with the new information systems as a result of the participative processes" (Kendall & Kendall, 2002:132).

A new form of JAD called electronic JAD or e-JAD is also practiced by CSPs. In e-JADs participants send ideas or opinions to each other using communication software or group support systems on networked computers (Dennis & Wixom, 2000:122; Hoffer et al., 2002:224-225; Kendall & Kendall, 2002:132). According to Dennis and Wixom (2000:122), this form of computer-mediated communication allows all participants to contribute ideas or opinions at the same time (synchronously) "without fear of reprisal from challenging others". Several studies have reported favourable results using e-JADs compared with traditional JAD sessions (Dennis, Daniels, Hayes, & Nunamaker, 1993; Liou & Chen, 1993). The findings of a two-year study which compared the effectiveness of nine traditional JAD with nine e-JAD sessions suggest that the e-JAD is a better technique in terms of productivity and quality because the process of systems analysis and design can be completed in significantly less time (4.5 times faster) and a more accurate and complete model of the system can be produced (Dennis, Hayes, & Daniels, 1999).

These two information gathering techniques, interviews and JAD or group discussion sessions, are important for systems developers. They offer rich, detailed and vital information at different stages of the systems development life cycle and encourage greater client involvement (Dennis & Wixom, 2000:130-132) and identification with the systems (Kendall & Kendall, 2002:132).

1.4 Communication Needs and Lacks of UTM Computer Science Graduates and Undergraduates

1.4.1 UTM Computer Science Graduates

The interview sessions with CSPs in Malaysia revealed that although English oral communication skills are important in the IT industry, many graduates from local universities still have problems with these skills. In 2003 I sent questionnaires to twenty-four UTM Computer Science graduates to find out about their jobs, language proficiency and language needs in the workplace (see Appendix A2). The majority (79.2%) of the respondents had obtained at least a grade B- in the third of three modules offered in the English language programme at UTM (a compulsory module for every UTM student). However, despite having successfully completed all the prerequisite modules of the English language programme and having received training in general English, only a minority rated their English speaking and writing proficiency as good or very good (in the case of speaking 16.7%, and in the case of writing 20.8%). Far more thought their listening skills were good or very good (33.3%) and even more thought this of their reading skills (41.7%).

The respondents were working as CSPs in government IT departments or private IT companies, and the majority (83.3%) described their duties or responsibilities as involving the process of computer systems development. Although their language of communication in the workplace was mainly Malay or another language such as Mandarin or Tamil, the majority (87.5%) agreed that competency in English was important for their job. The respondents who worked with government sectors and small businesses used English when interacting with English speaking clients and business associates. For those who were employees of multi-national companies, English was an even more important medium of communication. Most of the respondents (75.0%) rated English for electronic written communication as "much needed" or "very much needed".

1.4.2 UTM Computer Science Undergraduates

1.4.2.1 Perceived English Language Competency and Needs

A preliminary investigation into the perceived English language competency and needs of 850 Computer Science undergraduates at UTM was conducted in December 2002 using questionnaires that were written in Malay (see Appendix A3 for the Malay version and Appendix A4 for the translation in English).

Although most of the respondents rated their English language receptive skills as "good" or "satisfactory" (reading: M=3.57, listening: M=3.43) on a 5-point Likert scale that ranged from "very weak"' (1) to "very good" (5), they rated their productive skills much lower (speaking: M=2.98, writing: M=3.11). In terms of English language wants, the majority (92.7%) agreed that more focus should be given to improving their speaking skills in the English language modules. 72.1% agreed that the teaching of English should focus on English needed for Computer Science studies and 87.4% agreed that part of the instruction should focus on the English of CSPs in the workplace.

1.4.2.2 Attitudes Toward English Language

A 32-item scale was used to measure attitudes toward the foreign language (adapted from Corbin & Chiachiere, 1995) (see Sections C of Appendix A3 and Appendix A4). Corbin and Chiachiere's (1995) scale measuring attitudes toward foreign language was chosen for this preliminary investigation because assessment of its internal consistency reliability using two samples of 351 and 177 respondents resulted in Cronbach Alpha coefficients of 0.95 and 0.92 (Chiachiere, 1993). This questionnaire used a 5-point Likert scale which ranged from "never or almost never true of me" (1) to "always or almost always true of me" (5).

In the scale measuring attitudes (see Section C of Appendix A4 for a report of the responses to all the attitudes toward English language scale items in percentages), the majority of the statements (27 of the 32 items) reflective of positive attitudes toward the English language were supported by more than half of the students surveyed. 14 statements were supported by over three-quarters of the students. In general, these findings revealed that most Computer Science students at UTM have positive attitudes toward the English language.

Findings were analyzed in terms of the five factors or dimensions of attitudes toward the English language. These were: fascination with a foreign language, dislike of foreign language study, the value of learning a foreign language, the importance of foreign language study to education and the difficulty of learning a foreign language (as suggested by Corbin & Chiachiere, 1995). Although more than half of the students agreed that they had positive feelings about the English language (items 5, 7, 10, 13, 18, 26 and 28), less than half of them supported the statement that their interest in English speakers and their way of life had greatly increased (item 31). This was probably due to the content of the English courses which did not expose students to the culture and way of life of English speakers but to the use of English in the context of general science and technology. ESP was what they needed and not cultural knowledge.

Dislike of the study of English or English speakers was not evident in the survey (items 12, 14, 16, 20, 22, 24). Nevertheless, the responses to items 3 and 25 showed that only slightly more than half of the students agreed that learning English was enjoyable. This was probably due to the methods used to teach English which were not interesting to the students. The students' written comments in the open-ended questionnaire suggested that the English language modules at UTM should be improved by using learning and teaching methods and materials that were more interesting and lively. A few of their comments were "use of interesting approach for English language", "add more interesting teaching aid" and "follow the latest technology" such as conducting "chatting session"" and using "multimedia". They also proposed that there should be more communication and speaking activities to encourage participation and interaction in groups, as opposed to activities which focused on the theoretical aspects of learning English. A few examples of their comments were "expose student to interact in English", "focus on communication skill", "create an environment where people communicate in English" and "more practice in class than theoretical". They believed that these activities would increase their confidence in using English. More than half of the respondents (58%) agreed with the statement that they felt uncomfortable at the thought of being among English speaking people (item 9).

The value of learning English was rated highly by most of the respondents in the survey. The majority (more than 85%) disagreed with statements which suggested that studying English was worthless, useless and a waste of time (items 6, 17 and 23). Most of them (more than 85%) could think of many uses for English (item 4) and agreed that knowing English was a valuable asset (item 30). In terms of the importance of English language study to education, about three-quarters of the students in the survey agreed that learning English did provide them with a better understanding of the Computer Science modules (item 8) but only about half of them believed that it was a significant part of their education (item 11). These findings were supported by the students' responses to the open-ended questions. Slightly more than three-quarters (77.5%) of them agreed that their level of English language proficiency did influence their academic performance. They mentioned that most of the Computer Science books, references and lecture notes were in English and that many Computer Science lecturers conducted their lectures and wrote assignments, quizzes and examination questions in English. Project work that was assigned in Computer Science modules also sometimes required them to interact with clients or customers in English. However, despite the substantial influence of English on the students' academic performance, only 36.2% of the respondents indicated that the English language modules in UTM helped them much in learning their academic or content modules. Some of the causal factors they mentioned were that the modules were not related to their core or Computer Science modules and they were not given practical communicative tasks that were interesting and related to the Computer Science field. Instead, the focus was mainly on writing general science or technology texts or reports.

Finally, analysis of the Computer Science students' fifth dimension of attitude toward the English language revealed that less than one-third of them (21.2%) found learning English relatively simple (item 32). Most found learning English quite challenging since a high percentage (89.4%) of them agreed with the statement that it was a difficult experience (item 29). About half (44.3%) agreed it was the most difficult module that they had taken (item 27).

These results suggest that Computer Science students experienced some difficulty in learning English. Most had a positive attitude but would have preferred interesting, livelier and more enjoyable language activities and tasks that provided them with more communicative practice relevant to their academic and future professional field.

1.4.2.3 Anxiety in the English Language Classroom

A 33-item scale was used to measure foreign language classroom anxiety (adapted from Horwitz, Horwitz, & Cope, 1986) (see Sections D of Appendix A3 and Appendix A4). Horwitz et. al's (1986) foreign language classroom anxiety scale was selected for this study because it had demonstrated construct validity and internal reliability with a Cronbach Alpha coefficient of 0.93 and a test-retest reliability over eight weeks (value of $r = 0.83$ ($p < 0.001$)) (Horwitz, 1991). This questionnaire used a 5-point Likert scale which ranged from "strongly disagree" (1) to "strongly agree" (5).

The 33-item English language classroom anxiety scale was used to identify evidence of speech anxiety and communication apprehension (see Section D of Appendix A4 for a report of the responses to all the English language classroom anxiety scale items in percentages). The students' responses to statements such as "I start to panic when I have to speak without preparation in the English language class" (item 9: 57.6% agreed), "I feel very self-conscious about speaking the English language in front of other students" (item 24: 44.7% agreed) and "I get nervous and confused when I am speaking in my English language class" (item 27: 33.9% agreed) provide an indication that the Computer Science undergraduates had a certain amount of anxiety when speaking in English, especially without preparation and face-to-face with other students. Additionally, less than one-third of the respondents (28.9%) agreed with the statement "I feel confident when I speak in the English language class" (item 18).

Computer Science students' responses to the statements "It frightens me when I don't understand what the lecturer is saying in the English language class" (item 4: 51.3% agreed) and "I get nervous when I don't understand every word the English language lecturer says" (item 29: 44.9% agreed) provide evidence of their fear of not being able to comprehend all language input. They also reported fear of being less competent than other students or being negatively evaluated by them. This is endorsed by the statements "I keep thinking that other students are better at English than I am" (item 7: 64.2% agreed), "I always feel that the other students speak the English language better than I do" (item 23: 62.3% agreed), "The English language class moves so quickly I worry about getting left behind" (item 25: 24.7% agreed), "It embarrasses me to volunteer answers in my English class" (item 13: 48.2% agreed) and "I am afraid that the other students will laugh at me when I speak the English language" (item 31: 45% agreed). In such circumstances, my colleagues and I who have at least five years of experience teaching the English language to UTM students found that they tend to deliberately miss their English language classes, avoid eye contact with the language instructor or sit in the back row of the class to avoid the humiliation and embarrassment of being called upon to speak.

Another trait of anxious language learners is their fear of making mistakes in the language class. This was indicated by 20.5% of the Computer Science students when they endorsed the statement "I am afraid that my English language lecturer is ready to correct every mistake that I make" (item 19). Less than one-third of them agreed with the statement "I don't worry about making mistakes in the English language class" (item 2: 31.7%). This seems to indicate that some students constantly feel tested and regard their mistakes as failures.

The results of the survey suggest that Computer Science students experienced significant anxiety with regard to some aspects of English language learning. The majority of the statements reflective of English language anxiety (19 of the 33 items) were supported by one-third or more of the students surveyed and ten statements were supported by more than half the students. It is important to take into consideration the students' anxiety in face-to-face interaction, which seemed to be due to self-consciousness, embarrassment or feelings of inferiority in relation to other students that they thought were better at the English language, and their fear of making mistakes.

According to the interview responses with CSPs discussed earlier, feelings of shyness, anxiety about making mistakes and lack of confidence were still felt by Computer Science graduates even though they were working as CSPs in their workplace. They also felt inferior communicating with people who were more fluent in English. These results seem to indicate that although Computer Science students have a positive attitude towards the English language, the English language programme was not really successful in helping to reduce their level of anxiety or increase their confidence even after they had graduated and were working as CSPs.

1.4.2.4 Computer Science Curriculum at UTM

In the three-year Computer Science curriculum at UTM (see Appendix A5), Computer Science content lecturers identified three modules that required Computer Science students to be proficient in English oral communication skills as well as the technical and analytical skills of systems analysis and design. The modules were Software Engineering (a first year module), Systems Analysis and Design Methods (a second year module) and IT Project Management (a third year module). The Software Engineering and Systems Analysis and Design Methods modules assigned projects that required students to interact with academic and administrative staff at UTM or people working in organizations outside UTM.

In the Software Engineering module, this project work accounted for 20% of the coursework assessment (see Appendix A6 for the course outline). The project required students to work in groups and propose a topic that involved the development of software or a system for a company or organization. One topic proposed by the module lecturer was a "Management System for the Faculty of Computer Science and Information System Administration Staff". Each group was instructed to produce three reports or documents for the project: a software development plan, a software requirement specification and a software design specification. In order to produce these documents, part of the students' task was to perform requirements engineering processes to elicit, analyze and negotiate their clients' systems requirements, and to ask for confirmation or validation that the system designed met the clients' requirements (Pressman, 2001:256-261; Sommerville, 2001:121-147). This involved interacting with clients through interviews and conducting group discussions with multiple stakeholders of the system.

The project work assigned in the Systems Analysis and Design Methods (SADM) module also accounted for 20% of the coursework assessment (see Appendix A7 for the course outline and instructions for the project). The students were required to design an information system for a company or organization. They had to submit two types of reports: a problem definition report containing information about the organization and on the objectives, scope and limitations of the proposed system, and a design specification report containing a description of the refined physical design of the proposed system using suitable system design techniques.

According to the module lecturer, the whole project involved performing an "enterprise analysis" to obtain an overview of the organization's business objectives, structure, information needs, data and processes, identifying inefficiency or problems with the existing business process, and proposing a new or improved system. All these tasks entailed using various information gathering techniques such as interviews, questionnaires, document analysis, observation and JAD sessions with clients (Dewitz, 1996:192-271; Kendall & Kendall, 2002:83-202). Competency in the interviewing skills of information elicitation and probing were essential to accurately identify problems with the current system. Group discussion skills were also important for negotiating effectively with clients.

Although the students were required to adopt different approaches to systems analysis and design for their Software Engineering and SADM module projects, for both projects they needed to use English to discuss and gather information of a very precise and technical nature. Both the systems analysis and the design projects consisted of several major stages. First, each group had to approach a company or organization and request permission to elicit information about one of its current manual or computerized systems, such as a database management system, an accounting system, a booking system or an inventory system. Gathering this information involved conducting interview sessions with members of staff who were involved in the process, observing the current work process, distributing questionnaires to users of the system and analysing relevant documents. During the next stage students were required to create workflow diagrams to illustrate the current manual or computerized work process. They then verified their understanding of the current process through group discussion sessions with their clients. Once the clients had verified the accuracy of their description, the students had to analyze it in order to identify problems. Finally, they had to design a new or improved computerized system that would enhance the work process.

Apart from interviewing clients, students were encouraged to take part in JAD sessions with their clients to elicit relevant information for the systems analysis and design project, including clarification and verification of the client's work process and suggestions for improvements to the proposed system. JAD sessions were conducted "to overcome the communication gap between users and designers and thus reduce the time and effort devoted to identifying, documenting, and approving requirements and design specifications" (Dewitz, 1996:241). The systems analysis and design projects evolved over a period of about ten weeks in a fifteen-week module. One of the determining success factors was the students' ability to interact effectively with clients.

The students needed oral communication training and practice in interviewing and JAD skills to interact effectively with their project clients for efficient systems design. Unfortunately, in informal communication with the lecturers who were responsible for teaching these modules, they said that they were unable to provide the students with this preparation for the project field work due to time constraints and the need to cover a lot of content material in the Computer Science content modules.

In informal communication with these lecturers, there is evidence to suggest that the students experienced communication problems during the process of completing their module reports. The reports for the SADM module revealed, for example, missing and improper labelling/notation in the workflow or data flow diagrams, and incomplete diagrams. The list of interview questions students enclosed with their reports gave an indication that their questions were too general and did not focus on the current work process of the existing system they were defining or analysing. These problems imply that the students probably did not elicit relevant information or probe sufficiently for the information they needed to produce an accurate and complete diagram of their client's work process. Perhaps they did not know what information to elicit, or how to elicit or probe for more detailed information, or perhaps they forgot to probe further for details of the work process, or did not ask for clarification and confirmation of their client's information. I had a number of informal conversations with the students. They highlighted several communication problems that they faced while conducting their interviews and JAD sessions with their clients. These included problems in formulating eliciting questions and impromptu questions to probe for further information in English. In general, although there was a need for competency in the interviewing and group discussion skills for successful systems analysis and design, Computer Science students at UTM appeared to receive inadequate formal training and practice to develop these skills.

1.5 Background of the Study

The results of this preliminary investigation suggest that Computer Science students are required to work in teams and conduct interviews and group discussions or JAD sessions with their clients to complete the systems analysis and design projects for their academic study. They are also required to discuss and interview in English in their later life as systems analysts. In addition, these students are likely to experience some form of real-time online discussion in their future professional lives. They are expected to be able to communicate synchronously online with colleagues, vendors and clients for information elicitation, trouble-shooting purposes or to conduct e-JAD sessions at different stages of systems development.

In view of these findings, I was interested to conduct research to explore if synchronous CMC would be an effective tool to meet the oral communicative needs of Computer Science students. Because of the very specific language skills they required, a theme-based model of CBI called sustained-content language instruction (Murphy & Stoller, 2001; Pally, 2001) could be a possible approach to combine with synchronous CMC in the language classroom. To date, there has been little prior research into the use of synchronous CMC for learning languages for specific purposes.

1.6 Purpose and Significance of the Study

The purpose of this research is therefore to explore whether synchronous CMC would be an effective tool to help students meet the language demands of Computer Science as an academic subject and as a profession.

This research is considered unique and necessary for several reasons. Firstly, there seems to be a lack of research into the use of synchronous CMC for the development of ESP language skills. It is hoped that this research will contribute to the field of language teaching by investigating a purposeful and innovative method of language instruction for specific purposes.

Secondly, the findings of the preliminary investigation indicated that Computer Science students at UTM needed specific English oral communicative skills for systems analysis and design. The current Computer Science programme does not seem to provide them with sufficient training with these skills. The success of this research could help curriculum designers at UTM and at many other universities worldwide to improve their programmes.

Finally, although this research is a case study of a single tertiary educational institution in Malaysia, it is hoped that the findings can also provide language instructors in Malaysia and elsewhere with insights into the teaching of language for specific purposes.

1.7 Outline of the Thesis

Having presented the context, the background, the purpose and the significance of the study, I will provide an outline of the remaining chapters of the thesis.

In the following chapter, Chapter 2, I provide a literature review of areas which are relevant to this study. These include a discussion of studies relating to content-based instruction, task-based learning and computer-mediated communication.

In Chapter 3, I present the research design of this study. First, I argue for a mixed method approach and then present the research questions. These are followed by a brief description of the research procedure, participants and instruments.

In Chapter 4, I provide a discussion on Feasibility Study I. It includes the aim, research question, method and findings of the study followed by a discussion of the findings, practical issues and implications for Feasibility Study II.

In Chapter 5, I provide a discussion on Feasibility Study II. It includes the aim, research question, method and findings of the study followed by a discussion of the findings and implications for the Main Study.

In Chapter 6, I present the aim, research questions and method used to conduct the Main Study. I then provide the findings of the study. This is followed by a discussion of the findings and implications for the Follow-up Study.

In Chapter 7, I present a discussion on the Follow-up Study. It includes the aim, research question, method and findings of the study followed by a discussion of the findings.

In the final chapter, I briefly summarize the findings of the four studies and discuss their implications. I also present the limitations of the research and provide suggestions for future research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this literature review I will focus on two areas: content-based instruction (CBI) and computer-mediated communication (CMC). I will draw together two strands of research on CBI and CMC that are not normally discussed together. CBI is primarily concerned with face-to-face teaching instruction. There is very little research on CMC within CBI. CMC on the other hand, rarely discusses issues of content. The primary concern of CMC is to teach language for social purposes. The use of CMC is hardly discussed in the context of CBI (for example in English for Specific Purposes, Language for Specific Purposes or Language across the Curriculum). In this chapter, I will deal with CBI and CMC separately but I will show the need to combine these two areas in contexts where Computer Scientists need to communicate via the computer. My research has also been informed by literature on task design and implementation. This will also be discussed in this chapter.

The following section focuses on the content-based instruction (CBI) approach to language learning. It will elaborate a variety of CBI called English for Specific Purposes (ESP). This is followed by a description of sustained-content language instruction (SCLI) and the rationale for adopting this approach for this study.

2.1 Content-Based Instruction (CBI) Approach

An application of the communicative language teaching approach which has gained popularity and has been used widely in the past fifteen years is content-based instruction (CBI). According to Stryker and Leaver (1997a:5), CBI can be "a philosophical orientation, a methodological system, a syllabus design for a single course, or a framework for an entire program of instruction" which assumes "total integration of language learning and content learning". Brinton (2003:201) asserts the notion of CBI as a methodology when she describes it as teaching language using content that is both interesting and relevant to language learners.

Language use in CBI is purposeful and meaningful as it uses content that has been selected and determined from the learners' existing content modules or curricula as a resource for language learning (Stoller & Grabe, 1997:78). CBI enables language instructors to present learners with a rich context for language learning and to highlight specific features of the language (Brinton, 2003:201). It also promotes the learning of a second or foreign language, as the focus of instruction has been shifted from "the learning of language per se to the learning of language through the study of subject matter" (Stryker & Leaver, 1997a:5). Learners are "actually using that language, from the very first class, as a real means of communication" (Stryker & Leaver, 1997a:3).

Stryker and Leaver (1997a:5-11) propose three essential characteristics of CBI: 1) it is based on a subject-matter core; 2) it uses authentic language and texts; and 3) it is appropriate to the needs of specific groups of students. Brinton (2003: 205-209) expands upon these by suggesting six main principles of CBI: 1) the selection and sequencing of instructions are based on content rather than language criteria; 2) language is taught using an integrated skills approach; 3) the classroom is learner-centered and communicatively oriented; 4) content is chosen for its relevance to learners' lives, interests and/or academic goals; 5) texts and tasks are selected for their authenticity (texts are not initially designed for language teaching and tasks assigned reflect real-world tasks); and 6) learners are exposed to authentic input to use for communicative purposes, and are made explicitly aware of specific language features through awareness-raising tasks.

Although Stryker and Leaver (1997a), and Brinton (2003) emphasize the aspect of authenticity of tasks in CBI, there has been criticism of the term 'authenticity'. According to Hutchinson and Waters (1987:159), "we should be looking not for some abstract concept of 'authenticity', but rather the practical concept of 'fitness to the learning purpose'". This means that importance should be placed not on the arbitrary concept of authenticity, but rather the role that a task plays in the teaching and learning process. In reality, it may not be possible to conduct real-world tasks in the language classroom. These tasks may be adapted to simulate real-world tasks that meet the learning purpose.

Selection of techniques and tasks for implementing CBI should reflect its principles. This entails active participation of learners in the exchange of content or theme-related information. Examples of activities and tasks that are commonly used in CBI programmes are pair and group work, information gap, jigsaw, problem solving, discussion, debate, role-play and visuals for organizing information (see Brinton & Master, 1997; Crandall & Kaufman, 2002; Pally, 2000; Snow & Brinton, 1997; Stryker & Leaver, 1997b).

Meaningful content has been used by language practitioners worldwide in various language programmes and contexts. These include second language immersion programmes for K-12 classrooms, early foreign language classrooms, second language vocational and workplace instructional contexts and university-level foreign language instruction. Since its introduction by Bernard Mohan (1979, 1986) who pioneered ways of learning language and subject matter, several models of CBI have been presented by its proponents (Brinton & Master, 1997; Brinton, Snow, &

Wesche, 1989, 2003; Cantoni-Harvey, 1987; Crandall, 1987; Crandall & Kaufman, 2002; Echevarria & Graves, 1998; Pica, 2002; Snow & Brinton, 1997; Stryker & Leaver, 1997b).

Some of the common CBI models successfully implemented by language practitioners are sheltered content instruction (Brinton et al., 2003:45-56; Rosen & Sasser, 1997; Schneider & Friedenberg, 2002), theme-based language instruction (Brinton et al., 2003:26-44; Gianelli, 1997), adjunct instruction (Brinton et al., 2003:57-69; Rosenkjar, 2002; Snow & Brinton, 1988), discipline-based instruction (Krueger & Ryan, 1993), foreign language across the curriculum (Jurasek, 1988) and sustained-content language teaching (Murphy & Byrd, 2001; Murphy & Stoller, 2001; Pally, 2000). In certain CBI programmes, several combinations of the above models have been used and some language practitioners even propose the compatibility of CBI with other teaching approaches such as task-based language teaching (Corin, 1997; Kirschner & Wexler, 2002), whole language teaching (Freeman & Freeman, 1997) and vocational English as a second language (Wong, 1997).

All models of CBI, share a similar theoretical framework. They are based on the cognitive and linguistic theories which view second language acquisition as a complex process that requires prior knowledge, meaningful learning and strategy use to be successful. These theories include Anderson's (1976; 1983; 1985) model of human cognition called ACT* (Adaptive Control of Thought) and theory of skill acquisition, Krashen's (1981; 1982; 1985) notion of comprehensible input and Swain's (1985; 1995; 1998) view of comprehensible output. They will be discussed in Section 2.1.2.1. In the next section (2.1.1), I will describe the ESP approach to CBI that is adopted for this study.

2.1.1 English for Specific Purposes (ESP)

CBI studies tend to focus on the methodology of language learning and teaching (see Brinton et al., 2003; Cantoni-Harvey, 1987; Echevarria & Graves, 1998; Snow & Brinton, 1997; Stryker & Leaver, 1997b). ESP studies, on the other hand, are primarily concerned with syllabus and materials design (see Chamberlain & Baumgardner, 1988; Flowerdew & Peacock, 2001; Mackay & Mountford, 1978; Selinker, Tarone, & Hanzeli, 1981; Swales, 1988). CBI, however, emphasizes the analysis of the English language learner's needs, and thus can be seen as a kind of ESP teaching method (see Crandall & Kaufman, 2002; Kasper, 2000; Pally, 2000).

Mackay (1978:28) defines ESP as "the teaching of English not as an end in itself but as an essential means to a clearly identifiable goal", to meet both the specific academic or work needs of learners. Hutchinson and Waters (1987:19) look at ESP as an approach instead of as a product. They do not regard ESP as any type of language, methodology or teaching material but an approach to language learning that is based on learner need. They believe that "the foundation of all ESP is the simple question: Why does this learner need to learn a foreign language?" and it entails finding the answers to a list of questions relating to the learners, the nature of the language required and the learning context through the process of needs analysis (Hutchinson & Waters, 1987:19).

P. C. Robinson (1991) asserts that ESP is usually goal directed, which implies that learners learn English for academic or work purposes rather than due to their interest in the language. She also suggests that ESP "is based on a needs analysis, which aims to specify as closely as possible what exactly it is that students have to do through the medium of English" (P. C. Robinson, 1991:3). Strevens's (1988:1-2) definition of ESP highlights the difference between four absolute characteristics and two variable characteristics of ESP. The absolute characteristics of ESP are that it is:

- designed to meet specified needs of the learner;

- related to content (ie. in its themes and topics) to particular disciplines, occupations and activities;
- centred on the language appropriate to those activities, in syntax, lexis, discourse, semantics, etc;
- in contrast with 'General English'.

The variable characteristics of ESP are that it:

- may be restricted as to the language skills to be learned (eg: reading only; speech recognition only, etc);
- need not be taught according to any pre-ordained methodology (although communicative methodology is very often felt to be most appropriate).

All the above notions of ESP place a great emphasis on the importance of specifying learners' needs. Additionally, the functional definition of ESP is the preparation of learners to be effective participants in a specific discourse community (Swales, 1990). This prerequisite provides a clear guide to the content of an ESP syllabus (Abdullah et al., 1995:14). In this study, therefore, ESP is regarded as the preparation and the process of enculturation of learners for effective participation in the Computer Science discourse community. The "content" of their ESP syllabus should "include not only relevant subject matter and linguistic input, but also the whole value system or culture" of the target discourse community (Abdullah et al., 1995:15).

The notion of an enculturation process has intrigued a number of researchers. For instance, according to J. S. Brown, Collins and Duguid (1989), enculturation is the process of knowing and learning the cultural practices and norms of a community of experts. Since knowledge of cultural practices is a manifestation of the activity, context, and culture in which it is acquired and used, or is situated, learners should be provided with a "cognitive apprenticeship" of these practices (Collins, Brown, & Newman, 1989). This includes learning activities that present learners with the "peripheral features of authentic tasks" so that they gradually become enculturated with the practices of the experts through the process of apprenticeship (J. S. Brown et al., 1989:34). Lave and Wenger (1991) refer to this notion of learning as situated activity as it provides learners with "legitimate peripheral participation" in the sociocultural practice of a community. "Legitimate peripheral participation" is:

> *the process by which newcomers become part of a community of practice. A person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice. This social process includes, indeed it subsumes, the learning of knowledgeable skills* (Lave & Wenger, 1991:29).

Hence by providing ESP learners with situated learning, they might acquire the necessary training to eventually master the knowledge and skills that are essential for them to function effectively in the target discourse community. The theory of situated learning has its antecedent in Vygotsky's theory of social development (1962; 1978).

The process of preparing ESP learners to be effective members of their target discourse community through "legitimate peripheral participation" (Lave & Wenger, 1991) involves a cycle of overlapping and interdependent key phases: needs analysis, course and syllabus design, selection and preparation of materials or activities, teaching and learning methodology and evaluation (Dudley-Evans & St. John, 1998:121; Hutchinson & Waters, 1987; P. C. Robinson, 1991). The first phase entails analyzing the present needs, target needs and learning needs of learners (Dudley-Evans & St. John, 1998:121-144; Hutchinson & Waters, 1987:53-64).

For the purpose of this study, I had already conducted a present situation and target situation analysis of the Computer Science students at UTM (see Chapter 1). The needs analysis revealed a need for the following specific communication skills: 1) the interviewing skills of eliciting information and probing for detailed information of their clients' current work processes, and 2) the group discussion skills of asking for clarification and confirmation of their clients' work processes depicted through diagrams such as workflow and data flow diagrams, and exchanging opinions with clients on the proposed systems design during JAD or e-JAD sessions.

Computer Science students' target needs for competency in the specific communication skills of interviewing and JAD for systems analysis and design require intensive practice and rehearsal in these complex skills within a particular content-area, namely, systems analysis and design methods. My preliminary investigation, however, revealed that these needs are not being met by either their language modules (see Section 1.2) or content modules (see Section 1.4.2.4).

There have been many studies which indicate that more complex language skills such as higher-level reading and writing skills, critical thinking/analytical skills and academic/professional communication skills would remain underdeveloped without intensive engagement in a particular content-area (Andrade & Makaafi, 2001; Black & Kiehnhoff, 1992; Grabe & Stoller, 1997; Kasper, 1995, 2000; Snow & Brinton, 1997; Song, 2006; Stryker & Leaver, 1997b). Cummins (1980; 1981a; 1981b; 1984; 2000) refers to these complex skills as "cognitive academic language proficiency"; the second stage of his two-stage skill model.

During the first stage which Cummins suggests may take between one to two years, the learners acquire "basic interpersonal communicative skills" or functional literacy that would enable them to communicate and express their basic needs in the target language. In the second stage, called "cognitive academic language proficiency" (CALP), which may take from five to seven years, the learners acquire complex academic skills in the target language. For example, they would be able to use the target language to comprehend complex and de-contextualized language structures and to analyze and synthesize information in academic texts.

Cummins' two-stage skill model may not be applicable to all language learners. Adult learners such as UTM students, who require proficiency in complex academic skills in the target language for their academic studies and future profession, may not require basic interpersonal communicative skills to communicate and express their basic needs in the target language. Furthermore, those who have acquired basic interpersonal communicative or complex academic skills in their first language may take less amount of time to achieve proficiency in these skills in the target language than the ones Cummins suggests in his two-stage skill model.

CALP is necessary for learners to function well in their academic studies. It cannot be acquired through the use of non-academic language but can be achieved through task-based learning in which the learners are provided with the opportunity to interact with tasks and texts that present them with complex academic content (Cummins, 1981b). One possible approach that may facilitate the acquisition of complex language skills using academic content is sustained-content language instruction. This approach will be discussed in the next section.

2.1.2 Sustained-Content Language Instruction (SCLI)

The sustained-content language instruction (SCLI) approach to language learning and teaching offers students detailed treatment of a single topic or discipline, providing them with opportunities to "learn language through the medium of a single content area" (Murphy & Stoller, 2001:3). In SCLI, students are helped by the language instructor to practise language skills while studying "one discipline for a half or full semester, progressing through various aspects of a larger topic such that later concepts and information rely on earlier ones – just as students in content classes do" (Pally, 2001:281). SCLI, which is a variation of CBI, may therefore provide tertiary level language learners with the opportunity to acquire the necessary higher-level skills for success in their academic studies and future professions (Murphy & Stoller, 2001; Pally, 2001, 2000). This entails facilitating language learners to acquire complex language skills such as higher-level reading and writing skills, critical thinking/analytical skills and academic/professional communication skills through intensive engagement in a particular content-area.

2.1.2.1 The Rationale for SCLI

The rationale for SCLI is that, first, it is able to provide language learners with the opportunity to acquire Cummins' (1980; 1981a; 1981b; 1984; 2000) notion of CALP. Secondly, since SCLI is a variation of CBI, it supports the underlying theoretical framework of CBI which includes Anderson's (1976; 1983; 1985) model of cognition, and the concepts of comprehensible input (Krashen, 1981, 1982, 1985) and comprehensible output (Swain, 1985, 1995, 1998) in second language acquisition. Finally, SCLI affords language learners with a scaffold condition for language learning.

SCLI Facilitates Acquisition of Cognitive Academic Language Proficiency (CALP)

There are several benefits of SCLI. According to Carson (2000), sustained-content enables learners to develop:

1. the vocabulary associated with that specific content,
2. the syntactic patterns that are likely to recur in continuing text,
3. the background knowledge learners will actually need when they take the content module, and
4. the opportunity to work with cumulative knowledge/concept building throughout the module (ibid).

The complex academic language tasks will also be gradually manageable for the learners because they are built on continuous exposure to language and content. These may provide language learners with the necessary conditions to acquire Cummins' (1980; 1981a; 1981b; 1984; 2000) notion of CALP as they engage intensively in language tasks that focus on a particular subject-area. Carson (2000:23) further suggests that, without the use of sustained-content, it would not be possible to provide learners with the opportunity to develop the language, study and test-taking skills they require to perform well in graded "display tasks" such as assignments, essays, reports, projects and examinations in a single content area. These tasks "require them to integrate information across chapters – a task that is simply unavailable when course content changes from topic to topic" (ibid).

Carson's (2000) notion of SCLI implies that learners will be working through a single content area with a course book. In reality, this is not the case for most universities at the tertiary level, including UTM. As discussed in Chapter 1, the English language modules at UTM have been designed to integrate listening, speaking, reading and writing skills through the use of a variety of science and technology related English language materials. Furthermore, although Carson's (2000) view of SCLI seems rather important, it is still unclear if it can provide learners with the opportunity to develop Cummins' (1980; 1981a; 1981b; 1984; 2000) notion of CALP. It would therefore be interesting to find out if the sustained-content nature of SCLI would provide learners the opportunity to acquire proficiency in the higher-level language skills that they need for academic success.

SCLI Supports the Theoretical Foundations of CBI

Another rationale for SCLI is that, since it is a variation of CBI, it supports the theoretical foundation of CBI. This is based on cognitive and linguistic theories according to which second language acquisition is a complex cognitive task that requires declarative and procedural knowledge of the target language, opportunities for practice and strategic use to succeed. These include Anderson's (1976; 1983; 1985) model of human cognition called ACT* (Adaptive Control of Thought) and theory of skill acquisition, Krashen's (1981; 1982; 1985) notion of comprehensible input and Swain's (1985; 1995; 1998) view of comprehensible output.

Anderson's Model of Human Cognition and Theory of Skill Acquisition

Anderson's (1976:78) notion of human cognition suggests that the human mind stores two forms of information: declarative knowledge, or knowledge of facts, and procedural knowledge, or knowledge about how to do something. A few examples of declarative knowledge are memory of factual information, grammar rules, word definitions, sequence of events, and visual images. This form of knowledge is stored as meaningful concepts in long-term memory as nodes which are linked to other nodes through connecting associations. The strength of associations between the nodes is dependent on the frequency of their usage or activation process.

Procedural knowledge can only be acquired through performance of tasks. It would determine our capability to comprehend and produce language and can help to explain the complex cognitive process of language learning and use. According to Anderson (1983:216), procedural knowledge is represented in memory as production systems that are based on the "if-then" rule of condition in which it is "only when a procedure has been tried out and has proven itself that one wants to give it irrevocable control". Production systems are influenced by declarative knowledge when this knowledge is used as a set of instructions to perform a task. It may become automatized through a lot of repetition or practice.

The process of acquiring declarative knowledge of facts is quick and direct but procedural knowledge such as language skills can only be attained gradually and with a lot of opportunities for practice. Anderson (1983) asserts that language acquisition requires a high level of cognitive function which involves both explicit and implicit knowledge about language as a system and wide-ranging opportunities for practice to achieve autonomy. To this end, language practitioners normally teach language as declarative knowledge such as grammar, pronunciation and vocabulary interchangeably with language as procedural knowledge such as how to achieve communicative competence, proficiency and fluency in the target language.

Anderson's (1983) view on the relationship between declarative and procedural knowledge has implications for the acquisition of skills. Empirical evidence suggests that there is a three-stage cognitive process in which skills can be developed: a cognitive stage, an associative stage and an autonomous stage (Anderson, 1983, 1985). During the cognitive stage, learners develop declarative knowledge of the skill and try to memorize a set of facts that would assist in the operation of the task that would help them to develop the skill. Normally, learners rehearse these facts as they perform it for the first time. This process is time-consuming because relevant facts are still in the declarative form. They have to be retrieved and interpreted for the learners to perform the task. At this stage, the learners have not acquired procedural knowledge of the skill.

During the second stage of skill acquisition, the associative stage, two main things occur. First, learners are able to identify errors during the process of skill acquisition and eventually reduce them. Second, learners successfully attain proficiency in the skill. This is possible because the learners have acquired procedural knowledge of the skill. At the third stage, which is the autonomous stage, the learners have acquired a higher level of proficiency in the skill than the previous stage as the procedure becomes automated.

These cognitive processes, as suggested by Anderson (1983; 1985), help to explain how language strategies are represented and how they are learned. They may provide opportunities for development of language skills. Anderson's (1983; 1985) model of human cognition and theory of skill acquisition can be considered to provide the theoretical framework for SCLI. The content component of SCLI can be represented as declarative knowledge. This comprises the facts, concepts and skills that underlie the content-area. The part of SCLI that aims to develop the language learners' procedural knowledge of language use is the language development component. This component provides language learners with a lot of contextualized practice in target language skills so that these skills eventually become automatized.

Anderson (1983; 1985) claims that learners are able to identify their errors during the process of skill acquisition. In language learning, learners might not be able to notice their own linguistic errors or errors in language use during the process of developing target language skills. Language instructors should therefore play an important role to consciously raise the learners' awareness of errors that occur during task performance.

According to Newell and Rosenbloom's (1981) theory of the power law of learning, performance of skill improves as a function of practice. Newell and Rosenbloom (1981:50) suggest that repeated practice or reheasal gradually improves the learners' skill because the more practice the learners have learning a particular skill, the greater is "the amount of power it gets by making connection with a wide body of existing psychological work" that is related to the skill. This eventually lead to automatization of the skill (Neves & Anderson, 1981).

These theories indicate the ways in which language learners may benefit from SCLI as it can provide them with the opportunity to improve and automatize higher-level language skills through a cycle of repeated contextualized practice of the target skills.

Comprehensible Input

With reference to the theories on second language acquisition, SCLI can present language learners with meaningful or comprehensible input which is necessary and must be understood by the learners to facilitate the process of second language acquisition (Krashen, 1981, 1982, 1985). Krashen's (1985) Input Hypothesis suggests that input is necessary, sufficient and efficient for language acquisition. Krashen (1982; 1985) states that language learners can acquire linguistic structures efficiently when they are presented through comprehensible input that is just beyond the learners' current level of proficiency (moving from a current level, i to the next level, i + 1). This condition would initiate the learners to reach beyond the linguistic input and use prior knowledge and communicative ability to make sense of unfamiliar language structures. It could also probably lead to the learners' conscious attention or what Schmidt (1990; 1993) refers to as "noticing" of language features such as new vocabulary knowledge, rhetorical devices or syntactic structures in the input that he hypothesizes is necessary for language learning. Schmidt and Frota (1986:311) argue that for language acquisition to occur, the learners need to be presented with comprehensible input and consciously "notice the gap" or "notice a difference between their current form or competence *i* and the new form or structure *i*+1". Tomlin and Villa (1994) on the other hand propose three components of attention which they claim do not necessarily involve conscious awareness of the input to become intake for further cognitive processing: 1. alertness (readiness to attend to incoming stimuli), 2. orientation (adjusting the attentional resources to some specific feature of the input), and 3. detection (focusing attention to a specific feature of the input). In a recent article, Schmidt (2001) seems to indicate that conscious attention is not necessarily essential but would be useful for learners to process linguistic features in the input that otherwise might not be noticed.

In the context of SCLI, the use of sustained-content materials could provide the learners with comprehensible input as defined by Krashen (1981; 1982; 1985). Each sequence of content input and language skills (level i) would build on earlier ones to offer language learners the opportunity to acquire new ones (level i+1). The progressive recycling of words and forms could help the learners to notice and internalize them. This form of learning could therefore afford the necessary condition for the learners to acquire proficiency in both content and the target language.

Long (1983b; 1985; 1996) contends that providing language learners with comprehensible input alone is insufficient for second language acquisition to occur. Interactional modification through modified input and negotiation of meaning is important for input to be comprehensible (Long, 1983a, 1996). Modified input is the mechanism that a native speaker or language instructor uses to make the input comprehensible for the language learner such as simplification (shorter sentences with simple grammar forms and no subordinate clauses) or elaboration (longer sentences to make the meaning clearer) of the input (Larsen-Freeman & Long, 1991). Negotiation of meaning on the other hand occurs when interlocutors signal non-understanding of input through indicators such as comprehension checks (checking the interlocutor's comprehension), confirmation checks (eliciting clarification of the interlocutor's preceding utterance) and clarification requests (confirming their own understanding of the interlocutor's utterance (Long, 1983b; Varonis & Gass, 1985). Examples of these indicators and their operationalization are shown in Table 2.1.

Table 2.1 Indicators, operationalization and examples of negotiation of meaning

Clarification Requests	**Confirmation Checks**	**Comprehension Checks**
expression by an interactant to elicit clarification of another interlocutor's preceding expression	expression by an interactant immediately following an expression by the interlocutor to elicit confirmation that the interlocutor's expression has been correctly understood	expression by an interactant to elicit confirmation of another interlocutor's understanding of the interactant's preceding expression
e.g. What do you mean by ...? Can you state your information clearly?	e.g. Did you mean ... ? Am I right?	e.g. Do you understand? Is that clear?

In SCLI, language instructors provide learners with modified input to make the content and tasks comprehensible for the learners. The learners are presented with a sequence of content-based materials or tasks that are initially simple but became progressively difficult. At times, language instructors also provide learners with simplified or elaborated instructions for the tasks. Some of the tasks that are assigned in SCLI such as pairwork or groupwork activities are communicative in nature. This may encourage negotiation of meaning among the learners. Instances of negotiation of meaning that can be found in the transcripts of interactions within SCLI environment would indicate that this method provides opportunities for language learning and facilitates language acquisition.

Comprehensible Ouput

Apart from providing language learners with comprehensible input and opportunities for interaction modification, learners' output is also essential for language acquisition (Swain, 1985, 1995, 1998). When learners experience problems getting their message across they are:

> *pushed toward the delivery of a message that is not only conveyed, but that is conveyed precisely, coherently, and appropriately. Being "pushed" in output, ... is a concept parallel to that of the i+1 of comprehensible input. Indeed one might call this the "comprehensible output" hypothesis* (Swain, 1985:249).

In producing comprehensible output, the learners will be compelled to draw from their cognitive resources expressions that are meaningful and pushed from the semantic processing to the syntactic processing of the target language (Swain, 1985; Swain & Lapkin, 1995, 1998). On the other hand, comprehending input does not normally require learners to have an understanding of the syntax of the input because "in many cases, we do not utilize syntax in understanding – we often get the message with a combination of vocabulary, or lexical information plus extra-linguistic information" (Krashen, 1982:66). Swain (1985) argues that since comprehensible input does not demand language production, learners will not achieve native-speaker productive competency as in the case of immersion students who received a lot of comprehensible input but limited comprehensible output (see Genesse, 1987; Harley & Swain, 1984; Swain, 1984, 1985). In the context of UTM, students are more competent in receptive skills than productive skills (see Section 1.4). They are exposed to a lot of comprehensible input through a variety of reading and listening activities in their content and English language modules. There is limited opportunity for them to produce comprehensible output to feel that they are competent enough in their productive skills and to achieve native-speaker productive competency.

According to Swain (1995; 1998) there are three functions of output in second language learning: 1. the noticing or consciousness-raising role, 2. the hypothesis-testing role and 3. the metalinguistic or reflective role. Swain and Lapkin (1995) hypothesize that output would lead to noticing. When learners produce the target language, they may notice or become consciously aware either through self-awareness or external feedback (implicit or explicit) of any linguistic problem. The learners would then be pushed to modify the output.

What would be the cognitive processes that actually occur when a learner notices a problem? Swain and Lapkin (1995) conducted research which studied the think-aloud protocols of early French-immersion students to investigate the cognitive processes that occurred while the learners were writing an article. In the analysis of the think-aloud protocols, Swain and Lapkin (1995) found what they referred to as occurrences of language related episodes (LREs). LREs are parts of the protocol "in which a learner spoke about a language problem he/she encountered while writing and solved it either correctly ... or incorrectly ...; or simply solved it (again, either correctly or incorrectly) without having explicitly identified it as a problem" (Swain and Lapkin, 1995:378). They reflect the learners' cognitive processes as output is being edited.

In other studies by Swain (1998) and Swain and Lapkin (1998), the notion of LREs was referred to as parts of an interaction in which the students talk about the language that they are producing, question their own or their interlocutor's language use, self-correct or correct their interlocutor's language use. These were categorized as "lexis-based" or "form-based" (Swain & Lapkin, 1998, 2001). Lexis-based LREs involved learners selecting from a list of possible vocabulary items whereas form-based LREs involved learners focusing on the spelling, syntax or discourse of the target language. During LREs, the students could be testing their hypotheses of the target language. They may be using "their output as a way of trying out new language forms and structures as they stretch their interlanguage to meet communicative needs; they may output just to see what works and what does not" (Swain, 1995:131-132).

LREs could also involve instances in which the students reflect on their language use as they test their hypotheses of the language. The students could be making explicit insights of the target language such as talking about the language by reflecting on it and "trying to make sense of it in terms of the meaning it serves" (Swain, 1995:136). These are indications that the process of language learning is taking place. Pedagogically, tasks which activate cognitive processes and encourage collaborative work have the potential to promote output and second language learning.

LRE is a useful concept that could be used as a way of evaluating if SCLI provides opportunities for language learning to take place. Proponents of SCLI claim that most SCLI activities provide language learners with the opportunity to produce meaningful language. This kind of "pushed output" would lead learners to produce "comprehensible output" (Swain, 1985:248-249) and to grasp the linguistic and rhetorical aspects of the target language (Kasper, 1997; Leki & Carson, 1994; Schenke, 1996). Interactional activities in SCLI classes are expected to generate LREs that in turn could lead to language acquisition. Whether this is really the case still remains to be seen. Transcripts of interactions within SCLI environment could be analyzed to see whether there were any number of LREs. If there were LREs in the transcripts, these would indicate that the SCLI method provides opportunities for language learning.

SCLI Provides Scaffolding for Language Learning

Another benefit of SCLI is that it affords opportunities for scaffolding. The term scaffold was originally coined by Wood, Bruner, and Ross (1976) as the ideal role of the teacher. In building construction, the scaffold functions as a tool to provide the worker with support to complete a task that is otherwise difficult or impossible. In the learning of language or other skills, the teacher is responsible for providing the learners with scaffolding or a "supportive tool" by structuring the task with reference to what the learners can perform to reduce the gap between the requirements of a task and what the learners can do on their own (Greenfield, 1984:118). According to Greenfield (1984:118), this process of collaborative work between the teacher and the learners would eventually help the learners to improve their competency in the target skills and complete the assigned task successfully. The rationale for these effects lies in Vygotsky's (1978:86) concept of "zone of proximal development". It is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers ... the zone of proximal development defines those functions that will mature tomorrow but are currently in an embryonic state" (ibid).

In SCLI, the language instructor helps the learners to acquire new skills by providing the necessary scaffolding in the zone of proximal development. For example, the language instructor guides the learners to understand the components of the new skills through the progressive introduction of various aspects of a larger topic. The learners then practise those skills collaboratively with their peers. These could initiate the transformation of the learners' "embryonic skill toward its full-blown manifestation" (Greenfield, 1984:119) and help them to grasp difficult concepts and skills. However, collaborative work among learners in an SCLI environment might not necessarily result in improving the learners' competency in the target skills. This could be due to the dynamics of the group. For example, a non-homogeneous group of learners might experience difficulty working with each other due to differences in their level of proficiency in the target language, cultural, ethnicity, age or gender differences. Another possible reason is that the group of learners may not be interested in completing the assigned task because it is too easy or too difficult. Instead, they may decide to perform some other type of task as a group.

2.1.2.2 Criticism of SCLI

With reference to the above discussion, SCLI may be a useful form of instruction to provide language learners with the necessary conditions to acquire the specific English language communicative skills they need. The disciplinary content and the gradual disposition of new information that relates to previous information may be able to make the language learning situation relevant, contextualized and meaningful and provide opportunities for comprehensible language input. It may also offers the learners the opportunity for "pushed output" and for the progressive recycling of words and forms to communicate effectively with their "clients" through sustained-content tasks in a scaffolded environment.

Despite all that has been written about SCLI, it is still uncertain if this approach will work in all contexts. Several factors may influence the effectiveness of SCLI. For example, language learners may find it too difficult to work both with the content and the new language items because there is too much to learn. Otherwise, they may prefer not to deal with content in the language lesson because they have already covered much of the content in their content module. They may find it boring to go over the same subject matter in both their content and language modules. The modality that is used to conduct SCLI may affect the effectiveness of this approach to provide learners with the opportunity for language learning. Sustained-content tasks that are conducted face-to-face may or may not provide learners with more opportunities to improve their language skills in comparison with those carried out via computers. Anxious learners, for example, may find it intimidating to conduct the tasks face-to-face and therefore tend to participate less in the assigned tasks. On the other hand, they may find it less intimidating to interact via computers and therefore may be willing to participate actively towards completion of the assigned tasks.

It is also uncertain if SCLI will work for learners who require competency in ESP skills. To date, most studies on SCLI focus on providing language learners with EAP skills they will need to perform well in their content course (Camhi, 2000; Carson, 2000; Dhieb-Henia, 2003; Kasper, 1995; Leki & Carson, 1994; Nelson & Burns, 2000; Pally, 2001; Williams, 2000). Although some studies claim that these skills are generic skills that are required for the learners' future profession (Dhieb-Henia, 2003; Pally, 2001), these claims are based on speculation rather than specific analysis of the learners' actual target needs. There are hardly any studies on SCLI that provide learners with exposure to ESP skills that they require both for their academic studies and their future professions. It would be interesting to find out if an ESP approach to SCLI via task-based learning through sustained-content ESP tasks could provide learners with facilitative conditions to acquire the specific communicative skills that they need for their academic studies and future profession. In this study, the Computer Science students need the ESP skills of interviewing and group discussion (during JAD and e-JAD sessions) for systems analysis and design for their academic studies and future lives as CSPs (as identified in Chapter 1).

The following section will discuss the underlying concepts relating to task-based learning through sustained-content ESP tasks.

2.1.2.3 Task-Based Learning (TBL) through Sustained-Content Tasks

Underlying my choice of task-based learning through sustained-content ESP tasks for this study is Long and Crookes's (1992) notion of task-based syllabuses. Long and Crookes expanded their concept of task-based syllabuses from Wilkin's (1976:13) view of the analytic syllabus, which entailed providing learners with samples of language that had been organized according to "the purposes for which people are learning language and the kinds of language performance that are necessary to meet those purposes". The task-based syllabus assumes task as the unit of analysis. The teacher initially identifies learners' target tasks or real-world tasks through the process of needs analysis and then designs pedagogic tasks that:

> *provide a vehicle for the presentation of appropriate target language samples to learners – input which they will inevitably reshape via application of general cognitive processing capacities – and for the delivery of comprehension and production opportunities of negotiable difficulty* (Long & Crookes, 1992:43).

In the context of task-based learning (TBL), a task is defined as "a piece of work or an activity, usually with a specified objective, undertaken as part of an educational course, or at work" (Crookes, 1986:1) or "activities where the target language is used by the learner for a communicative purpose (goal) in order to achieve an outcome" (Willis, 1996:23). Crookes's (1986) and Willis's (1996) notion of TBL draw attention to the importance of identifying the learners' learning needs and providing them with learning tasks that would facilitate the process of fulfilling these needs. This accords with the principles of syllabus and materials design in ESP which emphasize the importance of specifying learner's needs or "what exactly it is that students have to do through the medium of English" (P. C. Robinson, 1991:3) .

Long (1991) and Long and P. Robinson (1998), on the other hand, suggest a different view of task in TBL. It entails a focus on form or focusing learners' attention on specific grammatical aspects of the target language occurring during the fulfillment of the task, rather than in isolation as in the synthetic syllabus (Long, 1991; Long & Robinson, 1998). However, learners should not "become too preoccupied with form lest they lose sight of the function and purpose of language" (H. D. Brown, 1994:69).

From the above definitions of task in TBL, it seems that Crookes (1986) and Willis (1996) have not considered a focus on form at all in TBL. In contrast, Long (1991) and Long and P. Robinson (1998) consider a focus on form as a very important aspect of learning in TBL. H. D. Brown (1994) nonetheless cautions that if learners are encouraged to keep on looking at form, they may not be provided with opportunities to improve their fluency in the target language.

It seems that language learners may benefit from tasks that improve both their accuracy and fluency in the target language rather than one at the expense of the other. It is difficult to get the balance right, however, and it is worth exploring the type of tasks and the form of implementation for TBL. In the context of this study, Computer Science students in UTM have not previously been provided with tasks that meet their ESP needs. It is therefore worth researching the types of sustained-content ESP tasks and the mode of implementation for TBL that may provide Computer Science students with opportunities to develop their interviewing and group discussion skills for systems analysis and design.

Task Design and Implementation for TBL

There are a number of ways to design and implement tasks for TBL. Proponents of TBL have proposed principles of task design and implementation. According to Nunan (1993:60), the process of creating a task-based syllabus involves three major stages: "selection, grading and sequencing of linguistic content and pedagogic tasks". He suggests that the selection of tasks for a syllabus should be based on the target needs of the learners and the theories of learning for it to be effective in meeting learning goals. Brindley (1984 cited in Nunan, 1993) added that the tasks should meet the communicative needs of learners in order to have high face validity. Pica, Kanagy & Falodun (1993) propose that selection of tasks can also be done according to the characteristics and learning opportunities that they provide. Pica et al. (1993) designed a task typology as a framework for task selection in which each task type is categorized according to its interactional activity, interaction requirements, communication goal and possible outcome. Five different types of tasks are described:

1) **Jigsaw** – each interactant holds different parts of the information that must be exchanged and works convergently to achieve a single outcome. There is a two-way flow of information between interactants.

2) **Information Gap** – one interactant holds the information and the other must request this information and work convergently to fulfil a single goal. There is a one-way flow of information between interactants.

3) **Problem-Solving** – interactants share access to the information and are expected but not required to request and supply information to complete the task. They have the same or convergent goals with one possible outcome.

4) **Decision-Making** - interactants share access to the information and are expected but not required to request and supply information to complete the task. They have the same or convergent goals but more than one outcome is possible.

5) **Opinion-Exchange** - interactants share access to the information and are expected but not required to request and supply information to complete the task. They have related but divergent goals and more than one outcome is possible.

The type of task which offers the most opportunities for successful second language acquisition through comprehension of input, feedback on production and interlanguage modification is believed to be one that fulfils the following criteria (Pica et al., 1993:17):

1) Each interactant holds a different portion of information which must be exchanged and manipulated in order to reach the task outcome.

2) Both interactants are required to request and supply this information to each other.

3) Interactants have the same convergent goals.

4) Only one acceptable outcome is possible from their attempts to meet this goal.

According to Pica et al. (1993), jigsaw tasks provide the best opportunity for learning followed by information gap, problem-solving, decision-making and finally, opinion-exchange. On the other hand, Smith's (2003b) study of the influence of task types on the use of communication strategies by eighteen adult learners of English suggests that jigsaw tasks do not necessarily provide more opportunity for learning than decision-making tasks.

With reference to Pica et al.'s (1993) task typology, jigsaw tasks may provide more opportunity for learning in comparison with decision-making tasks because this task type requires interactants to produce more comprehensible input and use more communication strategies in order to successfully exchange different parts of the information that each interactant hold to complete the task. Unlike jigsaw tasks in which interactants must exchange information and work together to achieve the outcome of the task, interactants who perform decision-making tasks are only expected but not required to request and supply information to complete the task. Hence, decision-making tasks may not result in interactants having more opportunity for learning as they may not have more opportunity for pushed output and use more communication strategies to come to a decision.

On the other hand, decision-making tasks may provide language learners with a better opportunity for learning than jigsaw tasks. One possible reason is that although both types of tasks require interactants to have the same or a convergent goal, the number of possible outcomes is different. There is more than one possible outcome for the decision-making tasks but only one possible outcome for the jigsaw tasks. Since decision-making tasks enable interactants to choose from a number of possible outcomes before they finally come to a decision, this type of task may provide more opportunity for language learners to negotiate for meaning. For example, there may be numerous instances or signals of non-understanding of suggestions made by the interactants, requests for clarification of unclear information by the interactants or requests for confirmation that the interactant's expression has been clearly understood, before a final decision can be made.

Smith (2003b) suggests that jigsaw tasks do not necessarily provide more opportunity for learning than decision-making tasks as his research results revealed no significant differences between task type (jigsaw and decision-making) and communication strategy use among adult English language learners. According to Smith (2003b:45) "this may be due to the fact that though the tasks differed in structural makeup, the requirements placed on the learners to cooperatively solve these particular tasks tap the same psychological processes". Furthermore, the two types of tasks may be more similar than different as they require the learners to perform a pedagogical task that is based on an authentic task (Smith, 2003b:45).

Task type is not the only thing to affect opportunities for learning. The age and motivation of the learners may have an effect on second language acquisition. A group of primary school language learners who are not used to expressing opinion may not have much to say as they have not developed argumentative skills in any language. On the other hand, this type of learners may be highly motivated to complete a jigsaw task as it is a simpler and more controlled task. The authenticity of the tasks may also play a role in providing language learners with real opportunities for pushed output. With reference to Pica et al. (1993) and their taxonomy of tasks, jigsaw tasks may be the least authentic as it is the simplest and most controlled task with a clear outcome than expected in the workplace environment. It may require the least number of turns to complete and negotiation of meaning is also least likely to occur as each interactant holds different parts of the information that must be exchanged to achieve a single outcome. Information gap, problem solving, decision-making and opinion-exchange are more authentic types of tasks as they are more common in the workplace. For example, CSPs perform information gap task type when they elicit information for systems development from their clients through interviews. They conduct opinion-exchange tasks when they exchange opinions and suggestions with their clients during a JAD session. Hence, it would be interesting to find out the extent to which TBL through sustained-content ESP tasks provides learners with real opportunities for learning.

In terms of the grading and sequencing of tasks, Nunan (1993; 2004) proposes that these can be done in relation to what is important to the learner, the familiarity of the content and the level of difficulty. Prabhu (1987) suggests that the level of difficulty or complexity of the task can be determined by the amount of information that is provided for task fulfillment and the number of cognitive operations that are required to complete it. A simple task (adding four and five or giving directions from location A to location B of an area with which the learner is familiar) would be less cognitively demanding than a complex task (doing algebra or giving directions from location A to location B and then to location C of an area with which the learner is unfamiliar with) as it demands less information processing of mental operations such as attention (see Schmidt, 1990, 1993) and memory (see Baddeley, 1986; Baddeley & Hitch, 1974; Gathercole & Baddeley, 1993) on the language learners for its completion (P. Robinson, 2001b).

There are contrasting viewpoints on how the complexity or cognitive difficulty of tasks may affect the performance of language learners. Skehan and Foster (2001:188-189) suggest that complex tasks or tasks which have a high cognitive load could probably lead to less accurate language production than simple tasks. Since humans acquire limited capacity to process information and have to prioritise where they allocate their attention (Skehan, 1992), complex tasks may deter learners from using "more attention-demanding structures in favour of simpler language for which they have already developed automatic processing" or to focus less attention on language forms (Skehan & Foster, 2001:189). For example, Skehan and Foster's (2001) study which examines second language learners' performance on three different types of tasks (a personal information-exchange task, a narrative task, and a decision-making task) suggests that lower accuracy in language production is associated with higher complexity of tasks.

On the other hand, P. Robinson (2001a) proposes that complex tasks may promote greater accuracy than simple tasks because the former task type may lead learners to pushed output (Swain, 1985, 1995) to meet the cognitive demands of the tasks and cause them to reanalyze and restructure their current linguistic resources. For example, a study by P. Robinson (1995) has demonstrated that a "There-and-Then" task which requires English language learners to describe events shown on a cartoon strip in the past tense with no context support, elicited more accurate production than a "Here-and-Now" task which is less cognitively complex and makes fewer demands on memory resources as it allows the learners to look at the picture strip as they describe the events in the present tense.

Left to their own devices, language learners may tend to use simpler language and focus less on form to complete complex tasks than simple ones due to its high cognitive load. However, learners in P. Robinson's (1995) study may have produced greater accuracy in language production towards completion of the "There and Then" task than the "Here and Now" task because of different task conditions. In the former task, the learners are prompted to describe a cartoon strip in the past tense but not allowed to look at the picture as they narrate it. On the other hand, the later task allowed the learners to look at the picture strip while narrating it using prompts in the present tense. The "functional complexity of maintaining displaced reference" when describing events in the past tense without context support may have prompted the learners to produce more accurate language to attend to the hearer's needs to comprehend the narration (P. Robinson, 1995:111).

Due to the contrasting viewpoints on the effects of task complexity on language performance, providing language learners with a combination of simple and complex tasks may offer them more opportunity for language development. This can be done by sequencing the tasks according to their cognitive complexity. Learners can initially be given a simple task followed by more complex ones. Robinson's (2001b) study suggests that the gradual increments in the cognitive demands of a sequence of tasks from simple to complex may lead to an increment in language learners' fluency and accuracy in language production. It may also provide the most favourable circumstances for language automatization and skill development (P. Robinson, 2001a:318). Although such gradual change may not change the learner's perception in terms of task difficulty (P. Robinson, 2001a:318), it may help to reduce the learner's anxiety in language production (P. Robinson, 2001b).

In the context of SCLI, this approach to language instruction places a high cognitive load on language learners as it requires the learners not only to deal with content but also learn new language items or skills through the medium of the content area. In SCLI, learners may use simple language to complete sustained-content tasks as they have to allocate their attention to processing new concepts and information that rely on earlier ones. However, there is a possibility that learners may be faced with a situation where instead of using simple statements for task completion, they have to use complex language that is appropriate for the task and focus more on producing accurate language. Hence, it is unclear if SCLI promotes the use of simpler or complex language and if it encourages both fluent and accurate language production.

In TBL, familiarity with the task content or language input data that is useful to perform the target task (P. Robinson, 2001a:292) may facilitate the production of more accurate language by initiating the learners' shift of attention:

> *this shift, from a preoccupation with finding the expressions to a greater capacity for monitoring formulation, may be precisely what teachers might wish to encourage since it may enable learners to pay more attention to the task of matching language for concepts, and possibly to improving their knowledge and organization of the language* (Bygate, 1996:144).

However, in SCLI, learners are not thoroughly familiar with the contents of its sustained-content tasks. A little bit of new information related to information provided in an earlier task is gradually added to each new task. They are therefore learning the task contents as they are doing the task.

The technique of immediate task repetition may enable learners to become familiar with the contents of sustained-content tasks and probably initiate the production of more accurate performance as the language learners' knowledge of the target language becomes automatized (Lynch & Maclean, 2001). Providing different versions of the same task or task repetition may help to improve learners' fluency and complexity in the target language due to the "effect of highly contextualised cognitive rehearsal" (Bygate, 2001:42). In addition, it may help develop learners' discourse skills (Bygate & Samuda, 2005).

Although there are possible benefits to task repetition, it may also have an adverse effect on learners. They may be reluctant to re-engage with a task that is similar to one they have already completed. In this case, it would be difficult to maintain the learners' interest and motivation while re-using the same or slightly changed material. Language instructors may find it challenging to find interesting and creative ways of repeating communicative tasks and encouraging language development.

Several proponents of TBL have proposed various ways of implementing tasks (see J. Lee, 2000; Prabhu, 1987; Skehan, 1996; Willis, 1996). However, there is a similarity between them in terms of the three principal phases of task implementation. The first phase is the "pre-task" phase which involves activities such as introduction to the topic and task, planning for the task, conducting a similar task in preparation for the coming task, and focusing on the language forms that will be useful in the coming task. The second phase is the "during-task" phase that requires the learners to complete the task as instructed either within a limited time duration or otherwise. The final phase is the "post-task" phase which consists of follow-up activities such as task repetition, public performance, analysis of task performance and consciousness-raising activities. According to Ellis (2003:243) only the "during-task" phase is mandatory in TBL, however the other two phases "can serve a crucial role in ensuring that the task performance is maximally effective for language development".

With reference to the needs analysis conducted in Chapter 1, other factors should also be considered apart from task design and implementation issues for TBL for Computer Science students. They include the students' need for a simulated environment to practice e-JAD, a real-time online communication of the sort that is common among CSPs, and a less face-threatening setting to practise the specific communicative skills of interviewing and group discussion for systems analysis and design (see Chapter 1). Computer-mediated communication (CMC) tools have the potential to provide a variety of affordances, for example by providing a less face-threatening simulated environment for Computer Science students to rehearse face-to-face oral communicative skills and to practice authentic workplace e-JAD sessions. The following section will discuss the affordances of the CMC environment as a technological tool and a tool for language learning.

2.2 Computer-Mediated Communication (CMC)

There has been little research into the affordances of CMC as a modality for TBL through sustained-content ESP tasks, particularly for Computer Science undergraduates. This study will propose a methodology for conducting research of this type with the theory of affordances and situated cognition as the underlying principles.

2.2.1 A Definition of Computer-Mediated Communication (CMC)

The traditional resources used by second and foreign language learners (textbooks, cassette tapes and videotapes) are now being supplemented by computers. The attendant concept of computer-assisted language learning (CALL) is defined by Levy (1997:1) as "the search for and study of applications of the computer in language teaching and learning". For Wyatt (1984:4), CALL is "the whole range of possible roles that the computer can play" in language learning. Among the important roles of computers in CALL are those of tutor, tool or tutee (Taylor, 1980). The role of the computer as a tool that is used to augment human capabilities includes application programs such as word processor, database and spreadsheet programs as well as communication tools under the umbrella of computer-mediated communication.

Herring (1996:1) defines computer-mediated communication (CMC) as "communication that takes place between human beings via a computer". Levy (1997:79) describes CMC as "concerned with communication between two or more participants via a computer" either locally on a local area network or at a distance over the internet on a wide area network. The term CMC is "used generically in the social sciences to cover email, bulletin boards, discussion lists, and computer-conferencing, both text-based and video-based" (Levy, 1997:79). CMC existed in a primitive form in the 1960's but only began to be used widely in the late 1980's. It allows either asynchronous (different time) or synchronous (same or real time) modes of communication among language learners with access to the network.

Synchronous or asynchronous CMC can be co-located (in the same place) or remote (in different places). Examples of CMC tools with the above features are shown in

Table 2.2 placed in the time/space matrix devised by Dix, Finlay, Abowd & Beale (1993). These technological tools have various affordances. The notion of affordances as described by Gibson (1977) and the affordances of synchronous CMC will be outlined in next the sub-section.

Table 2.2 Time/space matrix for computer-mediated communication (CMC) tools

	Co-Located (same place)	**Remote (different place)**
Synchronous (same/real time)	Chat Tools, MUDs, MOOs	Computer Video Conferencing
Asynchronous (different time)	Bulletin Boards Discussion Lists	E-mail

2.2.2 Affordances of Synchronous CMC

The concept of affordances began with Gibson (1977), a perceptual psychologist, who coined the term "affordance" to refer to the relationship between an "actor" (animal or person) and its surroundings or environment. Norman (1988) expanded Gibson's notion of affordance in his book entitled *Psychology of Everyday Things*. He suggests that the affordance of an object is "the perceived and actual properties of the thing, primarily those fundamental properties that determine how the thing could possibly be used" that would provide clear evidence to its operations (Norman, 1988:9).

Synchronous CMC technology has both input and output devices that can provide technology affordances. Its input devices such as a keyboard, a mouse, a scanner, a touch screen, or a microphone, together with the appropriate software, can transform information from the user into data that a computer application can process (Preece et al., 1994:212). Its output devices such as computer monitors, printers and earphones can "convert information from an electronic, internal representation in a computer system into some form perceptible by a human, which is known as output" (Preece et al., 1994:238). Different sets of input and output devices have to be interfaced to a particular program in a particular way to use them as a modality to perform required tasks. The choice of devices should help users to perform the tasks effectively, efficiently and enjoyably.

Synchronous CMC tools which comprise alphanumeric or qwerty keyboards, mice, computer monitors and chat software such as Microsoft NetMeeting, Yahoo Messenger and MSN Messenger afford text-based synchronous CMC between two or more interlocutors. In text-based synchronous CMC, text messages that are keyed-in using an alphanumeric keyboard and a mouse appear synchronously on the screen of the interactants' computer monitors when these devices are interfaced with chat software that are installed in networked computers.

This mode of communication affords language learners a different environment to experience language learning than that of face-to-face communication. Learners will have to type their message using a keyboard instead of producing it orally. They will be able to see each other's messages on their computer screen but will not be able to see each other face-to-face unless they are located in the same computer room. They can therefore choose to remain anonymous while interacting with their interlocutors. Learners who are anxious about communicating face-to-face will benefit from this mode of communication as it may help to make them feel less anxious and more confident about interacting in the target language. Unlike face-to-face communication, they will not be able to see each other's facial expression and body language throughout the interaction. Hence, they may worry less about making grammatical mistakes or mispronouncing words in the target language.

The time lag that is present in text-based synchronous CMC will provide the learners with the opportunity for delayed response time. The learners may not feel obliged to respond immediately to their interlocutor's prompts and will be able to plan and edit their responses before sending them through the chat environment. This mode of communication can also be used to rehearse communicative skills and simulate text-based electronic discussions such as e-JADs.

Synchronous CMC tools which consist of audio-based communication software such as Divace Duo, Horizon Wimba's voice tools, Skype and Thunderwire, together with headsets (earphones that are attached with a small mouthpiece that functions like a microphone), and computer monitors, afford audio-based synchronous CMC. In audio-based synchronous CMC, oral communication is transmitted from the mouthpiece to the earphones of the interactants' headsets when these devices are interfaced with audio-based communication software that is installed on networked computers and controlled using a mouse. Audio-based synchronous CMC is different from chat interaction as it allows a two-way oral rather than written communication. Although it is quite similar to face-to-face interaction, the experience of wearing a headset and not being able to see each other's facial expression and body language while communicating may provide learners with a sense of security and is less face-threatening. This form of communication can be used to rehearse face-to-face pair or group oral interactions.

Synchronous CMC technology (text-based and audio-based) affords a learning environment for its users. For example, it mediates the abundant and rapid exchange of information between users, provides access and rehearsal to a variety of learning experiences through the "use of simulations that replicate complex behaviour" and offers the potential for communication and collaboration among interactants (Conole & Dyke, 2004:117). Due to the time lag in text-based synchronous CMC, it affords conditions for planning and reflection because users have a longer time to think of a response. Audio-based synchronous CMC on the other hand affords immediate response as in face-to-face interaction.

There are numerous studies which indicate the positive and negative affordances of synchronous CMC (the text or chat mode in particular) as a pedagogical tool for language learning. Several studies suggest that it provides language learners with the conditions for planning, reflection, noticing and repair of language production, the opportunity to rehearse face-to-face communication in a less face-threatening situation, a simulated environment to practise online communication, and the opportunity to develop oral skills. There are also studies which highlight a few problems with synchronous CMC. For example, it affords information overload and lack of accuracy and coherence in online interaction. The following sections will discuss studies of the affordances of text-based synchronous CMC in further detail.

2.2.2.1 Planning of Message and Noticing of Errors

Text-based synchronous CMC permits delayed response, and thus provides language learners with longer processing time to plan the structure of their message, notice their own linguistic errors, notice the feedback on problematic linguistic forms provided by their interlocutors, and make the relevant corrections or revisions (Hudson & Bruckman, 2002; Kelm, 1992; Kroonenberg, 1994/1995; Lai & Zhao, 2006). For example, Kelm (1992) found that although a chat environment requires a certain degree of spontaneity, a group of fifteen learners of Brazilian Portuguese who participated in a synchronous computer-assisted class discussion noticed linguistic errors in their interaction and attempted to correct the mistakes. In one exchange, a student noticed that the word "shoes" in Portuguese was misspelled by a few other students. This student then provided the correct spelling of the misspelled word which was subsequently used correctly in the interaction. This is an example of LREs (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) in the students' chat interaction.

In another study, Kroonenberg (1994/1995) found that a homogeneous group of high school ESL students who worked in pairs to discuss and debate ideas on everyday life issues in a synchronous CMC chat mode were able to plan and reflect upon their ideas in the midst of interaction and correct what was written on the screen. This is due to the slight time lag in synchronous CMC. Similarly, Hudson and Bruckman (2002) suggest that a time delay in synchronous CMC enabled four classes of second-year college French learners in their study to have time to think and compose their message without holding up the class discussion. The condition for planning that synchronous CMC provides may allow learners to conceptualize and formulate their message before sending it to their interlocutors. This may help to improve their fluency and complexity in language production due to the reduction in the information processing load of the working memory during chat interaction.

A study conducted by Lai and Zhao (2006:110) suggests that text-based online chat has the capacity to promote language learners' noticing of their own mistakes and the noticing of negotiation of meaning or "noticing the feedback, indicating non-understanding or misunderstanding that is provided in a negotiation of meaning". In their study, a group of six mixed-proficiency dyads of ESL learners conducted one spot-the-difference task face-to-face and another via online chat. Instances of self-corrections and the noticing of negotiation of meaning from each mode of interaction were then tabulated and calculated for significant differences. The results of this study indicate that online chat elicited more LREs and negotiation of meaning than face-to-face interaction. The difference in the quantity of LREs was found to be statistically significant.

According to Lai and Zhao (2006:112), the extra time that is permitted by text-based synchronous CMC might lead to more noticing of errors than in face-to-face interaction because it places less cognitive load on the learners' limited working memory capacity so that they can focus their cognitive ability to "process the input and monitor their own language output" by "reviewing and evaluating the linguistic forms in their output". Furthermore, the "relative permanency of the text" in text-based online chat could provide the learners with the notion that it represents their language ability and therefore encourage them to monitor their language production and become more aware of its correctness (ibid).

The above studies therefore suggest that because text-based synchronous CMC affords composition time, it may provide learners with conditions for planning and encourage the noticing of errors. The delayed response that text-based synchronous CMC permits may provide learners with a longer processing time to conceptualize, formulate and monitor their own language production. This may help learners to improve the quality of their language production in terms of fluency, accuracy and complexity as it allows them to attend to information processing systems, placing a high demand on Levelt's (1989) notion of the conceptualization, the formulation and the self-monitoring systems in discourse production. However, learners may not have the declarative knowledge of the correct spelling and grammatical structure of the target language. They may not be able to produce accurate and complex language even though text-based synchronous CMC affords composition time for them to plan their message and notice errors. Furthermore, learners may not bother about monitoring their own language production to produce linguistically correct language. They may just decide to focus on the meaning rather than form throughout the interaction. They may be satisfied with the form of language that they produced as long as their interlocutors understand what they meant.

Text-based synchronous CMC's affordance to facilitate conscious attention to errors in the learners' language production is a useful condition for second language acquisition as it enables the learners to process linguistic features in the input that otherwise might not be noticed (Schmidt, 2001). However, the types of task imposed in text-based synchronous CMC might affect the levels of noticing because according to P. Robinson (2001b), different tasks provide different cognitive loads on the learners' limited working memory capacity. Tasks which are cognitively complex (e.g. pedagogic versions of real-world tasks that require reasoning, or thinking and providing answers to unexpected questions) demand higher cognitive loads and information processing on the learners' working memory than cognitively simple tasks (P. Robinson, 2001b) and may therefore initiate more instances of LREs such as questioning one's own or others' language use and self- or other-initiated corrections (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) and negotiation of meaning (Long, 1983b; Varonis & Gass, 1985) (see Section 2.1.2.1). On the other hand, Skehan and Foster (2001:188-189) suggest that complex tasks or tasks which have a high cognitive load could probably lead to less accurate language production than simple tasks, as complex tasks may deter learners from using "more attention-demanding structures in favour of simpler language for which they have already developed automatic processing" or to focus less attention on language forms. Due to these contrasting views, providing learners with a combination of simple and complex tasks offer more opportunity for language development.

With reference to the results of previous research, providing Computer Science students with composition time via text-based synchronous CMC may or may not encourage them to notice mistakes in their interaction and conduct self/other-initiated corrections. It will be interesting to discover if LREs occur when students use text-based synchronous CMC to conduct sustained-content ESP tasks.

A note of caution is that although prior studies claim that text-based synchronous CMC affords focus on form such as noticing of errors and self-correction, learners may choose to ignore some of the recurring linguistic errors they make in the online exchange because they may focus on meaning rather than form of the exchange due to the relatively quick pace of online interaction which requires some spontaneity. Learners may not be aware of some of the recurring linguistic errors or fail to correct linguistic errors if they have not acquired declarative knowledge of the correct form.

2.2.2.2 Reduction of Anxiety

Research in the area of CMC also suggests that chat-based electronic discussion can benefit language learners who suffer from foreign language anxiety by providing a low-pressure environment. According to Horwitz et al. (1986:128), foreign language anxiety is "a distinct complex of self-perceptions, beliefs, feelings, and behaviours related to classroom language learning arising from the uniqueness of the language learning process". MacIntyre and Gardner (1993) propose that it is the result of continuous negative experiences with the target language. "At the earliest stages, the language learner may experience a form of state anxiety, a transient apprehensive experience" but with "repeated occurrences of state anxiety, the student will come to reliably associate anxiety with performance in the second language" (MacIntyre & Gardner, 1993:6).

Language anxiety is a unique form of anxiety that "can be discriminated reliably from other types of anxiety" such as audience anxiety and interpersonal anxiety (MacIntyre & Gardner, 1991:530). Horwitz et al. (1986) proposed three forms of anxieties as the components of foreign language anxiety with reference to the findings of their study on anxious university students at a learning skills center: 1) communication apprehension, 2) test anxiety and 3) fear of negative evaluation.

Horwitz et al. (1986) also developed a 33-item foreign language classroom anxiety scale which reflects the three components of foreign language anxiety. The first component, communication apprehension, is the fear of communicating with other people which affects language learner's abilities to speak or listen to a spoken message. People who experience difficulty speaking in groups would normally be apprehensive about speaking in a foreign language because they believe that they will struggle trying to understand others or making themselves understood. The second component, test anxiety, normally occurs during performance evaluation such as quizzes, assignments and exams. In foreign language learning, oral tests would normally trigger anxiety among language learners who are anxious about test failure. The final component, fear of negative evaluation, refers to worry about others' negative impression of the speaker due to limited proficiency in the target language.

Anxiety can be associated with all four language skills: reading, writing, listening and speaking. However, speaking activities are the most common triggers of foreign language anxiety. Beauvois (1999) reported that 90% of the 40 intermediate French learners in her study rated speaking in the target language as the most uncomfortable situation. In Price's (1991) qualitative study, all ten French learners who experienced high foreign language anxiety consistently indicated having to speak in the target language as the greatest source of anxiety. In another study conducted by Chang (2002), 132 Korean students of English who were asked to respond to a questionnaire about anxiety in the English language classroom (adapted from Horwitz et al.'s foreign language classroom anxiety scale) tested high on speech anxiety. For example, 70% of them agreed that they started to panic when they had to speak in the English language classroom and 56% felt self-conscious about speaking English in front of other students. When a similar questionnaire was distributed to 850 Computer Science students in a preliminary investigation (see Section 1.4.2.3), 58% agreed that they started to panic when they had to speak in the English language classroom and 45% felt self-conscious about speaking English in front of other students. These studies suggest that many language learners experience a certain level of anxiety about communicating orally in the target language.

Helping students to reduce foreign language anxiety is a concern for language instructors. Several CMC studies have reported that synchronous CMC creates a less stressful and less face-threatening setting that may help reduce learners' communicative anxiety in a foreign language (Arnold, 2002; Beauvois, 1998; Freiermuth, 1998; Kern, 1995). Based on the responses of a group of 40 second semester French students to open-ended questionnaire items, Kern (1995) reported there was an indication that their experience with an online text-based synchronous environment called InterChange over seven fortnightly sessions reduced their communicative anxiety. Kern (1995) noted that students who were normally reluctant to participate in face-to-face discussion became more actively involved in the CMC sessions as they felt freer to communicate and enjoyed interacting in this low stress atmosphere. The majority (80%) expressed more confidence when participating in this environment as it allowed them more time to compose their messages.

Freiermuth (1998) found that international graduate students did not feel the pressure to produce an immediate response, and did not worry about expressing themselves in English during chat sessions. Anxious students in Warschauer's (1996a) study also reported a low level of stress in the synchronous CMC setting. In Beauvois's (1998) study, over 70% of 41 third semester French learners who participated in four weekly chat-based online discussions agreed that working in this environment was not stressful and facilitated self-expression. Ninety-two percent of the students she interviewed cited the less stressful atmosphere of the CMC environment as the reason for using the target language. In another study, Beauvois (1999) reported that all 76 students in three levels of French (elementary, intermediate and intermediate-advanced) interviewed over a three-year period unanimously agreed that synchronous CMC provided them with a stress-free environment to communicate in French. The results of an evaluative instrument administered to the students at the end of the semester were consistent with the above findings as the majority rated a low level of performance anxiety in the synchronous CMC setting.

The above studies seem to indicate that synchronous CMC discussions provide a low anxiety setting for language learners to communicate in the target language. However, the findings are based on research which used posttest measures to collect feedback about how learners felt when engaging in CMC exchanges, rather than their psychological state in general. Such studies cannot track changes in general attitudes or affect. An experiment conducted by Arnold (2002) attempted to investigate to what extent learners' participation in three different communicative modes affected their foreign language anxiety levels. Three groups of 56 third semester German learners participated in the study. Each group conducted six weekly group discussions on topics for their reading assignment or controversial everyday life issues using different modes of interaction; synchronous CMC (chat), asynchronous CMC (e-mail) or face-to-face conversation. Pretest and posttest foreign language anxiety questionnaires (adapted from Horowitz et al.'s (1986) foreign language classroom anxiety scale) were used to examine if there was any significant difference in anxiety across and between all three treatments. Qualitative data from open-ended questions provided possible explanations for the quantitative findings.

The results of the study revealed a significant reduction in anxiety about speaking in German for all three communicative modes. According to Arnold (2002), this could be due to the practice each mode of interaction provided. The differences of reduction in anxiety between all three modes of communication were not statistically significant. These findings therefore suggest that the students' anxiety level was affected by time but not by the mode of interaction. In spite of this, Arnold (2002) reported that the asynchronous mode led to more negative feedback than the synchronous mode as it was thought to interfere with the flow of the discussion. Arnold (2002:142) proposed that chat discussions should be used as a prelude to face-to-face discussions "to facilitate the carry over of any benefits that students might experience into the oral setting".

The findings of the above studies suggest that text-based synchronous CMC affords a low anxiety setting for language learners to express themselves in the target language. This mode of communication therefore has the potential to provide anxious learners with a less face-threatening environment to rehearse face-to-face oral communicative skills. It may thus provide Computer Science students with a less stressful setting to improve their English communication skills and help to reduce their anxiety and increase their confidence to participate in the English class. CMC studies which investigate the impact of text-based synchronous CMC on the development of learners' oral skills are divided, however, as will be discussed in the coming sections of this chapter.

2.2.2.3 Encouragement in Participation

In addition to helping learners to reduce their communicative anxiety in the foreign language, the low-pressure environment in online chat has a positive effect on the quantity and quality of students' participation and contribution in computer-mediated discussions. Warschauer (1997) reports on studies by Chun (1994), Kern (1995), Sullivan and Pratt (1996) and Warschauer (1996a) which quantitatively compare the amount of participation in face-to-face and computer-mediated discussions. In all these studies there was a greater amount of student participation in the CMC chat mode according to the following three measures:

- percentage of student talk versus teacher talk,
- directional focus of student talk (toward other students or toward the teacher),
- equality of student participation.

Kroonenberg (1994/1995) found that most of the students were more expressive in this mode of communication because they were able to "say" a lot of things which they found difficult to express face-to-face. Shy and quiet learners have been found to express themselves freely and contribute more to discussions and learning events in a text-based synchronous CMC environment (Beauvois, 1992; Bump, 1990; Hudson & Bruckman, 2002; Kelm, 1992; Kroonenberg, 1994/1995; Warschauer, 1996a). In several studies, learners were reported to have enjoyed this mode of communication (Beauvois, 1998; Beauvois & Eledge, 1995/1996; Blake, 2000; Freiermuth, 1998; Gruber-Miller & Benton, 2001). Their interest and motivation towards learning the target language were also found to increase dramatically through the use of synchronous CMC (Beauvois, 1992, 1998; Gruber-Miller & Benton, 2001; Kelm, 1992; Kroonenberg, 1994/1995; Warschauer, 1996b). It is possible that the less stressful and less face-threatening environment in text-based chat communication may have made them feel more positive and less anxious to participate and contribute in computer-mediated discussions as found by Beauvois (1998), Freirmuth (1998) and Kern (1995).

The low-pressure environment afforded by text-based synchronous CMC which encourages learners to communicate freely and post their entries synchronously, however, may lead to "information overload" (Warschauer, 1997:473). Kern (1995:469) reported that although 80% of the 40 French learners in his study felt more confident about participating in chat-based discussions via InterChange, the "rapid accumulation of messages on the screen" made in difficult for them "to read everything that everyone wrote" and led to lack of coherence and continuity in the exchange. The discussants can be so overwhelmed with the online messages that they choose to ignore what some of the discussants write (Moran, 1991) because unlike oral discussion where "everyone can get their word in", in chat discussions, "by the time they do the moment may be gone – it's not relevant anymore" (Bump, 1990:61). In Beauvois's (1998) study, although 41 French learners were involved in text-based synchronous classroom discussion, they tended to stay and "talk" with about four people to make the discussion more manageable.

The large number of participants involved in an online discussion may be one of the reasons for information overload. This can be avoided if the discussion does not involve the whole class but is restricted to a few discussants per group. Bump (1990) found that the increasing number of students who joined his synchronous online conference made it difficult to follow the pace of all comments posted. He therefore assigned students to groups of four or five to ensure smaller and more practical discussion, as "small groups allow people to pursue and support an argument more completely than the ordinary class discussion" (ibid:55). Furthermore, the advantages of discussion in small groups is acknowledged in the educational research community (Johnson & Johnson, 1987; Slavin, 1989).

2.2.2.4 Facilitation in Language Production

By encouraging a slower, more reflective approach and a psychologically low-pressure environment, there is also evidence to suggest that text-based synchronous CMC affects language production. Studies which attempt to analyze language functions used in online chat communication indicate that learners use a variety of functions (Chun, 1994; Kern, 1995) and more formal language (Warschauer, 1996a) in these environments.

Chun's (1994) analysis of first year German students' chat transcripts in 14 chat sessions over a period of two semesters revealed that they were able to use an array of language functions such as initiating and responding to simple statements, asking and answering questions, asking for clarification and explanation of misunderstanding or non-understanding of statements, giving feedback to others, and using greetings and leave-taking expressions appropriately when discussing everyday issues via online chat. These seem to indicate that discussions via online chat provide the opportunities for students to develop writing skills and interactive competence.

According to Chun (1994:28), the students' writing proficiency was enhanced because the various forms of sentences they wrote on the computer necessitated "not only comprehension of the preceding discourse but also coherent thought and use of cohesive linguistic references and expressions". Their interactive competence may have been developed as they were required to initiate and communicate real messages as well as expand on topics begun by others. Written competence acquired via text-based synchronous CMC may gradually improve their speaking competence since the types of sentences they produced "strongly resemble what would be said in a spoken conversation" (Chun, 1994:29).

The students in Kern's (1995) study produced a wider variety of language functions during text-based synchronous CMC sessions than during oral classroom discussions on the same topic. For example, transcripts of the students' online exchange showed much evidence of greetings and messages that were intended to establish contact between them. These were not present in the oral discussions. There were also more evidence of assertions and more varied types of questions during the online exchange than during the oral discussions. These results could be due to the "much greater student-to-student interaction and the relative absence of teacher evaluation" in chat communication (Kern, 1995:467). The absence of teacher evaluation in online interaction may be a good thing for language learners. Learners would normally be conscious and anxious of producing accurate language in the presence of their teacher. It may also deter them from producing as much comprehensible output.

Warschauer (1996a) found that text-based synchronous CMC sessions seemed to encourage English language learners to use more formal language than during oral discussions. These learners tend to use formal expressions such as "in my opinion", "over all", based on my experience", "such as" and "therefore" in the chat exchange as in written communication. These expressions were however, absent in the oral discussions as the students tend to use more informal expressions such as "because", "like", "you know", "I guess" and "for us".

There are studies which indicate that text-based synchronous CMC seems to encourage the use of language that is syntactically and lexically more complex (Chun, 1994; Kern, 1995). For example, the students in Chun's (1994) study described above were able to create not only simple one-sentence entries in text-based synchronous CMC but also paragraph length entries which consisted of a few compound and syntactically complex sentences. In another study, Kern (1995) reported that this mode of interaction encouraged his French students to produce a greater variety of verb forms and clause types, and more instances of subordinating conjunctions than during oral discussions.

From the above studies, text-based synchronous CMC seems to encourage the use of more formal, and syntactically and lexically more complex language. This could be due to a similarity of affordance between text-based synchronous CMC and written communication. Both modes of communication afford composition time which allows learners to plan their written communication and probably pushes them towards producing comprehensible output.

Text-based synchronous CMC therefore seems to be a good training environment for language learners to foster the use of a variety of language functions and syntactically and lexically complex and more formal language. Language learners such as Computer Science students who need to interact with their clients using specific language functions and formal language in their future profession may benefit from training using this mode of communication.

From the above discussion, it is evident that text-based synchronous CMC has the potential to facilitate the development of language learners' writing skills. Views on the impact of text-based synchronous CMC on oral skills are divided, however. Whether it helps learners increase their oral proficiency is less certain. Chun (1994:29) found that the types of sentences produced in computer-assisted classroom discussion (text-based synchronous CMC) "strongly resemble what would be said in a spoken conversation", and hypothesized that competence in text-based synchronous CMC could be transferred to the spoken medium. Kern (1995:462) believes since speaking in a foreign language "often does not come easily", especially to beginning and intermediate level learners, providing the learners with the opportunity to express and respond to many ideas in writing will allow them to engage "more effectively in subsequent oral discussions because their ideas have already been at least partially developed and articulated".

Several studies (Beauvois, 1997; Chang, 2002; Kost, 2004; Payne & Ross, 2005; Payne & Whitney, 2002) have claimed that practice with text-based synchronous CMC improves learners' oral skills. However, although Beauvois (1997) and Payne & Whitney (2002) found that their treatment groups using text-based synchronous CMC significantly outperformed face-to-face control groups in oral tests, Kost (2004) found no significant difference in oral skills development between text-based synchronous CMC and face-to-face participants, and Abrams (2003) found no significant difference between a face-to-face group, a synchronous CMC group and an asynchronous CMC group in terms of the lexical and syntactic quality of their speech. (Abram's synchronous CMC group did, however, produce a significantly greater quantity of text, after treatment and in comparison with the other groups). In de la Fuente's (2003) study of the effect of text-based synchronous CMC on second language vocabulary acquisition the CMC group's oral production improved significantly after treatment, but the face-to-face control group was the more successful one, outperforming the CMC group with a higher mean score in all oral tests.

Due to the divided views on the effects of chat interaction on learners' oral skills, more research is needed to ascertain if competence in text-based synchronous CMC can be transferred to oral conversation. This research aims to investigate the extent to which text-based synchronous CMC helps to develop the target oral skills needed by Computer Science students.

2.3 CMC as a Modality for TBL

Another affordance of synchronous CMC is that it may be used as a modality for TBL. As discussed earlier, the underlying principles of TBL is that tasks provide learners with the opportunity to engage in real and meaningful communication (see Section 2.1.2.3). The use of text-based synchronous CMC in TBL may help to develop language learners' communicative competence in the target language by providing them with a less face-threatening environment to rehearse face-to-face oral skills or a simulated environment to practice authentic online real-time communication.

There have been many CMC studies which use text-based synchronous CMC as a means for TBL. However, the tasks set in these studies usually involve general tasks such as language learning-related discussion on everyday issues (Chang, 2002; Hudson & Bruckman, 2002; L. Lee, 2002; Payne & Ross, 2005; Payne & Whitney, 2002; Tudini, 2003), or everyday decision making (Blake, 2000; Smith, 2003b, 2004). There has been little prior research into the use of synchronous CMC as a modality for task-based learning of languages for specific purposes. Even when the tasks have a serious professional theme (such as Freiermuth's (1998) business decision-making tasks, or Smith and Gorsuch's (2004) teaching tasks), they are not usually devised with reference to learners' academic and professional needs (the ESP needs of the participants in Freiermuth's and Smith and Gorsuch's studies are not stated).

Synchronous CMC is very common, however, amongst Computer Scientists. These professionals communicate synchronously online with colleagues, vendors and clients for trouble-shooting purposes or to conduct electronic JADs (e-JADs) at different stages of systems development (see Section 1.3.3). Various forms of text-based synchronous CMC tools such as Microsoft NetMeeting, Lotus Notes and Vision Quest can be used to provide Computer Science students with hands-on experience to practice online meetings with "colleagues" and "clients", for their current academic needs and future profession.

According to Money (1995/1996), electronic meetings such as e-JADs using synchronous CMC tools in a classroom setting would enable Computer Science students to experience what it is like to conduct a real-world systems meeting. Money (1995/1996:75) reported that the students in his study who were given the opportunity to use a synchronous CMC tool to "work through" a systems analysis problem using real-world data commented that their experience did not seem to be an "exercise" but "appeared to resemble the application of a systems meeting and communication support tool to a real-world problem". However, Money's (1995/1996) study did not provide any evidence that the training the students received helped them to develop the specific skill of online discussion for systems development, a skill that was required for their academic studies.

Synchronous CMC can therefore provide Computer Science students with exposure, in a simulated and scaffolded environment, to a form of online real-time interaction such as e-JADs that they would be likely to experience in their future professional lives. In addition, it can also provide Computer Science students who feel anxious about speaking in the target language with a less stressful setting to practice and improve specific communication skills such as face-to-face interviews and group discussions for systems analysis and design, for their current academic needs and future profession. In short, synchronous CMC may be used as a modality for TBL through ESP tasks to provide Computer Science students with situated learning (J. S. Brown et al., 1989).

According to J. S. Brown et al. (1989:32), since "knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used", the process of learning therefore is "situated". The process always takes place in a specific context and would structure a person's cognition. Due to the situated nature of learning, human cognition develops in social situations and uses "the tools and representational media that culture provides" which include computer devices such as interactive video, networks, optical media, input and output devices (Lave & Wenger, 1991:vii) to automate the cognitive processes for the acquisition of skills (Anderson, 1983). In the context of Computer Science students, when synchronous CMC is used as modality for TBL through sustained-content ESP tasks, it may help to enculturate them in the sociocultural practice of the Computer Science community. For example, it may provide them with the necessary training to acquire the specific communicative skills they need to be successful in their academic studies and future professions.

2.4 Conclusion

As a conclusion, this literature review chapter has shown the potential of combining the area of CBI with CMC to teach language for specific purposes. A possible combination is to use synchronous CMC as a modality for task-based learning through sustained-content ESP tasks. However, there are hardly any studies that have investigated the effectiveness of this new language instruction approach in meeting the ESP needs of language learners. This research therefore intends to design a set of sustained-content ESP tasks and investigate the affordances of synchronous CMC as a modality for TBL through these tasks. There were several studies involved in this research. In the following chapter, I will discuss the research design for this investigation.

CHAPTER 3

RESEARCH DESIGN

3.0 Introduction

This chapter will discuss the research design of the study. As mentioned earlier, the purpose of this study is to investigate how an English for academic purposes programme involving the use of synchronous CMC as a modality for TBL through sustained-content ESP tasks can benefit students in the process of becoming communicatively competent Computer Science professionals in the interviewing and group discussion skills for systems analysis and design. This entails the use of specific research approaches and procedures that will be described at length in the following sections of this chapter.

3.1 Approaches to Research

Research is commonly referred to as a systematic process of investigation (Hatch & Farhady, 1982:1; Mertens, 1998:2; Nunan, 1992:3). Three important elements of research are 1) a question, problem, or hypothesis, 2) data, and 3) analysis and interpretation of data (Nunan, 1992:3). The researchers' choice of inquiry method is highly dependent on their paradigm or how they perceive the world around them, namely, through deductive, inductive or a combination of inductive-deductive reasoning (Cohen, Manion, & Morrison, 2000:4). Three common categories of research paradigms are positivism/postpositivist, interpretive/constructivist and emancipatory (Mertens, 1998:8). Another paradigm that has recently emerged from the literature on research approaches is called pragmatism (see Creswell, 1994; Creswell, 2003; Maxcy, 2003; Mertens, 2005; Tashakkori & Teddlie, 1998; Teddlie & Tashakkori, 2003).

In general, quantitative research methods are characteristic of the positivist paradigm. The other extreme which is the interpretive/constructive paradigm is characterised by qualitative research methods. The pragmatist paradigm makes use of both quantitative and qualitative research methods.

The positivist paradigm, involving quantitative research methods, claims that the results of investigation or outcomes of social research can be regarded as equivalent to those of natural science (Cohen et al., 2000:8). Quantitative research requires computation of quantities of data using descriptive statistics such as means and percentages, or more complex statistical methods (correlation or inferential statistics) that may require hypothesis testing, as in an experimental research design (Henning, 1986:702). Among the advantages of quantitative research is the generalizability and reproducibility of its findings beyond its context, and the possibility of supporting or challenging present theories and models based on findings. Findings of quantitative research are less prone to bias because they are more objective, "somewhat external to and independent of the observer or researcher" (Nunan, 1992:3). There is a considerable amount of quantitative research reported in the literature on applied linguistics, especially those related to second language acquisition (see Chaudron, 1988; Day, 1986; Doughty & Williams, 1998; Gass & Madden, 1985; Larsen-Freeman & Long, 1991). A few of the criticisms of quantitative research are that its computational process provides "an artificial and spurious sense of precision and accuracy" and that "the analysis of relationships between variables creates a static view of social life that is independent of people's lives" (Bryman, 2004:78-79).

The interpretive/constructive paradigm, sometimes referred to as a naturalistic form of inquiry, involves qualitative research methods and rejects the notion that reality can be objectively known, because it is subjective, ungeneralizable and constantly changing. Since reality is complex and socially constructed, the aim of the researcher is to comprehend the social construction of knowledge and meaning associated with people involved in the research (Cohen et al., 2000:20). This can be accomplished through qualitative methods such as ethnography/participant observation, qualitative interviewing, focus groups, discourse and conversation analysis and the collection and analysis of texts and documents. Gubrium and Holstein (1997) propose four traditions of qualitative research: 1) Naturalism which seeks to describe social reality in natural settings, 2) Ethnomethodology which seeks to comprehend the natural order of talk and interaction, 3) Emotionalism which seeks to access the "inside" experience or inner reality of people, and 4) Postmodernism which emphasizes the different ways of presenting social reality. A few of the common criticisms of qualitative research are that it is too impressionistic and subjective, and difficult to replicate and generalize.

Quantitative research puts emphasis on quantification but qualitative research normally emphasizes words during data collection and analysis (Bryman, 2004:19-20). Data collected through quantitative research is therefore regarded as "hard" and "reliable", as opposed to "rich" and "deep" as in qualitative research (Bryman, 1988:103). Quantitative findings have to be tested for their reliability and validity while qualitative data have to be tested for their trustworthiness, which entails confirming truth value, applicability, consistency and neutrality (Lincoln & Guba, 1985:289-331).

Pragmatic researchers adopt multiple or mixed methods of inquiry which "arise out of actions, situations, and consequences rather than antecedent conditions (as in postpositivism)" (Creswell, 2003:11). They are mainly concerned with the research problem and employ both quantitative and qualitative methods of research to find its solution (see Creswell, 2003; Tashakkori & Teddlie, 1998, 2003b) as both methods are considered to be compatible (Howe, 1988 cited in Tashakkori & Teddlie 1998:12).

The mixed methods (Creswell, 2003; Tashakkori & Teddlie, 2003b) form of inquiry which combines quantitative and qualitative research within a single study is sometimes referred to as multi-methods (Brannen, 1992), multi-strategy (Bryman, 2004) or mixed methodology (Tashakkori & Teddlie, 1998). There are various different ways of conducting mixed methods research. Bryman (2006) suggests that the typologies of mixed methods research are developed based on the following considerations:

1. Are the quantitative and qualitative data collected sequentially or concurrently?
2. Will precedence be given to the quantitative or qualitative data?
3. What is the purpose of the integration – for example, triangulation, explanation or exploration?
4. At what phase(s) of the study does mixed methods research take place – for example; research question formulation, data collection, data analysis or data interpretation?
5. Will there be more than one strand of data – for example, a multi-strand study which involves more than one research method and data source?

Bryman's (2006) investigation of 232 journal articles on mixed methods research, over a ten-year period (1994-2003), reveals that most of the methods used in the articles were survey methods and qualitative interviews with the combination of these two instruments as the most dominant form of mixed methods – the integration of quantitative data collected by structured interview or questionnaire with qualitative data from semi-structured or unstructured interview. Bryman (2006) also found cases in which quantitative data were derived from qualitative research methods or vice versa. There are also articles that combined both quantitative and qualitative data from a single data collection instrument (ibid). Although some methodologists might argue against the integrity of this combination as a true representation of mixed methods research, it can still be considered as one of the various types of mixed methods research that occurs at the stage of data analysis (Creswell, Clark, Gutmann, & Hanson, 2003:220).

Greene, Caracelli and Graham (1989:259) propose five reasons for integrating quantitative and qualitative research:

1. Triangulation: seeks convergence, corroboration, correspondence or results from different methods. In coding triangulation, the main aim is to seek corroboration between quantitative and qualitative data.
2. Complementarity: seeks elaboration, enhancement, illustration, clarification of the results from one method with the results from another.
3. Development: seeks to use the results from one method to help develop or inform the other method; where development is broadly construed to include sampling and implementation, as well as measurement decisions.
4. Initiation: seeks the discovery of paradox and contradiction, new perspectives of [sic] frameworks, the recasting of questions or results from one method with questions or results from another method.
5. Expansion: seeks to extend the breadth and range of enquiry by using different methods from different inquiry components.

In mixed methods research, even though a researcher could have selected a particular research design to obtain a particular type of data, the results might be unpredictable as "surprise findings or unrealized potential in the data may suggest unanticipated consequences of combining them" (Bryman, 2006:99). For example, the triangulation of quantitative and qualitative data might reveal inconsistency and fail to corroborate each other. One way to resolve this issue would be to regard one of the data sets as definitive (Newby, 1977 cited in Bryman 2004) or to re-examine both data in light of the discrepancies (Deacon, Bryman, & Fenton, 1998).

The advantage of mixed methods research in the social sciences is evident as it can provide 1) answers to research questions that other methods are unable to answer, 2) more convincing inferences and 3) diverse perspectives (Tashakkori & Teddlie, 2003a:674-676; Teddlie & Tashakkori, 2003:14-17). However, the description of how both methods are used and how the data collected complement each other has to be clear so that the mixed methods study will not be considered as "less rigorous" or "thin" (Morse, 2003:195). Rather than looking for "metaphysical truth", pragmatists who adopt the mixed methods research approach would regard "what works" to be true (Tashakkori & Teddlie, 1998:12). What pragmatists intend to research and how they intend to do it depends on the "intended consequences" or what they propose to do with their research findings (Creswell, 2003:12). The purpose of the research is the main reason why they are conducting the study and should be linked to the research questions and methods (Newman, Ridenour, Newman, & DeMarco, 2003:173).

In view of the arguments outlined above, I have decided to use the mixed methods approach to inquiry. In my opinion, the use of both quantitative and qualitative research methods is not mutually exclusive. Reichardt and Cook (1979) assert the importance of using both quantitative and qualitative research methods as they believe that each method has its own distinct characteristics and they complement the other. It also enables the range of strengths of both methods "to be capitalized upon and the weaknesses offset somewhat" (Bryman, 2004:452). Although the outcome might be unpredictable, the use of both methods simultaneously will provide a better understanding of complex phenomena in the field of applied linguistics. This is indicated by the results of several studies of foreign or second language learning that use different models of the mixed methods research approach (Rocco et al., 2003:603-605).

By identifying myself with the pragmatist paradigm of research, I am able to answer exploratory research questions. It thus allows me to strengthen the underlying concepts and theories that influenced the design of my research (see Chapter 2). In the context of my study, the mixed methods approach allows me to explore with more convincing inferences and diverse perspectives, the effectiveness of a new technique of language instruction that has not been previously explored through triangulation of data collected from different research methods. It will enable me to find out the effects that resulted from the implementation of a state-of-the-art method of language instruction which involves the use of synchronous CMC as a modality for TBL through sustained-content ESP tasks for Computer Science students.

3.2 Research Design

There are two major types of research strategies in the mixed methods approach of inquiry: 1) sequential strategies and 2) concurrent strategies (see Creswell, 2003; Tashakkori & Teddlie, 1998). Sequential strategies can either involve the collection and analysis of quantitative data followed by the collection and analysis of qualitative data (sequential explanatory strategy) or vice versa (sequential exploratory strategy). Concurrent strategies use both quantitative and qualitative research methods simultaneously, either in the form of triangulation or nested to "confirm, cross-validate, or corroborate findings within a single study" (Creswell, 2003:217). The concurrent triangulation strategy uses both quantitative and qualitative methods separately but data collection is concurrent so that the findings can complement each other and be corroborated at the interpretation stage of the research. The concurrent nested strategy also involves concurrent collection of quantitative and qualitative data but one of the two research methods (less dominant) is nested within the other.

For my study, I have chosen to use the concurrent triangulation model of the mixed methods approach. Both quantitative and qualitative methods of research will be used concurrently to explore if synchronous CMC would be an effective tool to meet the needs of Computer Science undergraduates in the process of becoming communicatively competent Computer Science professionals. In Chapter 2, a new and innovative technique of language instruction which involved the use of synchronous CMC as a modality for task-based learning through sustained-content ESP tasks was proposed to address these specific English language communicative needs, drawing on concepts and theories of learning and cognition as well as language learning studies that influenced the development of this new method of language instruction.

The form of investigation used to carry out this study is longitudinal. Longitudinal study is "the study of an individual or individuals over a period, where the main focus of interest is upon any change that takes place during that time, or upon the effect of events on such change" (Davie, 1972:8). It is a collection of studies of various types carried out over a duration of time that can extend to several weeks or months in short-term investigation or several years in long-term investigation (Cohen et al., 2000:174). Repeated measurements of the same individuals or participants are conducted throughout the duration of a longitudinal study to measure changes (Wall & Williams, 1970:7). I have chosen this approach for my study because it is the only approach that can "show the nature of growth and trace patterns of change" in participants in the study, and accurately depict the "cause and effect relationships over time" (Wall & Williams, 1970:8). Further, although there have been a substantial number of ESP studies which use the longitudinal approach to study the long-term effects of CBI on the development of specific language skills, there is hardly any ESP research involving the use of CMC that studies the long-term effect of this new form of instruction on the development of specific communicative skills. Nevertheless, this form of study is time-consuming and one also has to consider the "difficulty of sample mortality" towards the end of the study and ensure that the participants who remain are representative of the original cohort sample (Cohen et al., 2000:176).

3.3 Research Questions

The purpose of this research is to explore if synchronous CMC would be an effective tool to meet the demands of Computer Science as an academic subject and as a profession. To this end, it aims to investigate to what extent the use of synchronous CMC as a modality for TBL through sustained-content ESP tasks provide opportunities for the development of Computer Science students' ESP skills. In this research, this new form of language instruction is referred to as the CMC ESP method.

The research questions for this research are:

1. Does the CMC ESP method provide opportunities for the development of Computer Science students' interviewing skills for systems analysis and design?
2. Does the CMC ESP method provide opportunities for the development of Computer Science students' group discussion or JAD skills for systems analysis and design?

To answer the above research questions, I used the one-group pre-test and post-test pre-experimental research design to test the following null hypothesis:

Null Hypothesis for Research Question 1
There would be no significant difference between Computer Science students' pre- and post-treatment interview test mean scores.

Null Hypothesis for Research Question 2
There would be no significant difference between Computer Science students' pre- and post-treatment group discussion test mean scores.

Since the CMC ESP method is a complicated technique that has never been tried before, I needed to prepare for the Main Study which aims to answer the above research questions. Two feasibility studies were carried out, Feasibility Study I and Feasibility Study II, to ensure that the proposed method can be conducted effectively for the Main Study. The feasibility of using synchronous CMC tools to conduct CMC tasks was carried out during Feasibility Study I (see Chapter 4). The design and feasibility of using a set of CMC ESP tasks in the context of the learners' academic environment were investigated during Feasibility Study II (see Chapter 5).

Upon completion of the Main Study (see Chapter 6), a Follow-Up Study was conducted to provide data for time triangulation with the findings of the Main Study. Cohen and Manion (1994:236), refer to "time triangulation" as a form of research procedure, in which data is collected from "the same group at a different point in the time sequence". The Follow-Up Study intended to further address the research questions of the Main Study by investigating the long term effects of the treatment through the students' academic performance in a content module. (see Chapter 7). Figure 3.1 illustrates the research procedure of the study.

3.4 Research Participants

The research participants were two cohorts of Computer Science undergraduates at UTM. The first cohort of students, Group 1, was involved in Feasibility Study I of the research. They consisted of seventy-two second year undergraduates. The second cohort of students was first year undergraduates divided into three convenient groups of about thirty students. Participants were assigned to Group 2A, 2B or 2C, according to registration in the three sections of the English for Academic Communication module. The first group of first year students participated in Feasibility Study II (Group 2A). The second (treatment) group were participants in the Main Study (Group 2B). The third group was assigned as the control or comparison group since they had not experienced the CMC ESP method during their studies at UTM (Group 2C). During the Follow-up Study, the academic performance of participants in Group 2B was compared with those in Group 2C, in their Systems Analysis and Design Methods module. Figure 3.1 illustrates the research participants in each stage of the study.

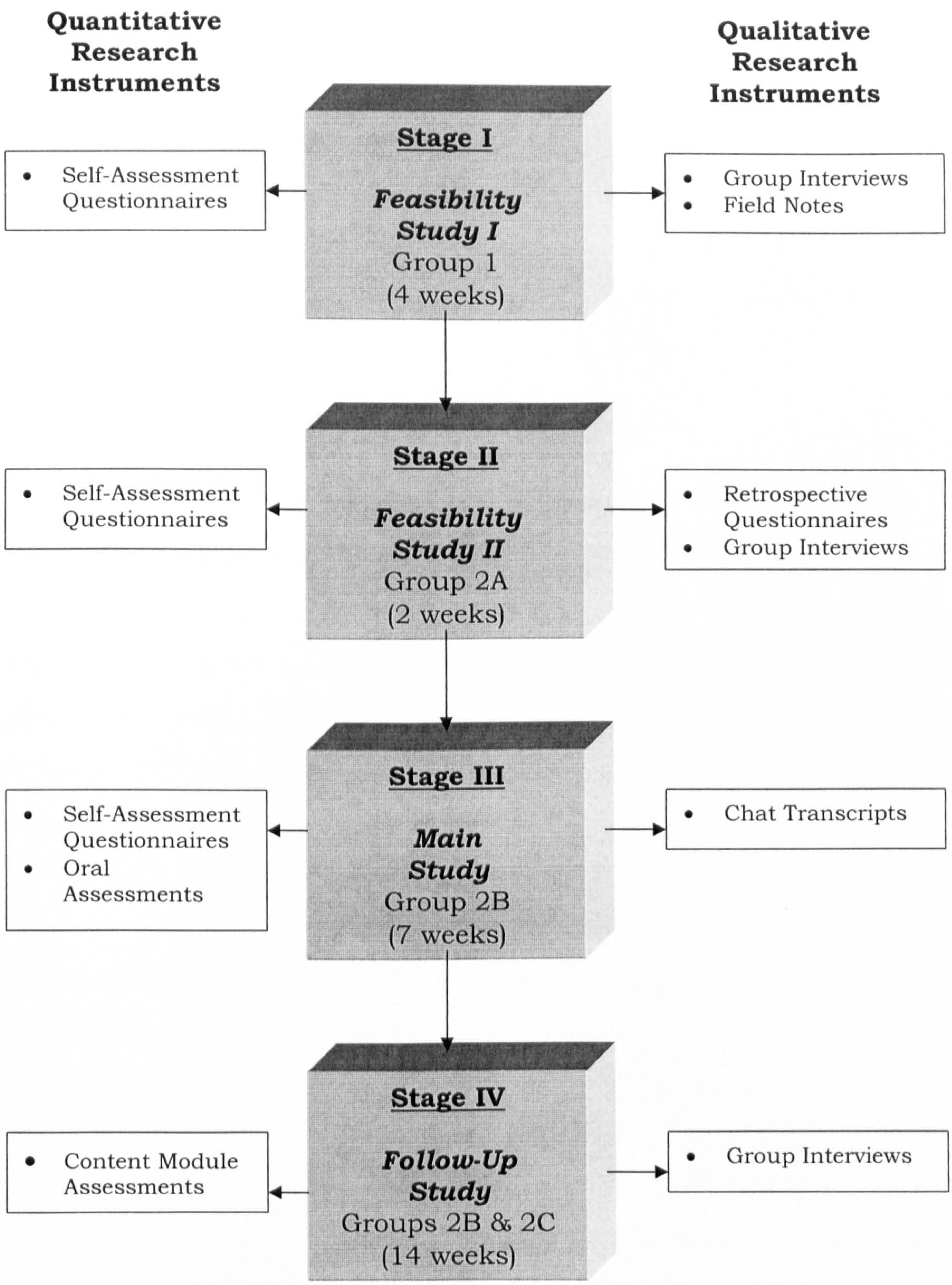

Figure 3.1 Research procedure of the study

Ethical issues were considered where I collected data from the participants in this research with reference to the recommendations of good practice in applied linguistics published by the British Association of Applied Linguistics (available at http://www.baal.org.uk/goodprac.pdf). I informed the participants of the purpose of my research and obtained informed consent for their participation. I also advised them that they had the right to decline or withdraw from participation at any point in my research. The participants' confidentiality was respected by making their data secure and anonymous.

3.5 Research Instruments

Rea-Dickins and Germaine's (1992) notion of descriptive data-based evaluation and Ellis's (1997; 1998; 2003) concept of learning-based evaluation influenced the technique that I used to assess the extent to which the CMC ESP method helped to develop the subjects' interviewing and group discussion skills for systems analysis and design. A descriptive data-based evaluation involves collecting information which provides language instructors with "insights into what is actually happening when teaching and learning is taking place" using instruments such as questionnaires and interviews (Rea-Dickins & Germaine, 1992:58). A learning-based evaluation entails obtaining information about whether exposure to the learning method or material within a module or programme "has resulted in learning, either in the form of new linguistic knowledge or in terms of enhanced ability to employ specific skills or strategies" (Ellis, 1998:229). It can be conducted through some form of test and analysis of the discourse or interaction that results from exposure to the learning method or material (Ellis, 1998:324).

I used both quantitative and qualitative research methods to obtain insights into the affordances of synchronous CMC and to explore its effects when used as a modality for TBL through sustained-content ESP tasks. Among the data collection instruments used in this research were descriptive data-based evaluation instruments, which included self-assessment questionnaires, retrospective questionnaires, group interviews and field notes, and learning-based evaluation instruments consisting of oral assessments, chat transcripts and content module assessments. The following sub-sections will provide a description of these research instruments.

3.5.1 Questionnaires

The use of questionnaires is very common among educational researchers in general and ELT researchers in particular, especially in the areas of study skills, needs analysis, assessment, curriculum development, writing skills, metacognitive strategies and programme evaluation (McDonough & McDonough, 1997:171, 179-181). A questionnaire is "a set of questions on a topic or group of topics designed to be answered by a respondent" (Richards, Platt, & Platt, 1992:303). It may consist of only open-ended or closed questions, or a mixture of both. Open-ended questions would require more than a one word answer or a longer response whereas closed questions such as likert scaled, rating scaled, multiple-choice, yes/no, naming and gap-filling questions, need a single answer or a limited number of responses (Wray, Trott, & Bloomer, 1998:173-177). According to Nunan (1992:143), questionnaires enable researchers to gather data in field settings, and "the data themselves are more amenable to quantification than discursive data such as free-form fieldnotes, participant observers' journals, the transcripts of oral language". Questionnaires, which are commonly referred to as "self-report methods" are also useful data collection instruments as they can provide researchers with the informants' accounts of their experiences and perceptions of a project or programme to understand the effects of its implementation (Weir & Roberts, 1994:140-141).

The limitation of questionnaire data is that since it is "indirect" data that is obtained "through the eyes of an intermediary" as opposed to direct data from documents, observations, field notes and test scores, its credibility may be questionable (Weir & Roberts, 1994:141). The respondents might provide answers that give a positive impression about their ability or simply to please the researcher. Furthermore, data from questionnaires can be unreliable if uncorroborated with other data because there is a possibility that the wording of its questions might influence the respondents' answers as in the case of attitude and opinion enquiries (Weir & Roberts, 1994:141). In order to address these problems, I designed questionnaires for this research carefully, with clear instructions and wording of questions that are not leading, complex and confusing. As suggested by Bryman (2004:156-160), I also used questions that have been employed by other researchers because it is in a sense using questions that have already been piloted for you.

3.5.1.1 Types of Questionnaires used in this Research and Data Analysis

I used two forms of questionnaires for this research: 1) a self-assessment questionnaire and 2) a retrospective questionnaire. The self-assessment questionnaire is a type of measurement questionnaire that uses a Likert scale. The aim of the self-assessment questionnaire was to gain insights into the affordances of synchronous CMC tools in terms of technology, affective factors and for language learning from the point of view of the students who used the synchronous CMC tools in this research. This instrument was used in Feasibility Study I, Feasibility Study II and the Main Study (see Figure 3.1). A detailed description of how this instrument was designed and administered is provided in the chapters which describe the studies that used this type of questionnaire (Feasibility Study I in Chapter 4, Feasibility Study II in Chapter 5 and the Main Study in Chapter 6).

The self-assessment questionnaire data collected in Feasibility Study I and Feasibility Study II were analyzed using descriptive statistics by tabulating the participants' responses to every statement in the questionnaire in percentages and then calculating the degree of agreement or positive assessment for each statement. Questionnaire data from the Main Study were also analyzed using descriptive statistics as in Feasibility Study I and Feasibility Study II. In addition, any significant differences between the participants' responses before and after the intervention were calculated using sign tests.

The retrospective questionnaires consist of open-ended and closed questions. The aim of this type of questionnaire was to gain insights into the students' experience and reaction to the CMC ESP tasks or sustained-content ESP tasks they completed via synchronous CMC during Feasibility Study II (see Figure 3.1). Their responses to each of the CMC ESP tasks were used to determine the suitability of the tasks for the Main Study. Data from closed questions were tabulated according to frequency. Those from open questions were analyzed using content analysis by listing all the responses to each question and deciding on their categories (Gillham, 2000a:63-69). According to Gillham (2000a:64), in content analysis of open questions data, there should be "as few categories as possible without doing violence to the data, and while still having enough for the purposes of the research". The tasks were either retained or modified for the Main Study, with reference to the students' responses to the retrospective questionnaires.

3.5.2 Interviews

An interview is "any interaction in which two or more people are brought into direct contact in order for at least one party to learn something from the other" (Brenner, Brown, & Canter, 1985:3). Like questionnaires, interviews are commonly referred to as "self-report methods" which can provide information about participants' experiences and perceptions concerning a project or programme (Weir & Roberts, 1994:140-141).

3.5.2.1 Types and Techniques of Interviewing

Interviews can be divided into three types: 1) structured, 2) semi-structured and 3) unstructured (McDonough & McDonough, 1997:182; Verma & Mallick, 1999:123). In structured interviews, the interviewers have a list of questions which are "tightly specified in advance" (McDonough & McDonough, 1997:182). At the other extreme, in unstructured interviews, the interviewers begin with some form of objectives but the "direction of the interview intentionally follows interviewee responses, with some of the characteristics of natural conversation" (ibid:184). Semi-structured interviews lie between these two extremes. I selected the semi-structured form of interview for this research because it enabled me to remain "in control of the direction of the interview but with much more leeway" to change the sequence of the questions and probe for further information to obtain richer data (ibid:184).

There are several techniques of conducting interviews. Individual or one-to-one interviewing involves a single interviewer and a single interviewee. In a group interview, "several participants in a social context can be interviewed simultaneously" (Frey & Fontana, 1991:175). Group interviewing is quicker than individual interviewing and can save the researcher time and money as well as minimizing disruptions because a few individuals are interviewed at the same time (Cohen et al., 2000:287). In educational research, group interviewing is a useful method of collecting data as it initiates the development of discussions among a group of participants who have been working together for a certain duration of time or for a common reason (Watts & Ebbutt, 1987). The participants in a group interview produce a variety of responses as it creates a situation in which they are encouraged to challenge and extend each other's ideas and introduce new ideas into the discussion (Lewis, 1992).

Group interviewing has its limitations. Lewis (1992) comments that the coding of a variety of responses from several participants poses a potential problem for the researcher. Fontana and Frey (1998:55) suggest that in a group interview, "the emerging group culture may interfere with individual expression, the group may be dominated by one person, the group format makes it difficult to research sensitive topics, "group think" is a possible outcome, and the requirements for interviewer skills are greater because of group dynamics". Three specific skills that are required by the group interviewer are that the interviewer must ensure that the group is not dominated by one or a few members of the group, encourage reluctant participants to respond and collect responses from all members of the group to ensure a comprehensive coverage of the topic (Merton, Fiske, & Kendall, 1956 cited in Fontana & Frey, 1998:55). All these aspects were considered when group interviews were conducted in this research.

3.5.2.2 Group Interviews used in this Research and Data Analysis

For the purpose of this research, semi-structured group interviews were conducted to provide complementary data with regards to the research participants' point of view on the affordances of synchronous CMC in task-based activities in Feasibility Study I and Feasibility Study II, and it effects to performance in content module assessments in the Follow-Up Study (see Figure 3.1). I have chosen this technique of interviewing for this research for the following reasons. First, since the participants have the experience of using synchronous CMC in pairs and groups (see Chapter 4 and Chapter 5 for a description of the activities), the exposure of working together would generate more ideas during group interviews, and thus provide a rich source of data. Secondly, it was difficult for me to schedule individual interviews with many participants because, as full-time Computer Science undergraduates, they hardly have any free time outside their class schedule. Furthermore, their limited blocks of free time were quite similar. The group interviewing technique enabled me to work within this constraint and gather interview data from participants in a shorter amount of time.

All the group interviews in this research were audio-recorded. I conducted a total of nine group interviews with 23 participants (N=72) from Group 1 throughout Feasibility Study I (see Appendix C11 for the list of interview questions). I also conducted two group interviews at the end of Feasibility Study II. These were with eight participants from Group 2A because although the total number of participants was 27, only eight of them participated in all the activities in this study (see Appendix D69 for the list of interview questions). I interviewed all 27 participants from Group 2B in the Follow-up Study, in six groups of four to five students because they participated in all the activities in the Main Study (see Appendix F5 for the list of interview questions). These interviews were transcribed and then analyzed using content analysis.

Mostyn (1985:117) refers to content analysis as the "diagnostic tool" that is used by qualitative researchers to make sense of a "mass of open-ended material" by identifying "specific characteristics of communications systematically and objectively". According to Gillham (2000b:59), content analysis "is about organizing the substantive content of the interview: the content that is of substance". This entails two major strands of analysis; identifying those key, substantive statements of the interview and then organizing them into categories (ibid).

I conducted a content analysis of the group interviews in this research with reference to Gillham's (2000b:63-66) proposed steps. First, I transcribed the group interviews and read through each of them highlighting substantive statements or parts of the interview that made a point. Then I went through the highlighted statements from the first transcript and derived a list of category headings for the responses to each question. For example, I derived the category heading "negative usability of NetMeeting" from the statement "*It [NetMeeting] is always not accessible*" in one interview transcript. The following step was to repeat this procedure with the other transcripts one at a time and construct new category headings for those statements that did not fit into the existing list. For example, I identified another category heading "negative usability of Divace Duo" from the statement "*The other difficulty is [using Divace Duo] the disk full*" from another interview transcript. Then I looked through the compiled list of categories to identify if any categories could be merged or split. I used the software called NVivo to facilitate the process of coding, linking all the highlighted statements in every interview transcript with the list of categories and forming a "category tree" (Arksey & Knight, 1999:161). NVivo enabled me to produce a list of all the statements from all the interviews that were coded with the same category and to verify if the statements had been coded appropriately. NVivo also allowed me to conduct a count analysis (counting the number of responses) and meaning analysis (tabulating the range of responses) for each category derived from the group interviews.

3.5.3 Performance Assessments

There are many types of measurement instruments that can be used by researchers to meet the needs of their proposed research. They can either use measurement instruments that are readily available, adapt existing ones or create new ones to meet the purpose of their research. Performance assessment is a form of measurement that determines how well individuals can do something and not their understanding of how to do it (ETS, 1995). This form of assessment is designed "to evoke complex cognitive behaviours, such as high-level thinking, communication, and analytical skills" (Mertens, 1998:308).

Two forms of performance assessments were used in this research: 1) oral assessments and 2) content module assessments. The oral assessments were used in the Main Study by Group 2B students and consisted of pre- and post-treatment interview and group discussion tests which aimed to measure the research participants' ability to conduct interviews and group discussions for systems analysis and design (see Chapter 6 for further details about these tests). Participants' performance for the pre- and post-treatment interview and group discussion tests were assessed by five raters who had at least ten years of experience teaching the English language, using rating scales designed for each test. Quantitative data for the oral assessments were obtained by calculating the participants' mean scores for each test. The mean scores for pre- and post-treatment interview and group discussion tests were then computed for significant difference using inferential statistics (paired samples t-tests) to answer research questions 1 and 2 (see Section 3.3).

Content module assessments, which are referred to as the systems analysis and design methods module assessment were used in the Follow-Up Study. The aim of this form of assessment was to examine differences in academic performance in the Systems Analysis and Design Methods module between participants in Group 2B and Group 2C. The assessment consisted of two quizzes, a test, a project and a final examination (see Chapter 7 for further details about these tests). Quantitative data from the Systems Analysis and Design Methods module assessment were obtained by calculating Group 2B (treatment group) and Group 2C (control group) mean scores for each assessment. Any significant difference between the mean scores of the two groups in each assessment was calculated using the independent samples t-tests to provide complementary evidence regarding the effects of the CMC ESP method.

3.5.4 Chat Transcripts

Chat transcripts are copies of written exchanges between interactants via a chat environment such as Microsoft NetMeeting, Yahoo Messenger or MSN Messenger. In this research, samples of Group 2B's chat interaction when conducting the CMC ESP tasks via synchronous CMC, in pairs and groups in the Main Study were gathered and analyzed using second language acquisition research techniques. These involved finding occurrences of language related episodes or LREs (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) and negotiation of meaning (Long, 1983b; Varonis & Gass, 1985) (see Section 2.1.2.1).

Instances where the Main Study participants 1) questioned their own language use, 2) questioned interlocutor's (other's) language use or 3) conducted self-correction in the chat interaction were classed as LREs (see Table 6.28). Signals of non-understanding in the chat interaction (comprehension checks (checking the interlocutor's comprehension), clarification requests (eliciting clarification of the interlocutor's preceding utterance) and confirmation checks (confirming their own understanding of the interlocutor's utterance) were classed as indicators of negotiation of meaning (see Table 2.1). Occurrences of LREs and negotiation of meaning in the chat transcripts would indicate that the CMC ESP method provides opportunities for language learning.

These techniques were used to provide data to complement the findings of the oral assessments and present an understanding of what was happening in the interaction that helped to develop skills. Further discussion of the data collection and analysis of chat data is provided in Chapter 6.

3.5.5 Field Notes

Field notes are "products of and reflect conventions for transforming witnessed events, persons and places into words on paper" (Emerson, Fretz, & Shaw, 1995:9). These entail the process of selecting certain things and leaving out others (ibid). They are based on the researchers' observations of the research events and participants' behaviour, and their reflections on them (Bryman, 2004:306). Field notes were taken during Feasibility Study I to complement the questionnaire findings. The notes aimed to record any problems encountered by research participants and difficulties that I experienced in managing their use of synchronous CMC tools (see Section 4.4.3 in Chapter 4 for a summary of the notes collected).

3.6 Research Procedures

A preliminary investigation was conducted to identify the specific oral communicative needs and lacks of Computer Science students at UTM (see Chapter 1). Then, in order to study the extent to which an English for academic purposes programme involving the use of synchronous CMC as a modality for TBL through sustained-content ESP tasks could benefit Computer Science undergraduates, I conducted four studies using both quantitative and qualitative research methods. These studies were carried out consecutively over three academic semesters at UTM: 1) Feasibility Study I, 2) Feasibility Study II, 3) a Main Study, and 4) a Follow-up Study (see Figure 3.1 for the research procedure and Figure 3.2 for the research instruments and data analysis for all four studies).

3.6.1 Feasibility Study I

The purpose of Feasibility Study I was to investigate whether it was possible to conduct synchronous CMC tasks in a digital language laboratory equipped with networked computers, with a group of Computer Science undergraduates and to investigate whether text-based or audio-based synchronous CMC was the most practical tool for this research. The study was conducted over four weeks during Group 1 students' academic semester using self-assessment questionnaires, group interviews and field notes (see Appendix B2 for the timeline). A detailed description of the research instruments used in Feasibility Study I and the technique used to analyze the data collected are provided in Chapter 4. The procedure and the results of this study are also discussed in Chapter 4. In response to the findings from Feasibility Study I, decisions were made regarding the choice of synchronous CMC tool that was the most practical for Feasibility Study II.

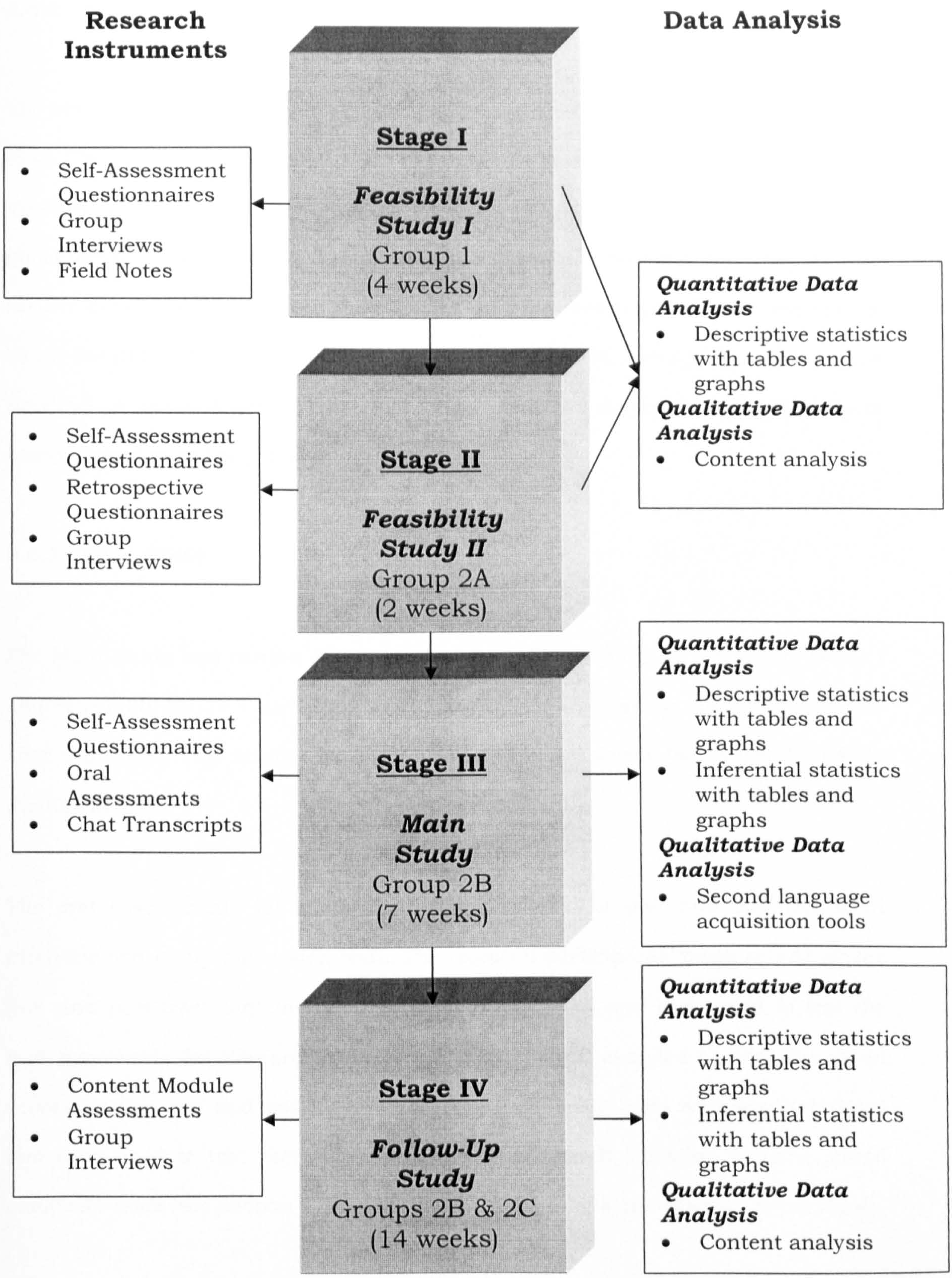

Figure 3.2 Research instruments and data analysis of the study

3.6.2 Feasibility Study II

The aim of Feasibility Study II was to design sustained-content ESP tasks (referred to as CMC ESP tasks) and test their suitability for investigating the effects of using synchronous CMC with Group 2A students. The study used self-assessment questionnaires, retrospective questionnaires and group interviews (see Chapter 5 for further details of the research instruments and the technique used to analyze the data). Feasibility Study II was conducted over two weeks (see Appendix B3 for the timeline). A detailed description of the study and the materials and instruments designed and tested is provided in Chapter 5.

3.6.3 Main Study

The Main Study was carried out with reference to the findings in Feasibility Study I and Feasibility Study II using oral assessments, self-assessment questionnaires and chat transcipts. This study was carried out over seven weeks (see Appendix B4 for the timeline).

The oral assessments for the Main Study consisted of pre- and post-treatment interview and group discussion tests. The research participants' mean scores for the pre- and post-treatment interview tests were tabulated and then used to test the null hypothesis for Research Question 1 using paired samples t-tests. The mean scores for the pre- and post-treatment group discussion tests were also tabulated and then used to test the null hypothesis for Research Question 2 using paired samples t-tests (see Section 3.3 for the research questions and the null hypotheses).

Pre- and post treatment self-assessment questionnaires were used to gain insights into the participants' opinions about their level of English language proficiency, English language speech anxiety and the CMC ESP method before and after the intervention. Textual analysis of the chat transcripts was conducted to triangulate the findings of the quantitative data. Further details of the research instruments used in this study and the data obtained are provided in Chapter 6.

3.6.4 Follow-Up Study

A Follow-Up Study was conducted to provide data for time triangulation at a later stage in the Main Study participants' course (the semester following the intervention). Content module assessments and data from group interviews were gathered over a period of 14 weeks (see Appendix B5 for the timeline).

Further analysis of post-treatment academic performance was undertaken to investigate whether the students' interviewing and group discussion skills were sustained beyond the intervention period. The Follow-Up Study indicated the extent to which the intervention affected the academic performance of participants in the treatment group (Group 2B) in comparison with another group (Group 2C) from the same cohort (referred to as the "control group"). Coursework was examined from the Systems Analysis and Design Methods module, as it required competency in interviewing and group discussion skills. It is not a common practice for CMC research to study the long term effect of intervention using time-triangulation. It was interesting to investigate to what extent learning and communicative development was sustained over a period of time, and to what extent the students had been helped to cope with the academic and communicative skills demands of their Systems Analysis and Design Methods module. A detailed description of the procedure for this study, the instruments used and the data is provided in Chapter 7.

3.7 Triangulation

Questionnaires and interviews are often used in the same study, with the questionnaire providing what is usually referred to as "hard data" and the interviews allowing a detailed and in depth exploration of particularly important aspects that are also covered by the questionnaire (supplementary data) or related topics which do not lend themselves to the questionnaire method (complementary data) (Verma & Mallick, 1999:122). This is a type of mixed-methods approach and is a "powerful way of demonstrating concurrent validity" when the data gathered from the use of one instrument correlates highly with those obtained from another instrument (Cohen et al., 2000:112). According to McDonough and McDonough (1997:181) interviews are used in ELT research both as a main research instrument and "as a checking mechanism to triangulate data gathered from other sources".

In this research, interviews were used concurrently with pre- and post-treatment self-assessment questionnaires in Feasibility Study I and Feasibility Study II. The participants who were interviewed in these studies had also responded to the questionnaires. In these two studies, the interview data were triangulated with the quantitative self-assessment questionnaire data (see Figure 3.2). It was useful to explore the feasibility study questions using interviews because they can provide "rich" and "deep" complementary data on the affordances of synchronous CMC in terms of technology, affective factors and language learning.

The pre- and post self-assessment questionnaires in Feasibility Study I consisted of two sets. The first set aimed to identify differences in the participants' general attitudes towards the use of two different synchronous CMC tools (audio-based and chat-based) in terms of each tool's positive and negative usability (see Appendices C7 and C9). The participants' responses to this attitude questionnaire were triangulated with their responses to the interview question which asked them to describe their experience (positive and/or negative) when using the two synchronous CMC tools.

The second set of self-assessment questionnaires aimed to identify differences in the participants' attitude to the affordance of synchronous CMC tools as effective language learning tools (see Appendices C8 and C10). Data collected from this set of questionnaires were corroborated with interview data which showed what participants thought of the synchronous CMC tools as a means of improving their communication and English language skills (see Appendix C11 for the list of interview questions). Data from field notes on the participants' reactions and my experience managing and facilitating the sessions provided complementary data on the practicality of using the tools for this research.

There were four sets of pre- and post self-assessment questionnaires in Feasibility Study II (see Appendix D58). Two of the four sets were similar to ones used in Feasibility Study I. The third set of questionnaires aimed to identify differences in the participants' rating of their proficiency in English language skills whereas the fourth aimed to measure differences in their level of speech anxiety. Findings from these questionnaires were triangulated with those collected from group interviews in Feasibility Study II which asked the participants to provide comments on the suitability of using the designed activity types for investigating the effects of using synchronous CMC (see Appendix D69 for the list of interview questions).

During the Main Study, quantitative results from the pre- and post-treatment interview and group discussion tests (see Appendix E2 to Appendix E14 for samples) were tabulated to test the null hypothesis for Research Questions 1 and 2 (see Section 3.3) using paired samples t-tests. The students' responses to the pre- and post self-assessment questionnaires (see Appendix E1) were used as complementary data to corroborate the findings of the oral assessments. The questionnaire responses were analyzed using descriptive statistics by tabulating the students' degree of agreement or positive assessment for each item. Inferential statistics (using sign tests) were then used to test if there were any significant differences between the students' responses to each item in the pre- and post-treatment self-assessment questionnaires.

The chat transcripts were analyzed in order to triangulate the findings of the quantitative data. Episodes conducive to second language acquisition were identified, such as language related episodes or LREs (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) and negotiation of meaning (Long, 1983b; Varonis & Gass, 1985) (see Section 2.1.2.1). This analysis was not intended to further second language acquisition theory, but to provide evidence to complement the findings of the oral assessments, and shed light on what was happening in the interaction to help develop skills.

During the Follow-up Study, interview data which asked the participants their views on the value of the CMC ESP method (see Appendix F5 for the list of interview questions) were corroborated with the quantitative data gathered from the content module assessment mean scores (see Chapter 7). This provided complementary evidence regarding the extent to which the CMC ESP method might help Computer Science students develop interviewing and group discussion skills for systems analysis and design.

3.8 Conclusion

In this chapter I have presented a mixed methods approach which was adopted to best address the research questions in Section 3.3. I have also discussed the research questions, followed by a brief description of the participants, the quantitative and qualitative research instruments used to collect my data, the triangulation of data collected and the research procedure. The following chapter will discuss the first stage of this research. It will report on the affordances of synchronous CMC tools as a modality to conduct task-based activities with a group of Computer Science undergraduates at UTM with its present information technology infrastructure and provide evidence to support my decision to use synchronous CMC in this research.

CHAPTER 4

FEASIBILITY STUDY I

4.0 Introduction

The main aim of the research discussed in this thesis was to investigate to what extent the CMC ESP method provides opportunities for the development of Computer Science students' oral communication skills for systems analysis and design. It was necessary to conduct a feasibility study because I was not sure whether students would respond favourably to using synchronous CMC tools or if there would be practical problems using the tools. Without this study, I might have discovered too late that certain tools would not function properly or that the timing did not fit the time available to use the tools. This was the first stage of the research and is referred to as Feasibility Study I (FSI) (see Appendix B1 for the timeline of all four stages and Appendix B2 for the timeline of FSI).

4.1 Aim of the Study

The aim of FSI was to identify any practical problems that would need to be resolved before addressing my main research questions. I wanted to discover the best ways to investigate the effects of the CMC ESP method with a specified group of students working within a specified context: Computer Science undergraduates at UTM, working in UTM's digital language laboratory. Two different synchronous CMC tools, Windows NetMeeting and Divace Duo were used in this study to discover the extent to which they were regarded as usable, useful and effective tools to meet their English language learning needs. A detailed explanation of the software as well as participants' assessment and feedback will be provided in the following sections of this chapter.

4.2 Research Questions

To address the above issues, FSI intended to answer the following question:

1. Which is the most practical synchronous CMC tool for investigating the effects of the CMC ESP method at UTM, bearing in mind the attitudes of students and their ESP needs?

FSI only focused on the feasibility of using synchronous CMC environment and not the feasibility of CMC task-based activities. Having resolved the practical problems of using synchronous CMC tools, issues related to CMC task design will be discussed in Chapter 5 because sustained-content CMC tasks and the feasibility of this form of activities will be introduced for Feasibility Study II.

4.3 Method

This study was conducted with two intact groups of participants. It focused on the feasibility of using two software applications which allow synchronous CMC, with two groups of second year Computer Science students at UTM. There were 36 students in each intact group. Both groups used the CMC environments over four weeks of their fourteen week semester, from the 1st of July 2003 until the 25th of

July 2003 (see Appendix B2 for the timeline of FSI). The software applications used were Microsoft's Windows NetMeeting for chat-based activities (computer-mediated written interactions) and Divace Duo for audio-based interactions (computer-mediated oral interactions using headphones attached to microphones). Both software applications were used once a week by the participants, on different days of the week. Quantitative data was collected to measure differences in the participants' attitudes toward the use of both software applications in general, and as effective English language learning tools. Qualitative data was gathered through group interviews with 23 participants and field notes to triangulate these quantitative findings on the usability and effectiveness of the synchronous CMC chat-based and audio-based tools. Data gathered from both intact groups were combined in the analysis.

4.3.1 Participants

The participants for FSI were second year Computer Science undergraduates who were taking their English for Professional Communication (EPC) module during the first semester of their 2003/2004 academic year at UTM. EPC is the last of three English language modules offered to all UTM undergraduates from all the ten faculties. The first module is called Proficiency Skills in English (PSE) and the second is English for Academic Communication (EAC). All participants in the study were concurrently taking their content module, Systems Analysis and Design Methods (see Appendix A5 for the list of English language and Computer Science modules offered in the Computer Science students' Bachelors of Science in Computer Science curriculum at UTM).

The participants' level of English language proficiency was at least intermediate. Students who obtained distinction (1A or 2A) in the English language paper of their SPM examinations (national examinations offered to students' who have completed five years of secondary school education in Malaysia) were exempted from the PSE and EAC modules. Those who achieved grade 3B, 4B, 5C OR 6C were exempted only from taking the PSE module. Students who failed their English language paper or only managed to get grade 7D or 8E had to sit for all three English language modules. All the participants for FSI obtained grade 3B, 4B, 5C OR 6C in the English language paper of their SPM examinations.

Thirty-six students in each class participated in the four-week study. Not all the students attended every weekly session. It was not possible to ascertain which students participated in each weekly session. I was not responsible for the participants' register and did not have access to the register although I did record the number of participants who participated in each session. The recorded figures dwindled as the study progressed (see Table 4.1).

Table 4.1 Feasibility Study I CMC task-based activities timeline

CMC Task-Based Activities	Number of Participants using NetMeeting for Chat-Based Activities	Number of Participants using Divace Duo for Audio-Based Activities
Week 4: 1st – 4th July 2003 **Preparatory Session (100 min)** ***Guessing Game***	Group A: 36 (1st July) Group B: 36 (3rd July) (n=72)	Group A: 36 (3rd July) Group B: 15 (4th July) (n=51)
Week 5: 8th – 11th July 2003 **Semi-Serious Session (100 min)** ***Interview Practice 1***	Group A: 36 (8th July) Group B: 36 (10th July) (n=72)	Group A: 33 (10th July) Group B: 12 (11th July) (n=45)
JAD Practice 1	Group A: 36 (8th July) Group B: 36 (10th July) (n=72)	Group A: 33 (10th July) Group B: 12 (11th July) (n=45)
Week 6: 15th – 18th July 2003 **Serious Session (100 min)** ***Interview Practice 2***	Group A: 29 (15th July) Group B: 28 (17th July) (n=57)	Group A: 17 (17th July) Group B: 6 (18th July) (n=23)
JAD Practice 2	Group A: 29 (15th July) Group B: 28 (17th July) (n=57)	Group A: 17 (17th July) Group B: 6 (18th July) (n=23)
Week 7: 22nd – 25th July 2003 **Very Serious Session (100 min)** ***Interview Practice 3***	Group A: 25 (22nd July) Group B: 16 (24th July) (n=41)	Group A: 6 (24th July) Group B: 0 (25th July) (n=6)
JAD Practice 3	Group A: 25 (22nd July) Group B: 16 (24th July) (n=41)	Group A: 6 (24th July) Group B: 0 (25th July) (n=6)

4.3.2 Equipment and Software

The equipment used in FSI was a digital language laboratory which comprises 36 networked personal computers for the students, a networked computer station for the language instructor, a communication server, a media server and an audio hub. The language instructor's computer was installed with Information Communication Manager software for the management of language learning activities. This application allows the instructor to structure, set up and run a computer classroom environment by either random or non-random settings of students for pair-work or group-work activities. Layout of the classroom setting is in clusters of six, as shown on the instructor's computer screen (see Figure 4.1). Every computer in the laboratory ran on the Microsoft Windows 2000 operating system and thus was equipped with Windows NetMeeting for chat-based activities (computer-mediated written interactions). The software called Divace Duo (Digital Interactive Audio Video Recorder) was preinstalled on every computer in the laboratory and was used in the study for audio-based interactions (computer-mediated oral interactions using headphones attached to microphones). Every computer was equipped with a headphone attached to a microphone.

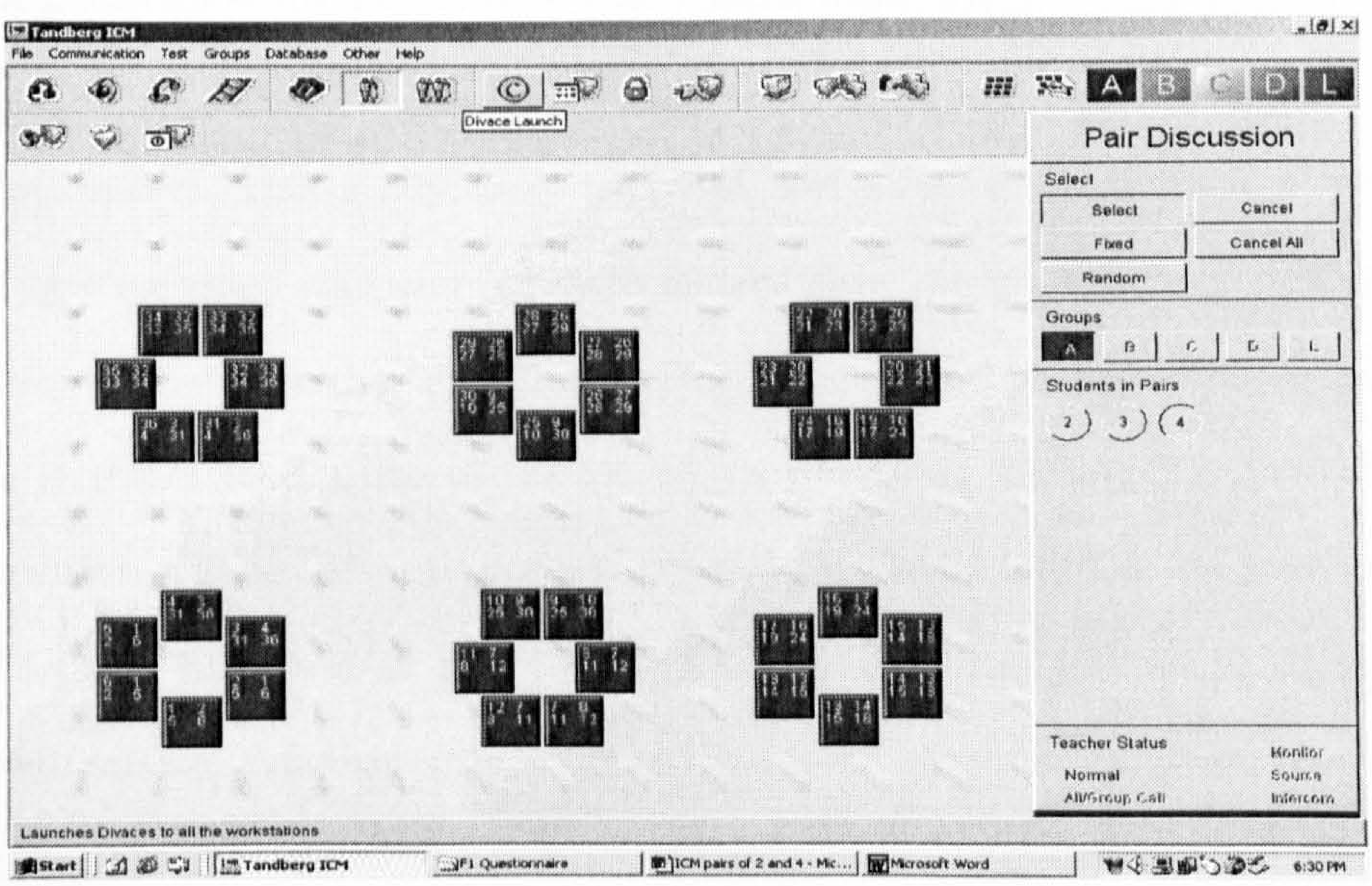

Figure 4.1 Screen capture of non-random groups of four using Information Communication Manager (ICM)

4.3.2.1 Windows NetMeeting

Windows NetMeeting version 3.01 (NetMeeting) comes with Microsoft Windows 95 and later versions of Microsoft Windows operating systems. NetMeeting is freely available if a computer runs on the Microsoft Windows operating system. It is simple to set up and user-friendly.

Besides allowing chat-based conversation with multiple people, over a local area network or the Internet, by using its "placing calls" facility, NetMeeting has many other useful features. It allows both audio and video communication, and the sharing of programs and an electronic whiteboard synchronously with other meeting participants. Files can be transferred easily to other people on the network and collaborative work with friends and colleagues can be done with ease as its sharing program feature enables meeting participants to jointly create documents, spreadsheets or other files simultaneously, without having the software on each computer. Only the person who has opened the file needs to have the software on his computer to share it with other meeting participants (see Figure 4.2 for a screen capture of NetMeeting and its chat window, and Figure 4.3 for a screen capture of NetMeeting and its shared electronic whiteboard window).

For the purpose of this study, only the chat and electronic whiteboard features of NetMeeting were used and compared to Divace Duo, which will be described in the next section. Whenever the term NetMeeting is used in FSI and other stages of the research, it refers to the use of the chat and electronic whiteboard features which enable written forms of interaction among participants. The audio feature of NetMeeting was not used in this research because it does not allow simultaneous audio transmission among interactants and also due to its poor transmission quality.

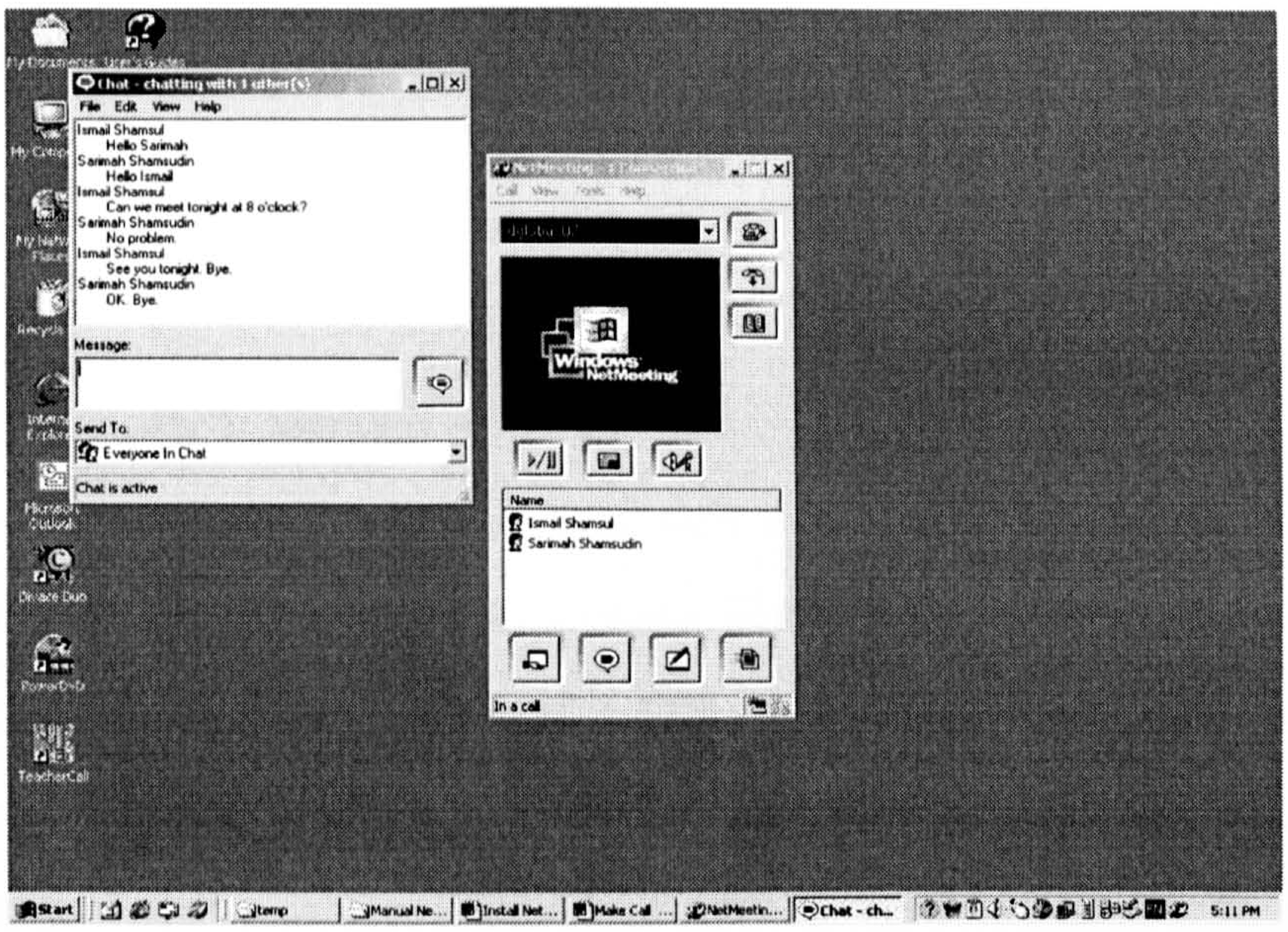

Figure 4.2 Screen capture of NetMeeting and its chat window

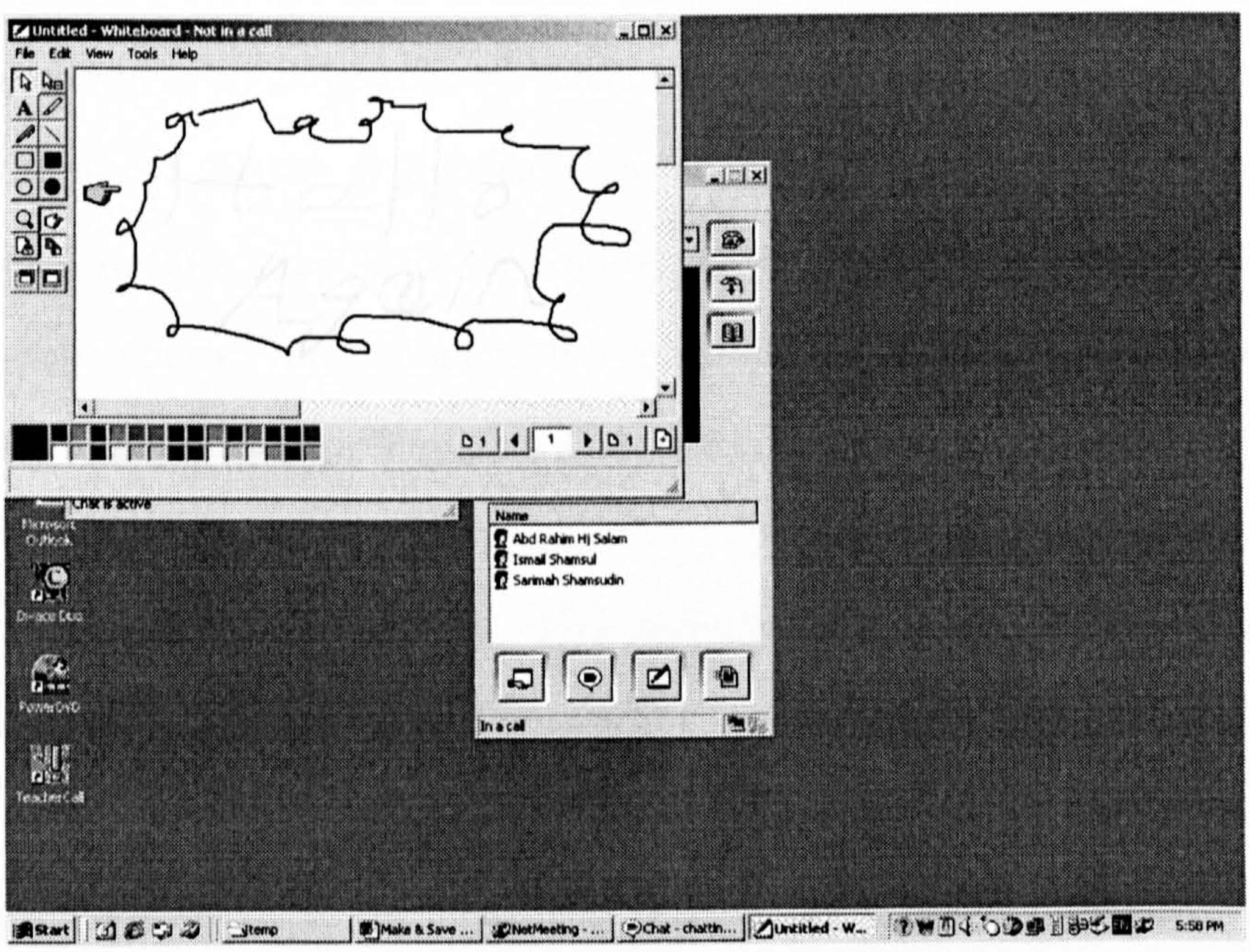

Figure 4.3 Screen capture of NetMeeting and its shared electronic whiteboard window

4.3.2.2 Divace Duo

Divace Duo is a specialist media player and recorder software application developed by Sanako Corporation in Finland. This software can be used for the recording of video, oral interactions, comments or translations. It has a digital two-track player and recorder which enables users to play back a digitally recorded video or audio file on one track and simultaneously record their voice on the other.

Divace Duo was used together with the Information Communication Manager software, the audio hub and headsets that were attached with microphones. It was chosen for audio-based interactions because it claims to be a versatile software application that is interactive, simple to use and very user friendly. It enables every learner to easily record, save (as a media file such as mp3 or wav) and play back their individual or group oral interactions. It can be used to simulate telephone or face-to-face oral conversations.

The sound quality of synchronous oral interactions between two or more people using Divace Duo is considered to be similar to that of telephone conversations. This is unlike the audio feature of chat software such as NetMeeting that does not allow simultaneous audio transmission of remote oral interactions. A speaker has to wait until his interlocutor has finished his turn before responding. Otherwise, the conversation will be incomprehensible due to overlaps.

In a face-to-face classroom of thirty to forty students, which is typical of UTM English language classes, it is not practical to record small group discussions. The quality of the recording would not be satisfactory as it would also record conversations of groups sitting nearby or sounds outside the classroom. Individual playback of group recordings for every student is impossible. Divace Duo allows many groups of learners to communicate synchronously with their group members without experiencing much interference from other groups' discussions. Each group's oral conversations can easily be recorded and every member in the group can control playback of the recordings at their own pace. Using Information Communication Manager and Divace Duo, the instructor can allow every student to listen to certain recorded conversations on their headsets or through speakers for language learning exercises such as error identification and correction. (see Figure 4.4 for a screen capture of Divace Duo which is ready to play back a recorded mp3 file).

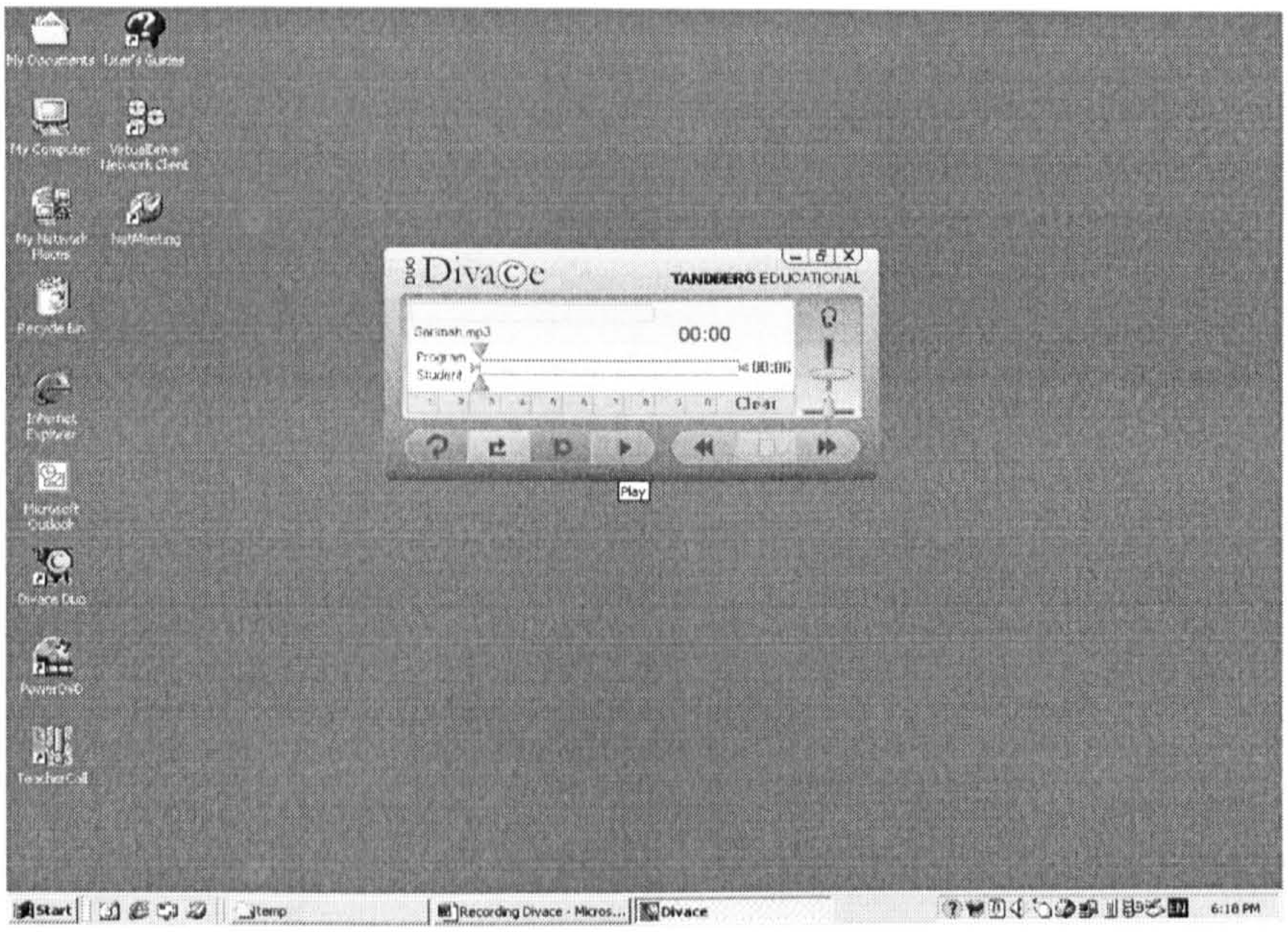

Figure 4.4 Screen capture of Divace Duo which is ready to play back a recorded mp3 file

4.3.3 CMC Task-Based Activities

To answer the research questions in Section 4.2, a set of CMC task-based activities was designed to provide participants with the experience of using NetMeeting for chat-based written interaction and Divace Duo for audio-based interaction. These tasks were ESP but not sustained-content ESP tasks because they were designed for the purpose of investigating the feasibility of using a synchronous CMC tool in the context of the Computer Science students' academic environment at UTM. The design and feasibility of conducting sustained-content ESP tasks via a synchronous CMC environment will be discussed in the next chapter.

The CMC tasks for FSI ranged from simple to more serious or linguistically challenging activities. The simplest task was a preparatory activity which aimed to familiarize participants with the CMC tools used for FSI. It was in the form of a guessing game. The serious task-based activities were adapted from recommended communicative practice activities that are included in the Computer Science students' textbook entitled "Systems Analysis and Design" (Dennis & Wixom, 2000:119-125) , required reading for their Systems Analysis and Design Methods module. The two types of practice activities found in the textbook are interview and joint application design (JAD or group discussion) practice. As discussed in Chapter 1, these are two important oral communicative skills Computer Science students need for their academic work and future profession. They were adapted to provide participants with experience using NetMeeting and Divace Duo for conducting semi-serious, serious and very serious interview sessions and JAD practice activities.

The following sections will provide a description of all four types of CMC task-based activities designed for FSI:

- CMC Task-Based Activity I: Preparatory Session
- CMC Task-Based Activity II: Semi-Serious Session
- CMC Task-Based Activity III: Serious Session
- CMC Task-Based Activity IV: Very Serious Session

The division of the study into four sessions (see Table 4.1 in Section 4.3.1) was adapted from Xie's (2002) research. Xie (2002) used three sessions: a preparatory session, a semi-serious session and a serious session in order to study the feasibility of using a chat environment, mIRC, to facilitate the teaching and learning of the Chinese language. Xie's (2002) research design was adapted for this study because it provided learners with a sequence of CMC tasks that were simple at the beginning but gradually became more linguistically difficult and more challenging as the study progressed.

4.3.3.1 CMC Task-Based Activity I: Preparatory Session

The CMC task-based activity for the preparatory session of FSI was a guessing game. It was intended to train the participants to use the equipment and software they would need for both chat-based and audio-based CMC activities. This training session was conducted during one of the class meetings, in week 4 of the participants' 14-week semester. The chat-based and audio-based preparatory sessions were conducted on different days of week 4. In this preparatory session, each participant was instructed to think of an object that they could find in the digital language laboratory and write the word on a piece of paper. Working in pairs, they were required to use NetMeeting for chat-based interaction in one class meeting, and Divace Duo for audio-based interaction in the next class meeting, and take 5-minute turns to guess the word that was written on their partner's paper. Participants were not allowed to ask more than twenty questions. They were allowed to provide hints to their partners if they were having difficulty guessing the object. At the end of each of the text-based and audio-based preparatory sessions, the students were instructed to save their written interactions (if using NetMeeting) or oral interactions (if using Divace Duo) onto a folder called "Guessing Game" in the media server. This would serve as a record for later analysis.

4.3.3.2 CMC Task-Based Activity II: Semi-Serious Session

The CMC task-based activities in the semi-serious session consisted of two different types of communicative activities that were adapted from the participants' textbook (Dennis & Wixom, 2000:119-125). The practice activities will be referred to as Interview Practice 1 and Joint Application Design (JAD) Practice 1 for both the chat-based interactions using NetMeeting (see Appendix C1), and audio-based interactions using Divace Duo (see Appendix C2).

Interview Practice 1 and JAD Practice 1 were conducted by the participants using NetMeeting in week 5 of their 14-week semester. During Interview Practice 1, the students playing the role of the interviewers elicited from the interviewees information about how they paid their university bills, got to class or got home for the semester holidays. During JAD Practice 1, the student facilitators had to elicit from group members the process of withdrawing money from a bank account, making a sandwich or posting a letter through the mail.

Both activities were repeated by the participants using Divace Duo on a different day of week 5. These activities are regarded as semi-serious activities because the information that had to be elicited during the activities was relatively simple and had no professional or academic content. The aim of the activities was for the participants to be more responsible in their interactions but in an informal and relaxed atmosphere as the activity was not linguistically demanding. It also provided them with interview and JAD practice in English for general purposes.

4.3.3.3 CMC Task-Based Activity III: Serious Session

The two practice activities in this session are considered as "serious". The instructions for conducting the activities in this session were similar to those for the semi-serious session. The only difference is the type of process that had to be elicited and the "task complexity" or "cognitive demands" of the task (P. Robinson, 2001a:294). This time the activities were linguistically more difficult and challenging. The practice activities will be referred to as Interview Practice 2 and JAD Practice 2. The chat-based interactions used NetMeeting (see Appendix C3), and the audio-based interactions used Divace Duo (see Appendix C4). The interview and JAD practice activities were conducted on different days during week 6 of the participants' 14-week semester.

For Interview Practice 2, the interviewers elicited from the interviewees the process of applying for a bank account, applying for a job during the semester holidays or applying for a degree programme at UTM. JAD Practice 2 required the facilitators of each group to gather information about the process of preparing an academic paper or preparing a problem definition report. At the end of both the chat-based and the audio-based activities, the facilitators in each group produced a flowchart of the information gathered from group members.

4.3.3.4 CMC Task-Based Activity IV: Very Serious Session

The two practice activities in the final session of this study were considered "very serious" because the activities were designed to simulate real-life interview and JAD sessions between systems analysts and their clients. The tasks were linguistically more demanding as students playing the roles of systems analysts or clients had to use the type of language that is used in the professional context.

During Interview Practice 3, the students playing the roles of systems analysts elicited information from those who were users about UTM's Academic Information Management System (AIMS) or Online Public Access Catalogue (INFOLAN2), and problems they experienced with the system. In JAD Practice 3, the student facilitators had to find out about problems group members had experienced with either of the systems and elicit suggestions about how to improve them. The students playing the role of the Computer Science professionals had to comment on the technical and economic feasibility of the users' suggestions for improving the systems. Student scribes were responsible for listing the problems and suggestions gathered in the JAD discussion.

Both the interview and JAD practice activities were conducted in week 7 using NetMeeting (see Appendix C5) and Divace Duo (see Appendix C6), on different days of the week.

4.3.4 Data Collection Instruments

To answer the research question in Section 4.2, both quantitative and qualitative instruments were used to elicit participants' general attitudes to the use of NetMeeting and Divace Duo for carrying out CMC task-based activities, and their effectiveness as English language learning tools. Self-assessment attitude questionnaires, group interviews and field notes were used.

4.3.4.1 Self-Assessment Attitudes Questionnaires

The measurement instruments were used to identify differences in the participants' attitudes toward the use of NetMeeting and Divace Duo in general and as effective English language learning tools. The instruments were adapted from Brett's (2000) 5-point Likert scale questionnaire, "attitudes to using multimedia". Brett (2000) administered a pretest attitude questionnaire to a group of sixty-four undergraduate learners of Business English, after introducing them to two CD-ROMs of Business English multimedia software. The learners were studying for a degree in Business and Languages and used the software as ESP language learning materials for their Business English module. A posttest attitude questionnaire, which was a retrospective version of the questionnaire, was administered to the learners at the end of the study.

Brett's (2000) attitude scale was chosen to be adapted for this study because his participants were also learning English for specific purposes (in his case Business English), and the questionnaire was a simple and convenient way of measuring learners' attitudes to using CALL tools (although of course subjective feelings can never be truly quantified). Since there is a danger that this form of data collection might provide "an artificial and spurious sense of precision and accuracy" if used on its own, responses were triangulated with data gathered from interviews and field notes (Bryman, 2004:78).

The two similar sets of self-assessment attitude questionnaires used in this study required respondents to indicate strengths of agreement or disagreement with a series of statements. The first set consisted of pre-treatment and post-treatment questionnaires which aimed to examine differences between participants' attitudes to the use of NetMeeting for chat-based CMC activities. The second set was intended to look at differences between their attitudes to the use of Divace Duo for audio-based CMC activities. The CMC task-based activities that were conducted over four weeks of their fourteen-week semester are referred to as the "treatment".

Both sets of questionnaires consisted of two sections. Section A comprised seven statements intended to provide an indication of participants' general attitudes to the use of NetMeeting or Divace Duo, as to whether it will be (pre-treatment) or was (post-treatment) "useful", "interesting", "motivating", "fun", "difficult", "a waste of time" or "complicated" (see Appendix C7 and Appendix C9 for the questionnaire statements). Section B contained seven statements which required participants to self-assess the effectiveness of NetMeeting or Divace Duo as language learning tools. They were asked to consider whether the CMC task-based activities would be able to improve (pre-treatment) or had improved (post-treatment) their general communication skills, language skills, knowledge of the English language, and English language skills for system requirements elicitation (see Appendix C8 and Appendix C10 for the questionnaire statements). Statements in the pre-treatment attitude questionnaires were worded to indicate future time whereas those included in the post-treatment questionnaires were in the past tense.

4.3.4.2 Group Interviews

Group interviews were used to elicit a sample of the participants' attitudes to the use of NetMeeting and Divace Duo (see Appendix C11 for the list of interview questions). During the interviews, participants were encouraged to describe their experience using the two synchronous CMC tools in the study and present their views on the usefulness of the tools to improve their communication and English language skills. They were asked to comment on what they liked and disliked about the use of NetMeeting or Divace Duo for CMC task-based activities, difficulties they had encountered and suggestions for improvement.

4.3.4.3 Field Notes

I was the researcher and the facilitator in the study. I noted any problems encountered by participants together with any difficulties I experienced in managing the participants' use of NetMeeting and Divace Duo. These notes are cited in the discussion at the end of this chapter as evidence to support conclusions.

4.3.5 Procedure

I conducted FSI during semester one of the participants' 2003/2004 academic year at UTM (see Appendix B2 for the timeline of FSI according to semester). All 72 participants in this study were divided into two groups, A and B, according to their registration in the EPC module. Both groups consisted of 36 participants. They completed all four sessions of the CMC task-based activities described in Section 4.3.3 via NetMeeting for chat-based activities or Divace Duo for audio-based activities, over four weeks of their 14-week EPC module, according to the timeline shown in Table 4.1 (see Table 4.1 in Section 4.3.1). The table also indicates the number of participants who participated in the sessions from each group. Each of the two synchronous CMC tools was used once a week for two contact hours (100 minutes), over four weeks from the 1st of July 2003 until the 25th of July 2003.

The preparatory sessions of FSI took place during week four of the participants' 14-week semester. I gave the participants hands-on experience on how to connect to the DLL server, set up NetMeeting and begin chatting in the chat-based preparatory session. I also taught the participants how to use Divace Duo for oral interactions during the first audio-based session. These two preparatory sessions were conducted on different days in the first week (week 4) of the study. At the end of the session, students recorded their chat-based or audio-based interactions and saved them in designated folders in the multimedia server and responded to a pre-treatment self-assessment attitude questionnaire (see Appendix C7 to Appendix C10).

In the following week (week 5), the participants had to complete the two semi-serious sessions, consisting of two types of chat-based and audio-based tasks (an interview in pairs and a JAD activity in groups of four) during two different class meetings (see Table 4.1 in Section 4.3.1). During the third week (week 6), they were assigned the serious interview and JAD task-based activities using the same CMC tools they had used in the previous two sessions, on two different days of the week (see Table 4.1 in Section 4.3.1).

Activities assigned for the very serious session were conducted in the final week (week 7) of the study using the same CMC tools they had used in the previous three sessions, on two different days of the week (see Table 4.1 in Section 4.3.1). At the end of the study, students had to complete post-treatment attitude questionnaires on the activities they had conducted using NetMeeting and Divace Duo (see Appendix C7 to Appendix C10).

I conducted at least one group interview at the end of each weekly session. Each group interview consisted of between two to four participants. I also took notes during class sessions to supplement findings from the questionnaires and interviews.

4.4 Findings

The findings from FSI are included in the following sections. Section 4.4.1 focuses on the questionnaires whereas 4.4.2 discusses the findings from the group interviews. A summary of the researcher's field notes is presented in 4.4.3.

4.4.1 Self-Assessment Attitude Questionnaires

Seventy-two participants responded to the self-assessment attitude questionnaire regarding the use of NetMeeting at the beginning of the study. Fifty of them responded to the retrospective version of the questionnaire, at the end of the study. Regarding the use of Divace Duo, there were forty-eight respondents for the pre-treatment attitude questionnaires and twenty-eight respondents for the post-treatment attitude questionnaires. Responses to every item were tabulated in percentages using Microsoft Excel. (see Appendix C7 to Appendix C10 for a summary of responses). The respondents' degree of agreement to the statements in the questionnaires was calculated by adding together the percentage of respondents who "agreed" and "strongly agreed" to each of the statements.

Results of the participants' initial reactions to the use of NetMeeting and Divace Duo for both attitudinal areas were very positive (see Figure 4.5). More than 60% agreed that NetMeeting would be a useful, interesting, motivating and fun tool for CMC task-based activities and only slightly more than 10% of them agreed that it would be difficult, a waste of time and complicated (see Figure 4.5). Quite similar results were obtained regarding the use of Divace Duo at the beginning of the study (see Figure 4.5).

At the end of the study, although the percentages were lower, at least 59% of the participants were still positive regarding the use of NetMeeting and Divace Duo as

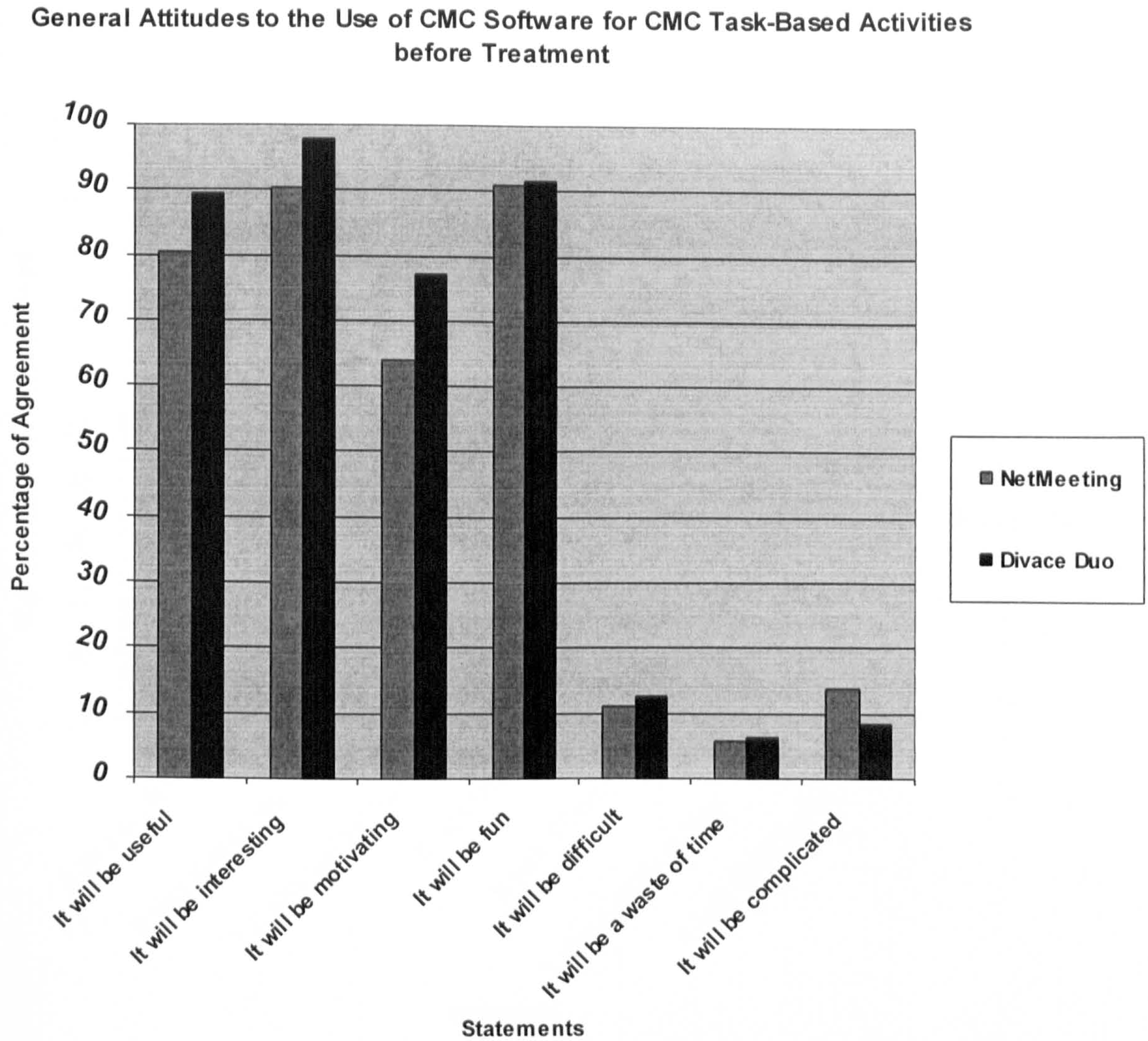

Figure 4.5 Feasibility Study I participants' general attitudes to the use of CMC software for CMC task-based activities before treatment

useful, interesting, motivating and fun tools for CMC task-based activities (see Figure 4.6). However, there was an increase in the percentage of respondents who agreed with the negative statements regarding the use of Divace Duo as difficult, a waste of time and complicated (see Figure 4.6). The increment was between 6 to 11 percent. On the other hand, the percentage of respondents who agreed with these three statements decreased slightly regarding the use of NetMeeting (see Figure 4.6).

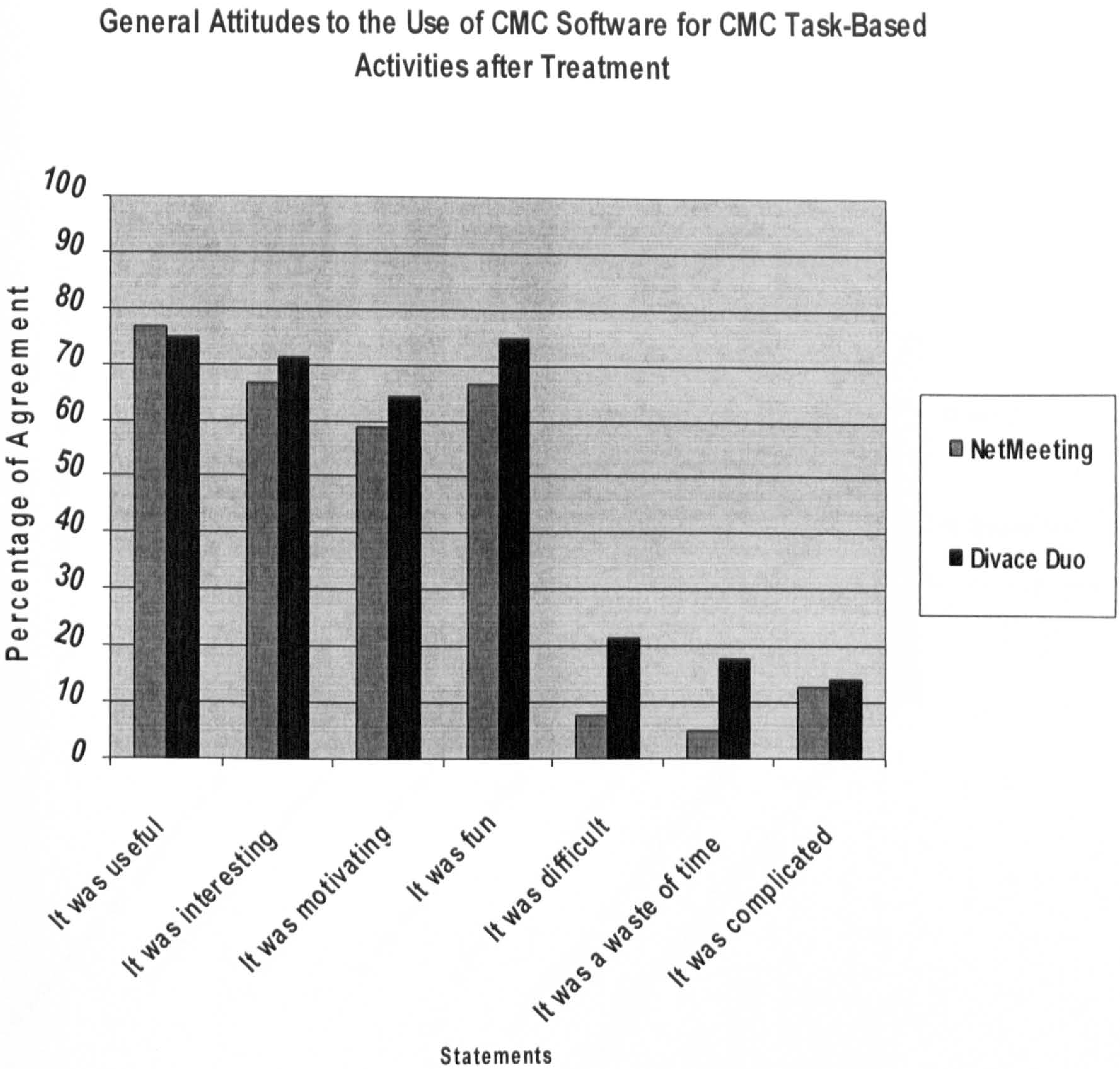

Figure 4.6 Feasibility Study I participants' general attitudes to the use of CMC software for CMC task-based activities after treatment

The decrease was between 0.5 to 3 percent. These results show that although most of the respondents' generally had a positive attitude to the use of CMC tools for conducting CMC task-based activities, they seem to indicate that NetMeeting was easier and less complicated to use than Divace Duo.

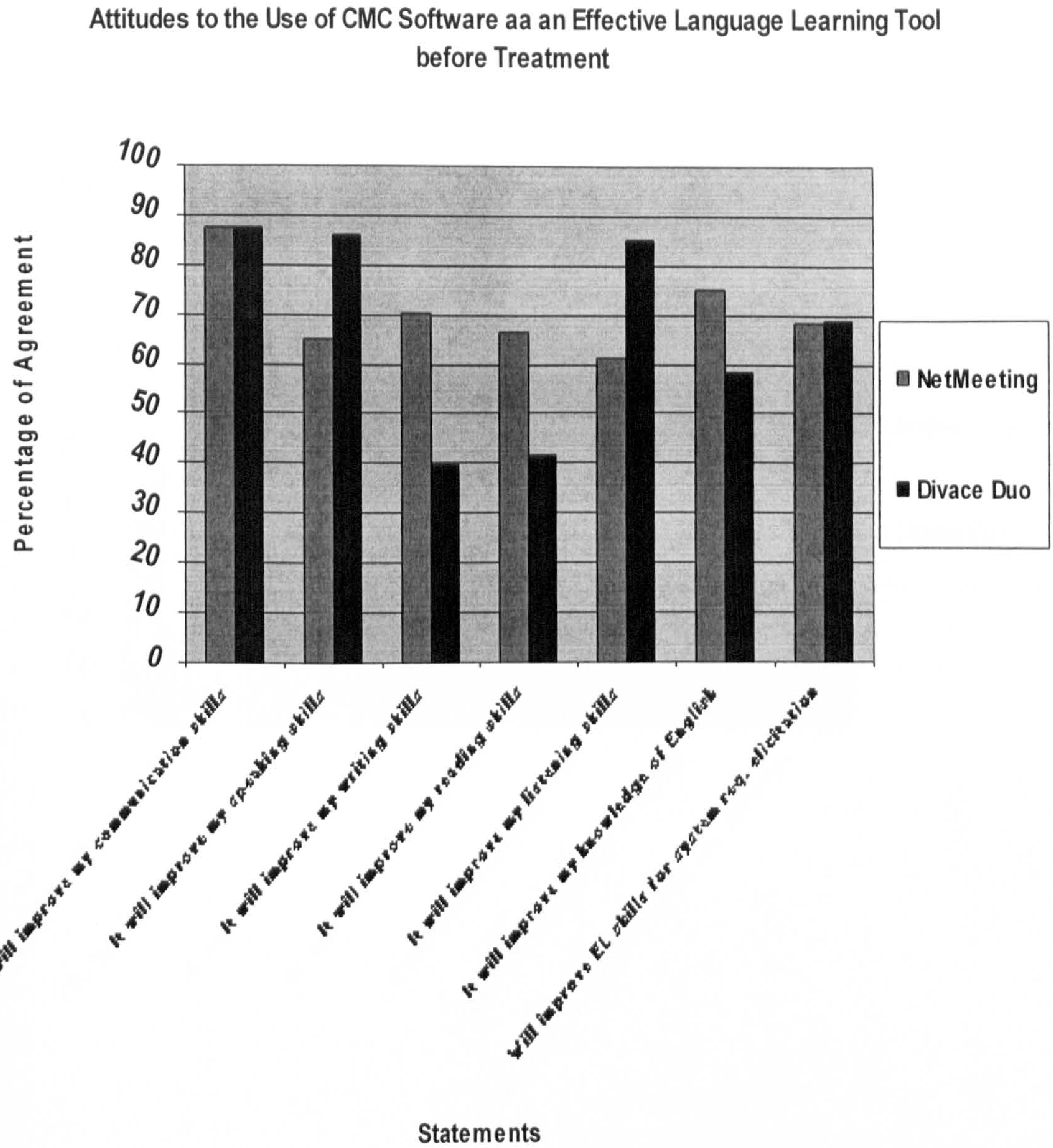

Figure 4.7 Feasibility Study I participants' attitudes to the use of CMC software as an effective language learning tool before treatment

In terms of their attitude to the use of NetMeeting and Divace Duo as effective language learning tools, the results were also encouraging. Although the percentages of respondents who agreed to most of the items in this section of the questionnaire were lower at the end of the study, at least half of the participants agreed that the CMC tools had improved their language learning skills and English (see Figure 4.7 and Figure 4.8).

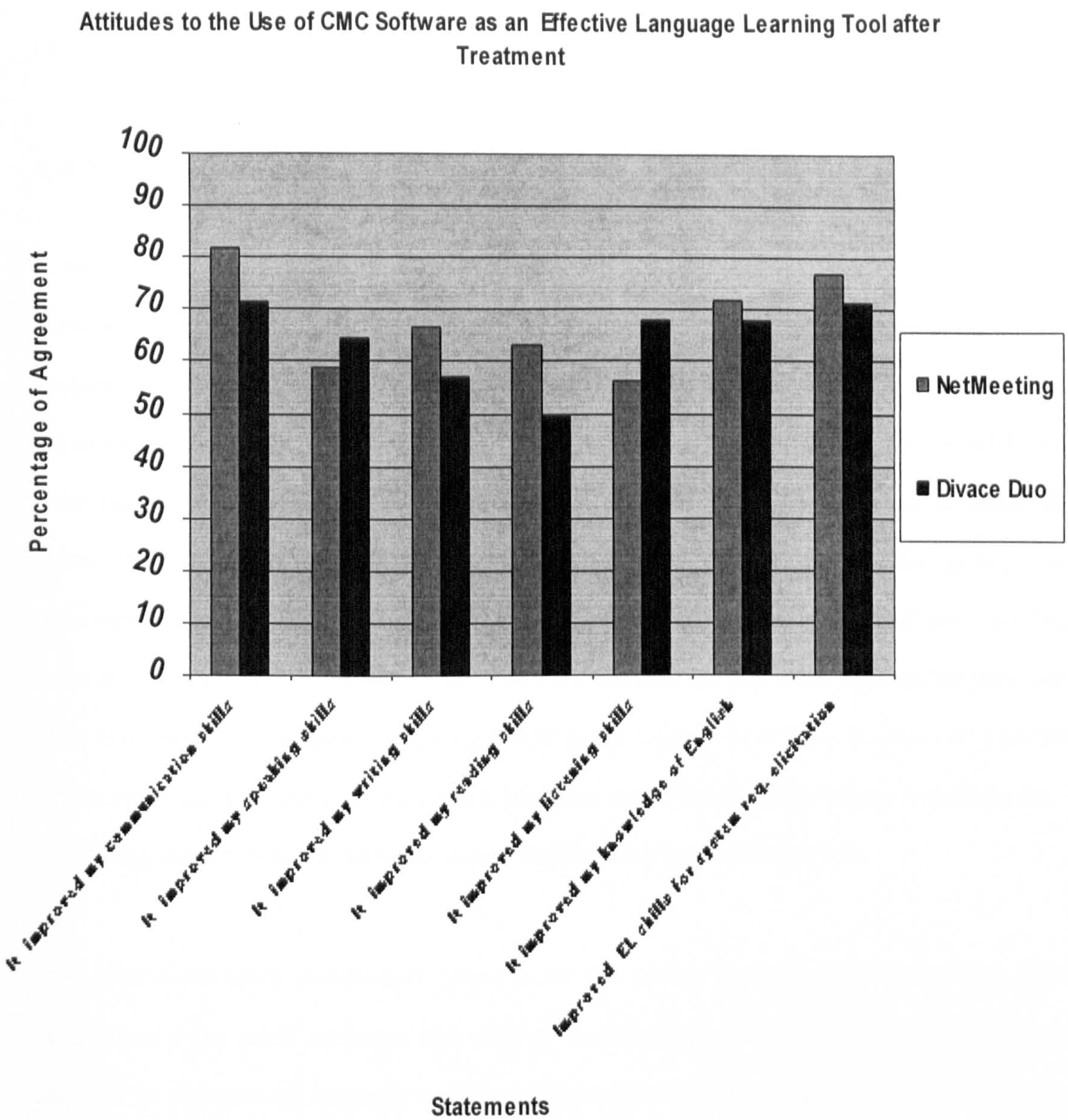

Figure 4.8 Feasibility Study I participants' attitudes to the use of CMC software as an effective language learning tool after treatment

Unlike the other items in this section of the attitude questionnaire, the statement "It improved my English language skills for system requirements elicitation" had a higher percentage of respondents for both CMC tools at the end of the study (see Figure 4.7 and Figure 4.8). More respondents (difference of 5.5%) agreed with the statement in terms of the use of NetMeeting, in comparison with Divace Duo. This result indicates that most of the respondents believed that the task-based CMC activities using both CMC tools were effective in meeting their communicative needs for information elicitation.

4.4.2 Group Interviews

I conducted nine group interviews with a total of twenty-three participants throughout the study. At the end of week four (after the preparatory session), five groups were interviewed. The first two groups were interviewed after they had experienced using only NetMeeting. The other three groups were interviewed after they had experienced using NetMeeting and Divace Duo. At the end of week five (after the semi-serious session), two groups were interviewed. One group was interviewed at the end of week six and seven (after the serious and very serious sessions). As a result, most interview findings relate to the interviewees' experiences after only one or two sessions using NetMeeting and Divace Duo. It was not possible to interview all the groups each week because not all the participants attended every CMC task-based activity session using NetMeeting and Divace Duo.

The interviews were conducted using both the Malay and English languages. Both languages were used because not all the interviewees spoke Malay as their mother tongue. In presenting extracts of the participants' responses in the group interviews, for the purpose of clarity, Malay words in the transcripts have been translated into English and written in bold. Each interviewee is identifiable by an identity code consisting of two capital letters. The researcher's extracts are represented by the letters "PS". Of the 23 participants interviewed, only one (AG) had no prior experience of synchronous chat software such as MSN Messenger, Yahoo Messenger or mIRC. Five participants (AZ, MS, MH, ZR and SH) had used NetMeeting before but none had any experience of using Divace Duo.

Findings obtained from the group interviews are presented in the following sections. They are organized according to the participants' attitudes to the use of the CMC tools and comments about the use of the tools for CMC task-based activities.

4.4.2.1 Attitudes to the use of NetMeeting and Divace Duo

Several categories derived when the group interview transcripts were examined for patterns and insights regarding participants' attitudes to the use of NetMeeting and Divace Duo are shown in Table 4.2. The main categories were "usability", "enjoyment" and "usefulness". Coding of the transcripts according to these categories and their sub-categories was done using NVivo (version 2.0.161).

Table 4.2 Categories derived from the group interview transcripts

CATEGORIES		NETMEETING (N=23)	DIVACE DUO (N=23)
USABILITY	Positive	7 (30.4%)	2 (8.7%)
	Negative	2 (8.7%)	4 (17.4%)
ENJOYMENT		12 (52.2%)	11 (47.8%)
USEFULNESS	Support for Communication	13 (56.5%)	8 (34.8%)
	Language Learning	22 (95.7%)	10 (43.5%)
	ESP Needs	8 (34.8%)	4 (17.4%)
	Total	22 (95.7%)	12 (52.2%)

Usability

Participants' responses to the usability of NetMeeting and Divace Duo were sub-categorized as either positive or negative (see Table 4.2). "Positive" comments were comments that the software was easy to use or access, or that it was easy to learn how to use the software and its features (see Table 4.3). "Negative" comments were claims of difficulties or problems when using, accessing or learning how to use the

Table 4.3 Samples of comments on the positive usability of NetMeeting and Divace Duo

NETMEETING	DIVACE DUO
Familiarity *Using NetMeeting is the typing one right because I use mIRC so for me I think it is quite easy.* (GO – Week 5, Interview 6) *Actually the NetMeeting software that we used yesterday, for me I'm not a first time user for that software so I* ***immediately easy to use****.* *So it's easy for me to communicate with my partner.* (AZ – Week 4, Interview 1)	**Technology** *Actually I prefer using Divace Duo because it's easier but when I use NetMeeting a bit* ***cumbersome*** *because we have to call and sometimes, cannot call.* (NU– Week 7, Interview 9) **Type of Communication** *Maybe it's more easy than we type it because we don't know what is the expression of the person, then we don't know how to,* ***don't know how to respond like if we write, we don't know the actual reaction****.* ***If we speak we would be able to know, there is certain expression expression that we can guess like if we write, "no, no" but if we speak, "no, that's not it, you are almost there" it's like that sort of expression intonation****.* (ML – Week 4, Interview 3)

software and its features (see Table 4.4). Seven of the students (30.4%) interviewed commented on the positive usability of NetMeeting but only two (8.7%) of them voiced the same opinion about Divace Duo (see Table 4.2). Only two students (8.7%) expressed negative comments about difficulties with NetMeeting, as opposed to four students (17.4%) with Divace Duo (see Table 4.2).

More students reported positive experiences with NetMeeting in comparison with Divace Duo because of familiarity with its functions. They were quite similar to other chat-based software such as Yahoo Messenger, MSN Messenger and mIRC, which the students were very familiar with. All the students except for AG had experienced using at least one type of chat-based software. For example, GO said that NetMeeting was quite easy to use because she was familiar with chat software (see Table 4.3 for GO's comment); five students (AZ, MS, MH, ZR and SH) who had prior

Table 4.4 Samples of comments on the negative usability of NetMeeting and Divace Duo

NETMEETING	DIVACE DUO
Technology ***It [NetMeeting] is always*** *not accessible not accessible.* (AD – Week 4, Interview 4) *Actually I prefer using Divace Duo because it's easier but when I use NetMeeting a bit* ***cumbersome*** *because we have to call and sometimes, cannot call.* (NU– Week 7, Interview 9)	**Technology** *I like to use the recording stuff [Divace Duo] but although it's a bit difficult.* (GO– Week 5, Interview 6) *The other difficulty is [using Divace Duo] the disk full.* (AI – Week 7, Interview 9) *EM:* ***It might be*** *interesting [****using Divace Duo] but sometimes there's problem with the listening facility, there might be an interference or it might cause difficulty for us to understand what they are saying so it's like a*** *conflict* ***in*** *communication,* ***sometimes it sounded like noises. It does affect how we would be able to get the answer, the right answer****.* *PS: What kind of interference?* *ML: The background sound.* *EM: The background sound.* *PS: Like, for example?* *ML:* ***Because*** *noise* ***from everywhere will be detected, it is sensitive, too sensitive, even noises from a distance can be detected, this would actually interfere with our conversation with the other person****.* (EM and ML – Week 4, Interview 3)

experience of using NetMeeting with their friends found NetMeeting especially easy (see Table 4.3 for AZ's comment).

Only two students, ML and NU, made positive comments about the usability of Divace Duo. NU expressed a preference for Divace Duo because of its technology. Unlike NetMeeting, CMC interaction using Divace Duo did not involve the use of certain software features to make calls because meetings were set up remotely by the researcher (see NU's comment in Table 4.3). ML found communication with

Divace Duo easier than NetMeeting because of the type of communication it affords. It did not involve typing and allowed her to respond correctly to her interlocutor's questions or statements because of intonation and stress signals in the interaction (see Table 4.3 for a transcript of her comments).

Two comments about the negative usability of NetMeeting in terms of technology were made by AD and NU. It was always not accessible and it was difficult to use its call feature to "make a call" (see AD and NU's comments in Table 4.4). Examples of the negative usability of Divace Duo in terms of technology were given by GO, EM, ML and AI. Although GO liked the recording feature of Divace Duo, she found it difficult to use (see GO's comments in Table 4.4). AI highlighted the difficulty of saving recordings of conversation with his partners because he kept receiving a message that the disk was full (see AI's comments in Table 4.4). Both EM and ML also mentioned problems with the listening feature; the software was so sensitive that it also captured the surrounding noises (see EM and ML's comments in Table 4.4).

Enjoyment

The second category derived from the group interview was "enjoyment". A total of 12 (52.2%) students expressed enjoyment using NetMeeting and 11 (47.8%) expressed enjoyment using Divace Duo (see Table 4.2). They used words such as "fun", "enjoy", "happy" and "interesting" to indicate this. In some cases, students responded positively to both tools without distinguishing between them (see FZ and AN's comments in Table 4.5).

Table 4.5 Samples of comments on the enjoyment of using NetMeeting and Divace Duo

COMMENTS
I quite enjoy using the software, the sessions, using whatever activities that you've done. (FZ – Week 6 – Interview 8)
Yes, OK lah happy lah doing ***this thing [using software for CMC task-based activity]. Can*** *improve* ***if I don't know about that thing, after that, I know about that thing****.* (AN – Week 5, Interview 6)

Students mentioned that the use of NetMeeting or Divace Duo for CMC task-based activities was fun and interesting for the following reasons:

1. it offered them the opportunity to communicate in English and know their level of English,
2. it provided them with an interesting approach to learning English or
3. it enabled them to get to know their friends better

(see Table 4.6 for sample of comments).

Table 4.6 Samples of comments on the reasons for enjoyment in using NetMeeting and Divace Duo

CATEGORIES	COMMENTS
Opportunity to communicate in English and know their level of English	*Because yesterday we use the almost all in English language so it's very interesting because for example me* ***really seldom*** *not really talk English or chatting in English among ourselves among our* **Computer Science** *group so yesterday we can know how our English standard.* (SH – Week 4, Interview 5).
Interesting approach to learning English	*AZ: For me, using software in communication, interaction in English, we learn English in IT environment, so it's interesting for students to learn English in IT environment. ...* *AZ: So student didn't bored lah.* *PS: They will not be bored?*

CATEGORIES	COMMENTS
Interesting approach to learning English	*AZ:* ***Yes****. Bored by the conventional way just talk and talk.* *PS: In the class?* *AZ:* ***Yes****. So it is an alternative way to learn the language, the English language.* (AZ – Week 4, Interview 1)
	PS: What are other things that you like about the activity using NetMeeting? *ZR: Fun lah fun. ...* *MH:* ***But for us, for me, the English language class is sometimes boring. This activity for instance, it's enjoyable. I enjoy learning, doing conference in English. It's not like just sitting in a classroom****.* *ZR:* ***Can see the difference****.* *MH:* ***Didn't feel sleepy****.* *[All students laughed]* *PS:* ***Didn't have time to feel sleepy****?* *MH:* ***We didn't even realize that class time was over****.* (ZR and MH – Week 4, Interview 2)
Enable to get to know friends better	*MA: Oh chat I mean chat learn about my friend. Know more about him OK because I ask him actually yesterday my partners are ZR and NU so I ask them a lot about themselves.* *PS: So you had time to talk about other things while chatting?* *MA: What I mean is chatting about the topic.* *PS: You get to know your friends through doing the activities using NetMeeting?* *MA:* ***Yes****.* *PS: How is that possible? I mean you were doing activities and then at the same time you get to know your friends much better. How is that possible?* *MA: For example yesterday we talked about holiday, semester holidays. How you get back for semester holidays. So before this,* ***we really don't know*** *how our friend go back home, just know holiday. So we can ask them what they are doing. How do they get there and where is their hometown.* (MA – Week 4, Interview 5)

Usefulness

The third category derived from the interviews was the "usefulness" of NetMeeting and Divace Duo. Almost all the participants interviewed (n=22, 95.7%), except for one (ML), commented on the usefulness of NetMeeting (see Table 4.2). Only about half of them (n=12, 52.2%) said that Divace Duo was useful (see Table 4.2). Interviewees talked about the affordances of the software as a means of supporting communication, facilitating language learning and meeting their ESP needs.

CMC Tools as a Means of Supporting Communication

Thirteen (56.5%) students claimed that NetMeeting was useful to support communication (see Table 4.2). Eight (34.8%) of them made the same claim about Divace Duo (see Table 4.2). The software was considered to support communication because it affords synchronous communication between interactants who are remotely located (see HI's comments in Table 4.7).

The other factor that was believed to support the students' communication was the ability of the CMC tools to reduce their level of anxiety. The CMC task-based activities using NetMeeting and Divace Duo affords anonymity and therefore, they were less face-threatening because they did not involve face-to-face communication. The tools helped the students to feel less nervous and increased their confidence because the person they were communicating with could not see them in person if they made any mistakes (see MN and SH's comments in Table 4.7).

The students claimed that NetMeeting supported communication as it affords composition time. Although Divace Duo was not conducted face-to-face, there was no time lag so it did not provide the students with as much time to plan their responses. MN and MF mentioned NetMeeting's ability to enhance English by providing time to plan responses (see Table 4.7). MF also mentioned that communication via NetMeeting may be transferred to face-to-face communication (see Table 4.7).

Table 4.7 Samples of comments on the usefulness of CMC tools as a means of supporting communication

CATEGORIES	COMMENTS
Enabled synchronous communication between interactants	***We want to communicate with people who are very far away, if we want to know the*** *idea idea* ***of people not close to us, to*** *combine* ***the*** *idea,* ***to get*** *idea* ***from other people who are not located at the same place****.* (HI – Week 5, Interview 7)
Reduced level of anxiety	*I think because when we shy to send our words to somebody, if we talk, we afraid doing, making mistake in our talk.* ***Like this, we are not afraid, when we chat, we are not shy, others cannot see us, we cannot see them****.* (MN – Week 1, Interview 1) *Because if for example in class, we have to stand in front and face a lot people, audience, so maybe if w****e do not stammer maybe we would tremble if we are not used to it****. By using the Divace Duo we can connect to all people in this laboratory so we can do like this, like the activities. Less nervous.* (SH – Week 4, Interview 5)
Allowed planning of message	*Of course it helps to improve our English by the you know, usually we we usually only talk, and then we had* ***stammer*** *and then by typing we have to think and then type and then think, type, so the word is very I mean very* ***looks perfect****.* (MN – Week 1, Interview 1). *By just now I said that by typing,* ***structuring the sentence*** *and then* ***send****, we learn like you say we can face,* ***speak in front of people, like that****. Its quite relevant* ***right****. It can* ***can I mean it can provide an activity which is different than any other activities****.* (MF – Week 4, Interview 1)

CMC Tools as a Means of Facilitating Language Learning

The ability of both NetMeeting and Divace Duo to facilitate language learning was also commented on by the students. Almost all the students (n=22, 95.7%) made this claim for NetMeeting and about half of them (n=11, 47.8%) for Divace Duo (see Table 4.2).

AZ, NI and MS mentioned using "the proper form of English" when they performed CMC task-based activities via NetMeeting, even though people normally use informal language and abbreviations during chat interaction (see example of NI and MS's comments in Table 4.8). ML claimed that they were encouraged to use "proper English" when they were interacting using Divace Duo because they felt too embarrassed to communicate informally with classmates whom they hardly knew (see Table 4.8 for ML's comments). Practice using formal English would be more useful for the students' because in their future profession, they will need to interact with people who they do not know very well.

Seven of the interviewees (30.4%) claimed that the use of CMC tools increased their motivation to learn English. They claimed that it encouraged more students to come to the English class early, improved their attendance and made them more attentive in class (see example of MH, MS and ZR's comments in Table 4.8).

Fifteen of the interviewees (65.2%) agreed that NetMeeting helped them to improve their English. They experienced some improvement when the tool encouraged them to produce sentences that their interlocutors could comprehend (see BZ's comments in Table 4.8). NetMeeting also provided conditions for the students to notice errors and note the production of more proficient participants as it affords them to see each others' written exchanges. This can be seen from MS's comments in Table 4.8. MU for example said she corrected her friend's mistakes (see Table 4.8). AI said her partner corrected her mistakes (see Table 4.8). Nine of the interviewees (39.1%)

agreed that Divace Duo helped them improve their English. For example, as AD claimed in Table 4.8, Divace Duo might encourage real-time self- or peer-correction and improve spelling.

CMC tools were also thought to push students to find the most suitable or appropriate words when asking, explaining or describing something, as MS pointed out in Table 4.8.

Table 4.8 Samples of comments on the usefulness of CMC tools as a means of facilitating language learning

CATEGORIES	COMMENTS
Encouraged the use of formal English	***If it's formal, if for example like interview in the form of chat, it's like a bit formal.*** (NI – Week 5, Interview 7) *Yes, I trying to avoid by using short form or sentence like usually I use in chat so I'm trying to use normal, formal English communication so that way I'm improving my English little by little.* (MS – Week 6, Interview 8) ***We can*** *improve* ***the way we*** *speaking* ***because we are talking with people whom we hardly know because if we hardly know them as*** *course mate* ***so it would be quite embarrassing to speak*** *informal* ***with them.*** (ML – Week 4, Interview 3)
Increased motivation to learn English	*PS: Do you think that it increases your motivation to learn the English language?* *MH:* ***Didn't feel sleepy.*** *MS: It increases my attendance. ...* *ZR:* ***Wanted to come to class quickly quickly.*** *...* *MH:* ***I think many came to class quickly [early].*** (MH, MS and ZR – Week 4, Interview 2)
Encouraged production of comprehensible sentences	***It feels like there's*** *improve improvement* ***a little right. Feel like trying to produce sentences to make people understand.*** (BZ – Week 4, Interview 4)

CATEGORIES	COMMENTS
Encouraged noticing of the production of more proficient participants	***Some people if they are proficient, we can see there. The way they spell, the way they structure the sentence correctly. We can learn indirectly the use of sentences, how to structure sentences, how to spell words, all that. We can see, we can apply them because we can see all of these. So, it's faster for us to understand.*** (MS – Week 4, Interview 2)
Encouraged noticing of errors	***If use*** *chatting* ***right, people spell so when they spell, we can see their spelling, when we type, we can*** *detect* ***what we*** *type,* ***whether it was right or wrong.*** (MS – Week 4, Interview 2) *Yes, they corrected their own mistake. More self-correct. Yes, I correct my friends.* (MU – Week 6 – Interview 8) *When I'm using NetMeeting and if I spell wrong my partner will correct it for me and he will say wrong spell.* (AI – Week 7, Interview 9) ***If we speak [using Divace Duo] our what, if pronunciation is wrong, later, we can listen to what we have said, eh it's really horrible. So we can*** *improve.* ***We can try to*** *improve* ***our language.*** (AD – Week 4, Interview 4)
Encouraged the use of suitable or appropriate words	***Have to find suitable words to depict the situation as brief and concise.*** (MS – Week 4, Interview 1)

CMC Tools as a Means of Meeting ESP Needs

Eight interviewees (34.8%) agreed that NetMeeting could help them meet their ESP needs, but only four (17.4%) agreed that Divace Duo could do this (see Table 4.2). Two students, AZ and MF, said that the use of NetMeeting was relevant as a means of meeting their academic needs (see NU and AI's comments in Table 4.9). Two other students, NU and AI said that the task-based activities using Divace Duo were relevant for their SADM module project which required interviewing skills (see NU and AI's comments in Table 4.9). Another student, ZR commented on the relevance of NetMeeting for future professional needs (see Table 4.9).

Table 4.9 Samples of comments on the usefulness of CMC tools as a means of meeting ESP needs

CATEGORIES	COMMENTS
CMC tools as a means of meeting ESP needs	*AZ: Using this method [using NetMeeting], we look at it, we use the computer right. We use the computer and at the same time we learn English, so we acquire two things there. Can learn English and then can learn about computer. It means that we learn two things at the same time. So it's good.* *MF:* ***Our major is Computer Science right. We use application. We learn how to use computer application. Maybe it's a new method, maybe it could also be a new teaching technique in the classroom. This means that if there's a student who is embarrassed to ask questions, the student can type the question and the lecturer can respond to it, maybe it can be a teaching technique.*** *So it is relevant to our academic needs.* *(AZ and MF – Week 4, .Interview 1)* *PS:* ***Are the activities using Divace Duo relevant to your academic needs****?* *NU: In SADM [Systems Analysis and Design Methods module]?* *PS: In SADM?* *NU: Yes.* *PS: AI, is it suitable? Are the activities using Divace Duo relevant or not relevant to your academic needs?* *AI: Yes I think so.* *PS: Especially interviewing?* *AI:* **Yes**. *Iinterviewing.* *(NU and AI – Week 7, .Interview 9)* ***I think it's relevant because NetMeeting also involve like it's related to IT right. First, it involves the use of computer. When we use NetMeeting, sometimes we come across*** *error error error* ***right, this is also useful so we are used to this software. Who knows, in the future, even meeting, meeting will be conducted online right. Sometimes Computer Science uses this thing as well, it's related it's relevant.*** (ZR – Week 4, Interview 2)

4.4.2.2 Comments and Suggestions on the CMC Task-Based Activities

Apart from commenting on their attitudes towards the use of NetMeeting and Divace Duo, the participants also provided some comments and suggestions regarding the CMC task-based activities. These comments were taken into consideration in the design of CMC task-based activities for the next feasibility study.

In general, the students liked the tasks because they involved the use of state-of-the-art software and equipment. The students also found the tasks interesting because the sitting arrangement was in clusters of six. Seven of them highlighted the problem of saving their chat-based or audio-based interaction as computer files. This was confusing because there were too many folders to open. They suggested that the computer folder that had to be used for saving those files should be placed on the computer desktop.

In terms of task type, MF, MN and MS mentioned that they liked the guessing game because it was fun and challenging (see MF's comments in Table 4.10). AI and NU enjoyed doing the interview tasks. However, even though the tasks were enjoyable, five of the students found the topics boring (see FZ's comments in Table 4.10) because as AN suggested, they were using the same topic to perform activities using NetMeeting and Divace Duo (see AN's comments in Table 4.10).

They suggested that there should be variety of tasks including group discussions in general and ESP issues and different topics with similar task types. They also requested guidelines on how to conduct content-specific interviews, and feedback on the appropriateness and accuracy of their interactions (see AI and NU's comments in Table 4.10).

Table 4.10 Samples of comments and suggestions on CMC task-based activities

COMMENTS
The game is actually indeed a lot of fun because we have to guess what are the things we don't know. When we play the game, we have to imagine when the clue is given and it's one thing in the room and then I have to think what is the thing that he's guessing then I feel so very in Malay we say, ***finding*** *what is the thing, finding the answer.* ***Made me feel that I really have to find it otherwise I would not feel satisfied****.* (MF – Week 4, Interview 1)
Not enough for enjoyment but enough for the study. I mean there is response from some of the students they said quite boring attending this class attending this lab session but when we refer to the chat session it's quite OK. Quite enjoy using the chat session, Divace Duo, but when referring to the task quite boring. It takes so long. They don't like the task but they enjoy using everything the equipment or the software but they hate doing the task. (FZ – Week 6, Interview 8)
When it's the second time, I don't feel like doing it because it's the same thing although the first was chatting, we were speaking [via Divace Duo] using the same topic, it's *boring,* ***it's the same*** *point* ***[ideas]. Don't feel like doing the same thing****.* (AN – Week 5, Interview 6)
NU: I know I know because I see, ***worried because sometimes they did not know what to ask****, wasting.* ***They did not ask spontaneously, later, that's all. I'm worried because when, I recalled during the earlier sessions I did not, like I did not really ask, so that day I felt like, it's a waste, not beneficial****.* *PS: Maybe* ***like*** *come up with guideline?* *NU: Ah guideline. Ah yes, yes.* ... *PS: Do you think that NetMeeting can help to improve your oral communication skill?* *AI: Yes, I think so and it is better if I get some feedback.* (NU and AI – Week 7, Interview 9)

4.4.3 Field Notes

I took field notes throughout the study and acted as the facilitator for all the CMC task-based sessions. I noted the participants' reactions regarding the use of NetMeeting and Divace Duo and my experiences of managing and facilitating the sessions.

In general, managing and facilitating the participants' chat-based activities using NetMeeting was challenging but fulfilling. Participants' reactions regarding the use of NetMeeting and Divace Duo were positive. One of the concerns was the dwindling number of participants who attended the chat-based and audio-based sessions as they progressed over four weeks. Feedback gathered from the participants during the interviews discussed earlier revealed that this was not due to any dislike of the CMC tools but because they had been assigned similar types of activities to perform using NetMeeting and Divace Duo, throughout the study. The CMC task-based activities for the semi-serious and serious sessions both involved eliciting information about processes, and the participants were bored doing similar type of tasks with both tools (see FZ's comments in Table 4.10). AN explained further that the tasks were boring because the same topic was covered with both CMC tools (see AN's transcript in Table 4.10). This issue was taken into consideration when CMC task-based activities were designed for Feasibility Study II.

During the chat-based sessions using NetMeeting, there were instances when a few participants were found to be sending private messages to their friends using the command prompt, checking their email or surfing the internet while completing the assigned tasks due to the time lag in chat communication. This problem was avoided in future sessions by blocking internet access from the networked computers during the sessions and reminding participants to focus on the assigned activities. The participants also tended to chat about daily life prior to attempting the activities. At times, they had to be reminded to focus on their tasks and avoid code-switching to their native language or using contractions in the Malay language. All these problems occurred mostly during the preparatory session because of the relaxed nature of the activity. As the activities became more serious and challenging, participants were more focused and less code-switching occurred.

The participants also seemed to be enjoying themselves and were seen to be very involved in the activities using NetMeeting. Their eyes were glued to their computer screens most of the time as they were typing their questions or responses to their interlocutors or when they were patiently waiting for a response. At times, they were seen smiling to themselves over responses they had typed or received from their interlocutors. They did not encounter any major problems using NetMeeting except that they had to register their name at the beginning of every chat-based session to ensure that it was their name which appeared in the chat window. For every chat-based session, one participant from each pair or group had to be assigned to "place a call" to their partner or group members before they began their interaction. At times, the digital language laboratory's server was quite slow, and this caused a slight delay for some students to begin their chat-based sessions. One participant, NU, complained about this when she said that placing a call using NetMeeting was cumbersome (see NU's comments in Table 4.4).

Participants did not experience many problems using Divace Duo at the beginning of each audio-based session. This was mainly because I set up the pairs or groups at the teacher's computer prior to each session. The participants just had to activate Divace Duo by clicking on the icon on their computer and put on headsets with attached microphones. Like NetMeeting, Divace Duo was very simple to use and operate. However, as with the chat-based activities, there were a few groups of participants who talked about issues which were not relevant to the task they were attempting at the beginning of a session. This was probably because they were excited with the new software and wanted to experiment with it.

There were two major concerns regarding the use of Divace Duo for audio-based sessions. One was the quality of the recording of participants' oral interactions. Two participants, EM and ML mentioned during an interview that Divace Duo's listening facility was so sensitive that it also recorded surrounding noises which interfered with the activity (see EM and ML's comments in Table 4.4).

The other concern was the problem of collecting recordings of participants' oral interactions. There were many instances in which the students' computers were unable to make copies of their pair-work and group-work oral interactions using Divace Duo due to technical failures of the software and computer system. They were frequently given the prompt "disk-space full" when they attempted to save their oral interactions in digital form. If they were successful, there were instances in which only their voice was recorded and their partner or group members' voices were missing. This would be an important factor to consider when choosing a CMC tool for further studies in this research.

Most participants in the study were able to complete the task-based activities that were assigned to them each session. They did not experience many problems with the tasks, probably because the activities required them to gather information about familiar processes. Even for the very serious activities, students were familiar with either the Academic Information Management System or Online Public Access Catalogue System. In any case, as Computer Science students, they were quick to learn about new information systems. Nevertheless, there were participants who indicated in the interview that they were not clear about the instructions for the tasks. These students either managed to resolve the problem amongst themselves or simply got distracted and discussed some other topics until they ran out of time. This occurred during the preparatory session, the only session for which participants were not given written instructions. This problem was spelled out by NU and AI during the last group interview, as shown in the transcript below:

NU: ***During the NetMeeting session for guessing object we didn't play the game. We were*** *confused.* ***We thought that we will be given questions to ask. We then realized that we had to*** *create* ***our own questions so we just chat and chat we were confused. We were not clear of what to do, it wasn't really successful. ...***

AI: *I don't understand your instruction.*

PS: *You didn't understand?*

AI: *For me the first experience was* ***what?*** *Confusion but after that you show us the instruction and you, you speak and then I understand it because I can read it and, hear you.*

PS: ***Week two, three or week one?***

NU: ***I think two and three.***

AI: ***Yes.***

PS: ***Maybe there was no*** *instruction* ***on week one.***

AI: *Yes, you just, you just speak, I, because I had to translate your instruction.*

NU: *There should be clear instruction.*

PS: ***For*** *the following week I gave you instruction because I interviewed some students.* ***They said if possible, they would like a written copy of the instruction for the tasks,*** *it would be better for them*

(NU and AI, Week 7, Interview 9).

At the time, I was unaware of this because it was quite difficult to check every student's computer screen to ensure that they had successfully completed the 5-minute preparatory tasks. Written instructions were given to participants for the remaining sessions, in addition to oral instructions.

4.5 Discussion

At the end of the study, the participants were positive about the use of NetMeeting, a text-based synchronous CMC tool, and Divace Duo, an audio-based synchronous CMC tool. Both tools encouraged them to complete the tasks and to learn the English language. The tools also provided an exciting alternative to their normal classroom-based activities. Most of the participants did not encounter many problems in using either of the tools, although NetMeeting proved particularly easy to use. This text-based synchronous CMC tool also provides conditions for the students to plan and reflect upon their messages and notice errors due to its affordance of a time lag.

Most of the findings derived from the interview data corresponded with the findings of the attitude questionnaire, which also revealed that students found Divace Duo more difficult to use than NetMeeting (see Figure 4.6). Similarly, in the group interviews more students reported difficulty with the use of Divace Duo (see Table 4.2). Although Divace Duo would be useful as a language learning tool, problems with its listening and recording features meant that the students encountered some problems comprehending their interlocutor's utterances and reflecting upon their oral exchanges. Hence, it was decided that this audio-based synchronous CMC tool would not be suitable for collecting interaction data for this research.

NetMeeting was an easier tool to use due to the students' familiarity with its functions which are quite similar to other text-based synchronous CMC software such as Yahoo Messenger, MSN Messenger and mIRC, all of which the students were already familiar with. Furthermore, copies of the students' written exchanges could easily be gathered for analysis by saving them onto the computer server.

In the attitude questionnaire, a slightly higher percentage of students agreed that Divace Duo was interesting, motivating and fun (see Figure 4.6) but the interview data produced opposite findings (12 students claimed to have enjoyed using NetMeeting compared to 11 students for Divace Duo, see Table 4.2). From these findings it can be concluded that the students enjoyed using both types of synchronous CMC tools more or less equally. Both tools offered them a different but fun and interesting approach to learning the English language, NetMeeting affording written interaction and Divace Duo affording oral interaction.

The results gathered from the interview data on the usefulness of NetMeeting and Divace Duo corresponded with the findings of the attitude questionnaire. The questionnaire data indicated that a higher percentage of students considered NetMeeting a useful tool in comparison with Divace Duo (see Figure 4.6). More of the participants also agreed that NetMeeting was a useful tool in terms of its affordances to help improve their general communication skills, knowledge of the English language (spelling, vocabulary, grammar, pronunciation) and the specific ESP skill of interviewing for system requirement elicitation (see Figure 4.8). The differences ranged from 6% to 14%.

During the group interviews, students suggested that both the applications were useful in terms of providing support for communication, facilitating language learning and meeting their ESP needs. However, more students claimed that NetMeeting was useful and it seemed to afford a more conducive environment for them to improve their English language and communication skills. In contrast to Divace Duo, they noted that NetMeeting enabled them to see their written interaction on the screen and therefore provided conditions for them to notice errors, the quality of their language production and the language production of good learners. It also afforded them a time lag to reflect upon and plan their messages before sending them to their interlocutors. These findings support several CMC studies that text-based synchronous CMC affords delayed response, and thus provides language learners with time to plan the structure of their message, reflect upon their ideas and notice and repair errors (Hudson & Bruckman, 2002; Kelm, 1992; Kroonenberg, 1994/1995; Lai & Zhao, 2006). A few students even commented that communicative practice with NetMeeting might help to improve their oral communication skills in English due to its affordance as a tool to rehearse the structure of oral discourse (see MF's comments in Table 4.7).

4.6 Practical Issues

Practical issues raised in relation to this study are those concerning equipment, technical support, time-tabling and accessibility. It proved to be more practical to use NetMeeting for further studies because this software is easily accessible in every computer laboratory at UTM. At present there is only one laboratory at UTM that is equipped with Divace Duo. Issues regarding time-tabling and accessibility had to be considered as well because other language instructors needed to use equipment in the digital language laboratory for their language classes. The laboratory had to be booked in advance, prior to the CMC sessions, to avoid problems with access, and all participants had to be registered to enable them to log onto any computer in the laboratory and gain access to the CMC tools.

4.7 Summary and Implication for Feasibility Study II

The findings of FSI suggested that it was logistically possible to conduct CMC task-based activities via two different types of synchronous CMC tools, NetMeeting and Divace Duo, in a digital language laboratory with a group of Computer Science undergraduates at UTM. However, the results of the study indicated that although the students enjoyed using both tools equally, it was more feasible to use NetMeeting.

Unlike Divace Duo, NetMeeting affords observation of learners' chat interactions to provide conditions for the noticing of mistakes or good sentence structures. The time lag it affords enables students to plan and reflect upon their message. In addition, NetMeeting can simulate real-time text-based discussions and meetings which are common among Computer Science professionals, especially e-JAD sessions (see Section 1.3.3). It was also easily accessible in all networked computer laboratories around UTM campus and enabled reliable data collection of students' chat-based interaction for feedback and analysis. With these considerations, NetMeeting has been identified as the synchronous CMC tool to be used in Feasibility Study II and the Main Study. A small amount of time, however, was also allocated to the use of Divace Duo during the Main Study to provide the students with a slight variety of learning experience, and some experience with online oral communication.

On the basis of findings from Feasibility Study I, this research was continued to the next stage, Feasibility Study II. At this next stage, the focus of the study was on the feasibility of sustained-content tasks using the chat feature of NetMeeting as the main communication tool. This study will be discussed in the next chapter.

CHAPTER 5

FEASIBILITY STUDY II

5.0 Introduction

With reference to the findings of FSI, I conducted a second feasibility study called Feasibility Study II (FSII) over a three-week period (22nd December 2003 – 5th January 2004) during the second semester of UTM's 2003/2004 academic year (see Appendix B3 for the timeline of FSII). In this chapter, I will present this study and its implications for the Main Study.

5.1 Aim of the Study

The aim of FSI was to look at the feasibility of synchronous CMC tools. The aim of FSII was to look at the feasibility of sustained-content CMC activities in the context of UTM. It was necessary to conduct these two feasibility studies because the main objective of this research was to find out to what extent the use synchronous CMC as a modality for TBL through sustained-content ESP tasks or CMC ESP method provides opportunities for the development of Computer Science students' interviewing and group discussion skills for systems analysis and design. To this end, it was essential to investigate students' attitudes, anxiety levels and confidence in connection with the proposed method.

The aim of FSII was to design sustained-content ESP tasks that are conducted via a synchronous CMC called NetMeeting (referred to as CMC ESP tasks) and discover whether the proposed activity types were suitable for use at UTM.

5.2 Research Questions

FSII aimed at answering the following research question:

1. Are the proposed CMC ESP task types suitable for investigating the effects of the CMC ESP method on Computer Science students at UTM, bearing in mind the attitudes of students and their ESP needs?

To answer this research question, a variety of CMC ESP task types were designed based on the principles of task design discussed in Chapter 2. The suitability of the task types was determined with reference to their feasibility and usability with Computer Science students at UTM and their potential to afford positive effects. A text-based synchronous CMC environment called NetMeeting was chosen for this study based on its positive affordances and feasibility as a modality for TBL through CMC task-based activities at UTM (see Chapter 4).

5.3 Method

The method I employed in conducting FSII is described below.

5.3.1 Participants

Ninety-five first year Computer Science students at UTM between the ages of 18 to 21 took their English for Academic Communication or EAC (UHB1322) module during the second semester of their 2003/2004 academic year. These students were a different group from the FSI participants. They were all Malaysian from various ethnic backgrounds. Their MUET (Malaysian University English Test) scores ranged from Band 2 to Band 4 (Band 1 indicates the lowest level and Band 6 the highest level of proficiency in English).

The students were assigned to three different classes or sections of the EAC module; Section 29 (n=32), Section 30 (n=33) or Section 31 (n=30). Each section had between 30 to 33 first year Computer Science students. All these students were also taking their Software Engineering (SCK1233) module in the same semester. They would take the Systems Analysis and Design Methods (SCK2433) module in the following semester.

Section 30 of the EAC module was randomly selected as the treatment group for FSII. Although there were 33 students in this section, only 27 of them volunteered to participate in FSII. The number of participants dwindled as the study progressed. This was probably because although I was able to obtain permission from their language instructor to conduct the first two tasks of the study during class time, the remaining four tasks were held outside class time.

Section 29 was randomly selected as the participants for the Main Study. These students were subjected to treatment with the CMC ESP method. Section 31 became the control group for the Main Study.

5.3.2 Equipment and Software

Networked computer laboratories at the Faculty of Computer Science and Information Systems in UTM were used throughout FSII. Each was equipped with at least 30 computers that operated on Windows operating system and were installed with Windows NetMeeting version 3.01. Different laboratories were used according to availability.

5.3.3 CMC ESP Tasks

In this sub-section I will describe the process of selecting, grading and sequencing the tasks for this study. This is followed by a description of the tasks and their task type.

5.3.3.1 CMC ESP Tasks Selection, Grading and Sequencing

The forms of tasks that I selected for this research were based on the current and future communicative needs of Computer Science undergraduates at UTM. As discussed in Chapter 1, the specific oral communication skills the students require are the ability to conduct interviews and group discussion sessions with clients.

As identified in Section 1.3 and 1.4, interviewing during the process of systems analysis and design entails:

- information elicitation (Activity A; see Appendices D4 to D9), and
- probing for further information (Activity B; see Appendices D10 to D19),

while conducting JAD or group discussion sessions entails:

- asking for clarification and confirmation of clients' workflow diagrams, based on information elicited during earlier interview sessions (Activity C; see Appendices D20 to D44), and

- asking for opinions and suggestions for improvements to design prototypes (Activity D; see Appendices D45 to D57).

As argued in Section 2.1, the selection of tasks should reflect the fact that content-based form of instruction entails active participation of learners in the exchange of content information. According to Pica et al. (1993), jigsaw tasks provide the best opportunity for learning according to second language acquisition (SLA) research, followed by information gap, problem-solving, decision-making and finally, opinion-exchange. On the other hand, Smith (2003b) suggests that jigsaw tasks do not necessarily provide more opportunity for learning than decision-making tasks. These studies were not concerned with task authenticity or the development of discourse and pragmatic competence, however Computer Science students at UTM need to acquire competence in interviewing and group discussion for systems analysis and design. For this study, I selected three of five Pica et al.'s (1993) task types: information gap, jigsaw and opinion-exchange because I could create authentic tasks within these types to develop interviewing and discussion skills.

Activities A (see Appendices D4 to D9) and B (see Appendices D10 to D19) have the characteristics of information gap tasks. For these activities, the client holds the information that the systems analyst must request. Activity C (see Appendices D20 to D44) is a jigsaw task. For this activity, the clients hold information of their own workflow diagram. The systems analysts hold some inaccurate information of the clients' workflow diagrams. They need to exchange the information and work convergently to produce an accurate combined workflow diagram. Activity D (see Appendices D45 to D57) can be categorized as an opinion-exchange task because it involves clients and systems analysts exchanging information for systems improvement.

I selected these activities when choosing the CMC ESP tasks for this study because of their sustained-content nature. They would expose students to the specific communication skills and language items that are required for systems analysis and design. Moreover, as "pushed output" tasks that demand the production of language, they could lead the students to produce "comprehensible output" (Swain, 1985), a necessary condition to acquire language. The tasks could also prompt the students to use communication strategies to facilitate the process of acquiring strategic competence.

Activities A, B, C and D are referred to as "serious" activities in this study as they are sustained-content ESP tasks. In accordance with the literature on systems analysis and design (see Section 1.3.3) and the requirements of the projects in the Software Engineering and Systems Analysis and Design Methods modules (see Section 1.4.2.4), these activities were sequenced according to the interaction routine for system analysis and design. Activity A was followed by B, then C and finally D (see Figure 5.1).

I also designed two other tasks: 1) a guessing game (guessing an object, see Appendix D1), and 2) a group discussion on problems of bullying in schools (see Appendices D2 and D3). These tasks were general tasks as opposed to the four serious tasks listed above. The purpose of the tasks was to provide participants with easier and cognitively less demanding activities before they attempted the more specific and cognitively challenging sustained-content tasks.

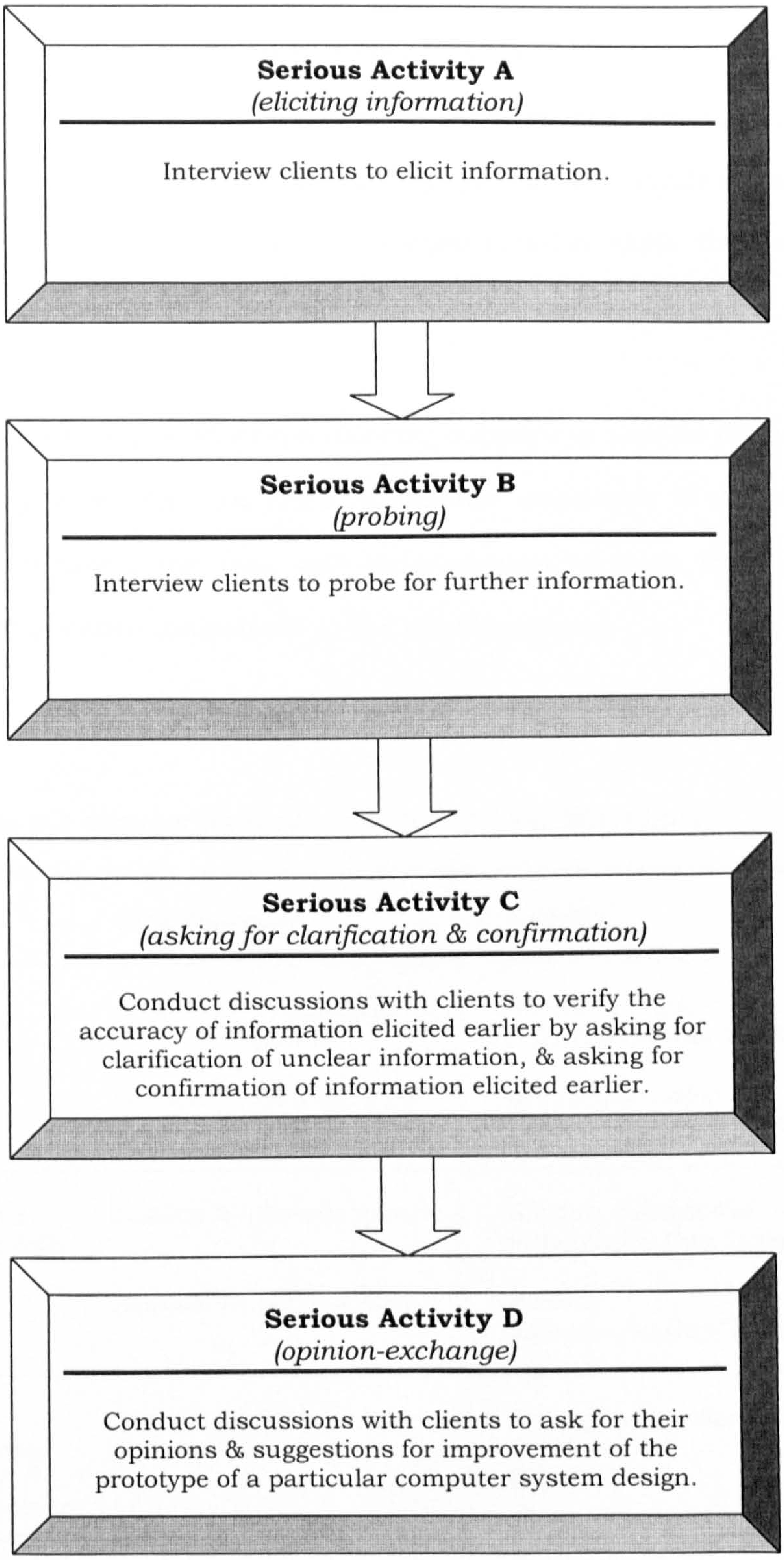

Figure 5.1 Sequence of "serious" activities according to the interaction routine for systems analysis and design

The six tasks were performed in six sessions, via NetMeeting: a preparatory session, a semi-serious session and four serious sessions. They were sequenced and graded in terms of level of difficulty (moving from easier to more complex linguistic forms) and from general, less serious activities to specific, more serious activities as shown in Table 5.1. This form of task sequencing may provide the students with the necessary conditions to develop the specific communication skills they need for systems analysis and design.

Each serious activity was repeated with a different scenario to provide the students with the opportunity to switch their roles, automatize knowledge of the language items required to complete the task and thus perhaps improve their fluency, accuracy and communicative competence in the target language.

Table 5.1 Categories and sequence of CMC ESP tasks

Task Categories		**Task Sequence**	**Activity**
General Tasks		Session 1 – Preparatory Activity	Guessing Game (Information Gap Task)
		Session 2 – Semi-Serious Activity	Group Discussion (Opinion Exchange Task)
ESP Tasks for Systems Analysis & Design	Interview session with 'client'	Session 3 – Serious Activity A	Eliciting Information (Information Gap Task)
		Session 4 – Serious Activity B	Probing (Information Gap Task)
	Joint application design/ development (JAD) session with 'clients'	Session 5 – Serious Activity C	Asking for Clarification & Confirmation (Jigsaw Task)
		Session 6 – Serious Activity D	Asking for Opinions & Suggestions (Opinion-Exchange Task)

5.3.3.2 CMC ESP Tasks Description and Type

A description of all six CMC ESP tasks that I designed for the study and their purpose is provided in this sub-section. The task type, activities and goals of each CMC ESP task is summarized in Table 5.2.

Table 5.2 CMC ESP tasks type

Task Type	Task	Task Activities & Goals
Information gap	Guessing an object (Preparatory Activity) Eliciting information from 'client' (Serious Activity A) Probing information from 'client' (Serious Activity B)	One-way flow of information from the sending interactant (X) to the receiving interactant (Y). Interactional activity - One interactant (e.g. client) holds all information and supplies it as the other (e.g. systems analyst) requests it. Interaction required - One interactant (e.g. systems analyst) is required to request, the other (e.g. client) is required to supply the information. Roles are then reversed. Communication goal - Interactants have same or convergent goals and only one acceptable outcome is possible. Impact on opportunities for learning – Expected comprehension of input, feedback on production and interlanguage modification.
Jigsaw	Asking for clarification & confirmation (Serious Activity C)	Two-way flow of information among interactants. Interactional activity - Each interactant holds a different portion of information and supplies and requests this information as needed to complete the task. Interaction required - Interactants who are systems analysts are required to supply information and request for clarification and verification, the others who are clients are required to correct or verify the information based on their portion of information to complete the task. Roles are then reversed. Communication goal - Interactants have same or convergent goals and only one acceptable outcome is possible. Impact on opportunities for learning – Expected comprehension of input, feedback on production and interlanguage modification.

Task Type	Task	Task Activities & Goals
Opinion-exchange	Group discussion (Semi-Serious Activity) Asking for opinions & suggestions (Serious Activity D)	Two-way flow of information among interactants. Interactional activity - Each interactant has access to information and supplies it if other(s) request it. Interaction required - Each interactant is expected to request and supply information but not required to do so. Communication goal - Interactants have related but divergent goals and more than one outcome is possible. Impact on opportunities for learning - Possible comprehension of input, feedback on production and interlanguage modification.

The first CMC task-based activity was a preparatory session in the form of a guessing game. It was the simplest activity that aimed to familiarize participants with the chat feature of Windows NetMeeting version 3.01 (NetMeeting Chat). This was followed by a semi-serious group discussion of current issues, which was intended to encourage participants to think more carefully about the CMC contributions. The activity was not linguistically demanding, and the atmosphere was informal and relaxed. The following four sustained-content sessions set serious tasks: two interviews followed by two JAD sessions. These activities were linguistically more demanding as participants had to play the roles of systems analysts or clients and use language features typical of professional contexts.

Each of the tasks consisted of two phases: a pre-task and a during-task phase. In the pre-task phase of each session, students were provided with content input relating to systems analysis and design, relevant language input, and practice exercises. This phase lasted for only a few minutes in the first two sessions, and for up to an hour (one class period) in subsequent sessions.

In the during-task phase, the students conducted communicative activities in pairs or in groups of four (as instructed), communicating with each other in English via

NetMeeting Chat. For each of the four serious sessions, the students played the role of systems analysts and clients and conducted CMC task-based activities concerning the development of a computerized information system for a company. Once the first task was completed, they were instructed to switch their roles and complete another similar type of task for a different company. The during-task phase lasted for about one hour (one class period).

In this study, there was no third phase involving analysis of students' chat interaction transcripts and feedback on grammar and communication problems. This phase was excluded because the aim of FSII was to test the suitability of the proposed tasks for use with Computer Science students at UTM. The post-task phase was, however, included in the Main Study. In the following sub-sections, I will describe all the six tasks I designed and conducted with the participants of FSII.

Session 1 - Preparatory Activity

The first CMC activity was a preparatory activity called the guessing game (see Appendix D1 for the instruction sheet). It was an information gap task which required the students to work in pairs and take 5-minute turns to guess an object in the computer laboratory. The purpose of this activity was to familiarize students with the use of Windows NetMeeting (to conduct chat-based interaction). Prior to this task, the students were given input on the forms of Yes/No questions. They were then instructed to use Yes/No questions to guess objects in the laboratory. As the facilitator of the CMC activities, I demonstrated how to play the guessing game using NetMeeting Chat.

Session 2 - Semi-Serious Activity

The second CMC activity was a semi-serious group discussion (see Appendix D2 for the instruction sheet). It was an opinion-exchange task which required the participants to work in groups of four and conduct a 30-minute group discussion on the causes and effects of bullying in schools and ways to solve the problem. One member from each group was elected as the coordinator of the discussion and another was assigned to take note of the discussion using the Windows NetMeeting whiteboard feature. The aim of this activity was to train students to be responsible for their responses in the session in an informal and relaxed atmosphere. They were given input on useful expressions and phrases that could be used in a group discussion before conducting the chat-based activity (see Appendix D3 for the input handout). During this pre-task phase, they were instructed to work in pairs and expand upon a few examples of interactional exchanges to show agreement or disagreement with a given issue. As the facilitator of the CMC activities, I modelled one of the students' exchanges using NetMeeting Chat and demonstrated the use of NetMeeting Whiteboard for writing notes.

Sessions 3, 4, 5 and 6 - Serious Activities

There were four sustained-content CMC tasks: Serious Activity A, B, C and D. I conducted them in four separate sessions. All these pedagogic tasks were serious activities which intended to simulate real-world communicative activities that the Computer Science students would experience in their Systems Analysis and Design module and in their future profession. They were linguistically more demanding than the first two sessions described earlier. The tasks were also sequenced according to the authentic process of computer systems development. The first two serious tasks were systems analysis interview sessions whereas the second two tasks were JAD sessions.

Session 3 – Serious Activity A (Systems Analysis Interview)

Serious Activity A was an information gap task called eliciting information (see Appendix D4 for the instruction sheet). The aim of this activity was to train students to be able to conduct a structured systems analysis interview using the technique of information elicitation. During the pre-task phase, students were given input on interviewing skills and practice identifying different types of interview structures and questions from three transcripts (see Appendix D5 for the input handout).

In the during-task phase, the students were required to work in pairs and take 30-minute turns to play the role of a systems analyst (Student A) who elicited relevant organizational and job-related information from the client (Student B).

Student A and Student B were given different task sheets for this activity (see Appendices D6 and D7 for Serious Activity 1A). Each task sheet contained a description of the students' role, instructions for the task and two diagrams. The first diagram was an organizational chart and the other, an activity table. The systems analysts' diagrams could only be completed by interviewing the clients via NetMeeting Chat to elicit the missing information.

In the first 30 minutes, students exchanged information to develop a driving school client information management system. They then switched roles and were given another similar set of tasks concerning the development of a hotel booking information management system (see Appendices D8 and D9 for Serious Activity 2A). Student A played the role of the hotel manager and Student B was the systems analyst.

Session 4 – Serious Activity B (Systems Analysis Interview)

Serious Activity B was the second serious task designed for the study. It was an information gap task involving "probing" (see Appendix D10 for the instruction sheet). The purpose of this activity was to train students to conduct a systems analysis interview and probe their clients for further information. They were required to gather detailed information on the client's workflow and trace the flow of work tasks or data in the client's organization for systems improvement.

In the pre-task phase, students were provided with input on the probing skill in a systems analysis interview (see Appendix D11 for the input handout). They were then instructed to identify examples of probing questions in samples of interview transcripts provided during the pre-task phase of Serious Activity A. The during-task stage required students to work in pairs and take 20-minute turns to role-play a systems analyst or a client. During the first turn (Serious Activity 1B), Student A, who assumed the role of the systems analyst, had to conduct a follow-up interview and probe the workflow (flow of work tasks and information or data between entities or persons/functional areas within or outside an organization) of Student B who was the driving instructor (see Appendices D12 and D13). Both students were supplied with a user-level workflow diagram but Student A's diagram lacked information about the driving instructor's workflow. After this, the students had to switch their roles and conduct the same type of interview with Student A playing the part of the hotel manager and Student B, the systems analyst (see Appendices D14 and D15 for Serious Activity 2B).

A second version of Serious Activity B was designed following comments from the participants that the first version was too difficult. The task was similar but more information was provided on the task sheet to facilitate the process of probing. The student clients' task sheet contained a workflow diagram and a written description of the flow (see Appendices D17 and D18) whereas the student systems analysts' task sheet had a workflow diagram with only four missing work tasks instead of six (see Appendices D16 and d19). This version was not tested in FSII but used in the Main Study.

Session 5 - Serious Activity C (Joint Application Development)

The third serious task was a jigsaw task called asking for clarification and confirmation (see Appendix D20 for the instruction sheet). The aim of this task was to train students as systems analysts, to conduct an e-JAD session and ask their clients for clarification and confirmation regarding a combined user-level workflow diagram. The combined workflow diagram consisted of the combined work processes of two clients working for the same company. It contained missing and inaccurate work processes that required clarification and confirmation from both clients through an e-JAD conducted via NetMeeting Chat.

In the pre-task stage of this activity, students were provided with input on JAD information gathering techniques and useful phrases to ask for clarification and confirmation regarding the combined user-level workflow diagram (see Appendix D21). The during-task phase required them to work in groups of four and take 30-minute turns to conduct a JAD session via NetMeeting Chat. During the first turn (Serious Activity 1C), Student A and Student B played the role of systems analysts. Student A had to facilitate a JAD session and ask for clarification and confirmation of the given combined user-level workflow diagram whereas Student B was instructed to be the scribe and take note of changes to the diagram in response to feedback from the clients. Student C had to play the role of the driving instructor and Student D, the lecturer. They had to provide Student A and Student B with the correct information regarding their work processes.

All four students in each group were provided with a task sheet and a copy of the incomplete and inaccurate version of the combined user-level workflow diagram for the driving instructor and lecturer (see Appendices D22 to D25; the correct version of the combined diagram is in Appendix D26). As clients, Student C and Student D were also provided with the correct version of their respective user-level workflow diagram. They had to study this and compare it with the combined workflow diagram to identify missing and inaccurate work processes. During the e-JAD session, the student clients had to provide the student systems analysts with the correct information about their work processes upon request.

In the second turn of Serious Activity C, the students switched their roles and conducted a similar type of activity (Serious Activity 2C; the correct version of the combined user-level workflow diagram is in Appendix D31). Student A and Student B role-played as hotel employees. Student A was the hotel manager and Student B, the hotel booking clerk for the hotel (see Appendices D27 and D28). Student C and Student D played the role of systems analysts with Student C as the facilitator for the JAD session and Student D, the scribe (see Appendices D29 and D30).

A second version of Serious Activity C was designed when the participants encountered a lot of problems conducting and completing this activity (see Appendix D32 for the instructor sheet). The second version was also tested in FSII. There were two major differences between the two versions. Firstly, the first version only contained the visual representation of the clients' individual workflow and combined workflow but the second version also provided a written description of work processes (see Appendices D33 to D36 for Serious Activity 1C and Appendices D39 to D42 for Serious Activity 2C). Secondly, the first version used NetMeeting Chat but the second version used both NetMeeting Chat and NetMeeting Whiteboard. An electronic copy of the combined workflow diagram was placed on NetMeeting Whiteboard so that every participant could view it (see Appendices D37 and D43; the correct versions are in Appendices D38 and D44). The student who role-played the scribe had to use the features of NetMeeting Whiteboard to make changes to the diagram online as the JAD session was taking place. The student clients were able to view the original and edited combined workflow diagram online and comment on it.

Session 6 – Serious Activity D (Joint Application Development)

The final serious activity that I designed for the study was an opinion exchange task which aimed to train the students to be able to exchange opinions or suggestions during a JAD session (see Appendix D45 for the instruction sheet). In the pre-task phase, the students were provided with input on user interface design and useful phrases to ask for opinions or suggestions and to respond appropriately to them (see Appendix D46 for the input handout). They were also given practice exchanging opinions about the interface design of web-based courseware (see Appendix D47 for a copy of the user interface design).

As in Serious Activity C, this session also required the students to work in groups of four and take 30-minute turns to conduct an e-JAD session via NetMeeting Chat. For Serious Activity 1D, all the four students' roles were similar to those assigned in Serious Activity 1C. The only difference was the task description. Every student was given a copy of their respective task sheet (see Appendices D48 to D51) and a copy of the user interface prototype for the driving school client registration system (see Appendix D52). Student A, as the JAD facilitator for this activity, was instructed to place an online copy of the user interface design prototype on NetMeeting Whiteboard for every participant to view throughout the e-JAD session. Student A and Student B were given five minutes to prepare questions that would enable them to elicit what Student C and Student D liked and disliked about the user interface design prototype, and their suggestions for improvement. At the same time, Student C and Student D had to analyze the given prototype, list the things that they liked and disliked about it and make suggestions for improvement. Student A then had to facilitate the 30-minute e-JAD interface evaluation session to elicit comments and suggestions about the prototype while Student B recorded the session using NetMeeting Whiteboard. As clients, Student C and Student D had to provide the systems analysts with the information requested.

For the second turn called Serious Activity 2D, the students switched their roles and conducted another similar activity (see Appendix D53 to D56 for the task sheet and Appendix D57 for the user interface design prototype). Student A played the role of the hotel manager and Student B, the hotel booking clerk (see Appendices D53 and D54). Student C and Student D were the systems analysts, with Student C acting as the facilitator for the JAD session and Student D, the scribe (see Appendices D55 and D56).

5.3.4 Data Collection Instruments

Both quantitative and qualitative instruments were used to answer the research question in Section 5.2. The aim was to find out if the six proposed tasks (treatment) were appropriate for my research purposes. The quantitative instruments used were the pre- and post-treatment self-assessment questionnaires whereas the qualitative instruments were the retrospective questionnaires and group interviews.

5.3.4.1 Pre and Post Self-Assessment Questionnaires

The purpose of the pre and post-treatment self-assessment questionnaires was to find out the affordances of text-based synchronous CMC as a modality for TBL through CMC ESP tasks on Computer Science students. The results of this study would then determine the suitability of the proposed task types for the Main Study. The questionnaires were divided into three main sections: Section I – Personal Information, Section II – English Language Proficiency Self-Assessment and Section III – Attitude and Anxiety Self-Assessment (see Appendix D58 for a sample of the questionnaire). Section I contained eight items on personal information, Section II was a 4-item rating scale for proficiency in English language skills and Section III was made up of two types of attitude measurement scales (an 8-item and a 7-item scale) and a 7-item anxiety measurement scale (see Table 5.3).

Section I for both the pre- and post-treatment self-assessment questionnaires required respondents to provide personal data about themselves such as name, age and gender. In Section II, respondents had to personally rate their current listening, reading, writing and speaking skills using a 5-point Likert scale which ranged from "very good" (5) to "not very good" (1). Section III was divided into three main sections consisting of attitudes and anxiety measurement scales:

- Section IIIA – General Attitudes to the Use of NetMeeting Chat for CMC Task-Based Activities,
- Section IIIB – Attitudes to the Use of NetMeeting Chat as an Effective English Language Learning Tool and
- Section IIIC – Anxiety in the English Language Classroom.

Respondents were required to indicate their agreement to statements in the attitudes and anxiety measurement scales using a 5-point Likert scale which ranged from "strongly agree"' (5) to "strongly disagree" (1).

Table 5.3 Distribution of items in the pre- and post-treatment self-assessment questionnaire

SECTIONS	NUMBER OF ITEMS
Section I: Personal information	8
Section II: English language skills proficiency	4
Section IIIA: General attitude to the use of NetMeeting Chat for CMC task-based activities	8
Section IIIB: Attitude to the use of NetMeeting Chat as an effective language learning tool	7
Section IIIC: Anxiety in the English language classroom	7

The only difference between the pre- and post-treatment self-assessment questionnaires were the attitude statements. Statements for the pre-treatment expressed futurity through the use of "will" whereas those for the post-treatment were in the past tense (see Section III of Appendix D58).

The attitudes scales used in the pre- and post-treatment self-assessment questionnaires of this study were similar to the ones distributed to the participants of FSI. They were adapted from Brett's (2000) attitude measurement scales. The justification for adapting Brett's (2000) attitude scales was discussed in Section 4.3.4.1. The first attitude scale for the pre-treatment self-assessment questionnaire intended to measure to what extent the respondents agreed that the use of NetMeeting Chat for CMC task-based activities would be "useful", "interesting", "motivating", "fun", "difficult", "a waste of time" and "complicated". Another item which intended to measure to what extent it would be "relevant" to the needs of the students was added to the scale. The aim of the second attitude scale was to measure the extent to which participants agreed that it would improve their "general communication skills", "listening skills", "reading skills", "writing skills" , "speaking skills", "knowledge of the English language" and "English language skills for system requirements elicitation". All statements for both attitude scales in the pre-treatment self-assessment questionnaire expressed future time as this questionnaire was distributed at the beginning of the study immediately after participants had completed the preparatory session using NetMeeting Chat (see Section III of Appendix D58). The statements were written in the past tense for the post-treatment self-assessment questionnaire, which measured the participants' attitudes after they had completed all six sessions of CMC task-based activities (see Section III of Appendix D58).

The anxiety scale for both the pre- and post-treatment self-assessment questionnaires was adapted from Horwitz et al.'s (1986) 33-item Foreign Language Classroom Anxiety Scale (FLCAS). FLCAS was chosen for this study because it had demonstrated construct validity and internal reliability as discussed in Section 1.4.2.3 (Horwitz, 1991). The items in the FLCAS are reflective of the following anxiety traits: 1) communication apprehension or speech anxiety, 2) test anxiety, 3) fear of being less competent or negative evaluation, and 4) fear of making mistakes (Horwitz et al., 1986).

This research focused on all the FLCAS anxiety traits except for test anxiety. Results of an English language classroom anxiety survey conducted with 850 Computer Science students at UTM had already revealed that they experienced significant anxiety with the selected anxiety traits (see Section 1.4.2.3), and CSPs interviewed during the preliminary investigation also indicated that they experienced these anxiety traits (see Section 1.3.2). Test anxiety was not selected because the communication needs of Computer Science students and professionals do not involve test conditions.

Seven items in the FLCAS were adapted for FSII as they were indicative of the selected anxiety traits. The first four items reflected communication apprehension or speech anxiety, the fifth and sixth item reflected the fear of being less competent or negative evaluation, and the last item reflected fear of making mistakes. The items are listed in Table 5.4. As with the attitude scales, a 5-point Likert scale was used to indicate the extent to which the students agreed with the items.

Participants' responses to the items in the anxiety scale gave an indication of their level of anxiety in the English language classroom. Additionally they indicated the relative prevalence of the various anxiety traits. A marked difference in results from the pre- and post-treatment self-assessment questionnaire would provide evidence of whether the use of text-based synchronous CMC as a modality for TBL through the CMC ESP tasks had helped to reduce participants' level of anxiety in the English language classroom.

Table 5.4 Items for Anxiety in the English Language Classroom Scale

ANXIETY TRAITS	ITEM NUMBER	STATEMENT
Communication Apprehension or Speech Anxiety	*1*	*I start to panic when I have to speak without preparation in the English language class.*
	2	*Even if I am well prepared for the English language presentation, I feel anxious about it.*
	3	*I don't feel confident when I speak in the English language class.*
	4	*It frightens me when I don't understand what the lecturer is saying in the English language class.*
Fear of being Less Competent or Negative Evaluation	*5*	*I always feel that the other students speak the English language better than I do.*
	6	*I am afraid that the other students will laugh at me when I speak the English language' their fear of being negatively evaluated by other students.*
Fear of making mistakes	*7*	*I worry about making mistakes in the English language class.*

5.3.4.2 Retrospective Questionnaires

Six retrospective questionnaires were designed for FSII. The purpose of this type of questionnaire was to obtain the participants' feedback on every CMC task-based activity that they had completed for this study. The participants' feedback would be used to determine if the technique of using synchronous CMC as a modality for conducting the CMC ESP tasks has the potential to afford positive effects for the Main Study. Changes to the tasks were made based on students' feedback. Each questionnaire consisted of several closed and open-ended questions which required participants to indicate if they were able to complete the activity, the length of time they took to complete it, what they learned, any difficulty experienced, its usefulness or relevance, things they liked and disliked about it, suggestions for improvements and any other comments.

The six retrospective questionnaires can be categorized into two types. The first type aimed to gather the participants' feedback on the two general tasks: the preparatory and semi-serious activities (see Appendix D59). The second type was to obtain their response to all four CMC ESP tasks: Serious Activities A, B, C and D (see Appendix D60). The major difference between the two types of questionnaires was the question which asked about the usefulness or relevance of the activities. The retrospective questionnaires for the general tasks asked if these activities were a useful preparation for computer-mediated communication using NetMeeting Chat (see question 1e in Appendix D59). The retrospective questionnaires for the CMC ESP tasks on the other hand asked the students if the activities were relevant for their academic needs as Computer Science undergraduates, and for their future needs as Computer Science professionals (see questions 1e and 1f in Appendix D60).

5.3.4.3 Group Interviews

The purpose of the semi-structured group interviews was to obtain participants' feedback on the CMC ESP tasks and gather information about the effects of the CMC ESP method (see Appendix D69 for the list of interview questions). The interviews were conducted in groups of either three or five participants.

5.3.5 Procedure

I conducted FSII over a two week period (22nd December 2003 – 5th January 2004) during the second semester of UTM's 2003/2004 academic year (see Appendix B3 for FSII timeline according to semester). I carried it out on the seventh and ninth week of the participants' 15-week semester. The participants were not available for the study in Week 8 because it was the mid-semester break. There were 33

Computer Science students in Section 30 of the EAC module. Altogether, 27 of them volunteered to participate in the first of six sessions of CMC task-based activities but this number had dwindled by the final session. They met for two hours (two class periods) in a computer laboratory equipped with at least 30 networked computers pre-installed with Windows NetMeeting, and used the chat feature of Windows NetMeeting to conduct the activities. I facilitated all six CMC task-based sessions.

I conducted the first five sessions of CMC tasks in Week 7 and the final session in Week 9 of the academic semester (see Section 5.3.3.2 for a description of the CMC task-based activities for Session 1, 2, 3, 4, 5 and 6). During the study, I designed a second version of the CMC ESP task for Session 4 based on feedback from the participants, but I did not test it because the changes made were only minor (see Section 5.3.3.2 for a description of both versions for Session 2). I also had to design a second version of the CMC ESP task for Session 5 because the participants experienced problems trying to complete the first version (see Section 5.3.3.2 for a description for both versions of Session 5). Session 5 was conducted twice using two different versions.

The timeline sequence of sessions and number of participants for FSII are shown in Table 5.5. The students who participated in the final session of the study attended all the previous sessions. A summary of the activities conducted at the pre-task and during-task phase of the CMC ESP tasks is shown in Table 5.6.

I distributed the pre-treatment self-assessment questionnaire to the participants of FSII at the end of the first session (Week 7, 22nd December 2003, n=27). I then distributed the post-treatment version of it after I had conducted all six sessions of the study (Week 9, 5th January 2004, n=16). All the 16 students who responded to the post-treatment self-assessment questionnaire also responded to the pre-treatment version.

I handed out the retrospective questionnaires to the participants at the end of each session. The number of respondents for the retrospective questionnaires was similar to the number of participants for each session (see Table 5.5). At the end of the study after all the six sessions were completed, I conducted two semi-structured group interviews with three participants in one group and five participants in the other (week 9, 5th January 2004). All the students who were interviewed had participated in all the sessions that I conducted for FSII.

Table 5.5 Feasibility Study II CMC task-based activities timeline

CMC TASK-BASED ACTIVITIES	NUMBER OF PARTICIPANTS (N=33)
Week 7: 22nd December 2003 (Monday, 8pm - 10pm) Session 1: Preparatory Session *Guessing Game*	27
Week 7: 23rd December 2003 (Tuesday, 8am - 10am) Session 2: Semi-Serious Session *Group Discussion*	25
Week 7: 23rd December 2003 (Tuesday, 8pm - 10pm) Session 3: Serious Session A *Eliciting Information*	16
Week 7: 24th December 2003 (Wednesday, 8pm - 10pm) Session 4: Serious Session B (100 min) *Probing*	14
Week 7: 26th December 2003 (Friday, 10am - 12pm) Session 5: Serious Session C (Version 1) *Asking for Clarification and Confirmation*	16
Week 7: 27th December 2003 (Saturday, 2pm - 4pm) Session 5: Serious Session C (Version 2) *Asking for Clarification and Confirmation*	16
Week 8 Mid-Semester Break	
Week 9: 5th January 2004 (Monday, 10am - 12pm) Session 6: Serious Session D (100 min) *Opinion Exchange*	8

Table 5.6 Examples of activities at the pre-task and during-task phase of the CMC ESP tasks

Phase	Activities	Examples
Pre-task	Input on content relating to systems analysis & design	How to prepare, conduct and close a systems analysis interview, interview structures and types of questions. Probing skill in a systems analysis interview. Information gathering techniques of Joint Application Design/Development (JAD). Definition & principles of user interface design.
	Input on forms of language in the context of systems analysis & design	Elicit information. Probe for further information. Ask for clarification & confirmation. Ask for & responding to opinions/suggestions.
	Pre-task exercises & activities	Identify interview structures such as opening & closing moves from transcripts of systems analysis interviews. Identify types of interview questions (open-ended, closed & probing) from transcripts of systems analysis interviews. Brainstorm ideas on what the students like & dislike about the user interface design of a web page & suggestions for improvement. Practise using forms of language for systems analysis & design. An overview & written instruction of tasks using NetMeeting Chat for the next phase.
During-task	CMC ESP activities via NetMeeting Chat	Students conduct the CMC ESP activities via NetMeeting Chat in pairs or groups of four. Students assume the role of systems analysts or clients during each serious activity. Their roles are reversed when the same serious activity is repeated.

5.4 Findings

This section will present the findings of FSII. Section 5.4.1 will describe the results of the self-assessment questionnaires before and after the treatment. Section 5.4.2 is a summary of participants' responses to the retrospective questionnaires. This sub-section is followed by a presentation of participants' comments on the activities during two group interview sessions.

5.4.1 Pre and Post Self-Assessment Questionnaires

Twenty-seven participants responded to the pre-treatment self-assessment questionnaire at the beginning of FSII. Only sixteen of them responded to the retrospective version of the self-assessment questionnaire that was distributed at the end of the study. The questionnaires consisted of four subsets of multi-item measurement scales aiming to measure the following constructs:

- English language skills proficiency (4 items),
- general attitude to the use of NetMeeting Chat for CMC task-based activities (8 items),
- attitude to the use of NetMeeting Chat as an effective language learning tool (7 items), and
- anxiety in the English language classroom (7 items).

The internal consistency reliability of a multi-item measurement scale can be measured by calculating its Cronbach Alpha coefficient value, which ranges between zero and 1.0. The closer the value is to 1.0, the higher is the internal reliability of the items in the questionnaire. A high Cronbach Alpha coefficient value would indicate that a set of items in a questionnaire is homogeneous or measures a "targeted construct". Cronbach Alpha should be at least 0.60 to indicate internal reliability (Dörnyei, 2003:112). A lower value would indicate low internal reliability (Abu & Tasir, 2001:261).

Each of the four subsets of measurement scales in the pre- and post-treatment self-assessment questionnaires were tested for internal consistency by calculating their Cronbach Alpha coefficient value using SPSS version 10.0.1 for Windows. The results of the test are shown in Table 5.7. The Cronbach Alpha coefficient value for the scale measuring general attitude to the use of NetMeeting Chat for CMC task-based activities ranged from 0.62 to 0.70. The value for the scale measuring English language skills proficiency ranged from 0.71 to 0.76, that measuring attitude to the use of NetMeeting Chat as an effective language learning tool ranged from 0.82 to 0.92 and that measuring anxiety in the English language classroom ranged from 0.77 to 0.85.

Table 5.7 Reliability analysis for each of the four measurement scales in the pre- and post-treatment self-assessment questionnaires

SECTION	MEASUREMENT SCALES	CRONBACH ALPHA	
		PRE-TREATMENT	POST-TREATMENT
II	English language skills proficiency	0.7099	0.7564
IIIA	General attitude to the use of NetMeeting Chat for CMC task-based activities	0.7015	0.6179
IIIB	Attitude to the use of NetMeeting Chat as an effective language learning tool	0.8181	0.9163
IIIC	Anxiety in the English language classroom	0.7684	0.8450

These results indicated that the four subsets of measurement scales had internal reliability but the findings obtained from the scales cannot be considered conclusive because there were only between four to eight items. According to Dörnyei (2003:112), more items in a scale would result in a higher internal reliability but:

> *L2 researchers typically want to measure many different areas in one questionnaire, and therefore cannot use very long scales (or the completion of the questionnaire will take several hours).*

The participants' responses to each item in both questionnaires were tabulated in percentages using the statistics application called SPSS version 10.0.1 (see Appendix D58 for the descriptive statistics of the responses). The respondents' positive self-assessment of their proficiency in the four English language skills was calculated by adding the percentages of those who agreed that they were "good" or "very good" in these skills. Their degree of agreement to each statement of attitude and anxiety was calculated by adding the percentages of participants who "agreed" and "strongly agreed".

The sign test was then used to conduct inferential statistics and test for significant differences between the students' responses to items in the pre- and post-treatment self-assessment questionnaires. This test was selected because the data collected from the questionnaires were ordinal data and therefore, no assumptions can be made that the differences between each point on the questionnaire scales was equal. The students' responses to items in the questionnaires were given a value from one to five using the 5-point Likert scale described in Section 5.3.4.1. The sign test will look for positive versus negative differences between the pre and post-treatment self-assessment scores, but ignore the magnitude of these differences. Only data from the 16 students who responded to both the pre- and post- self-assessment questionnaires were used for the sign test because it required paired samples.

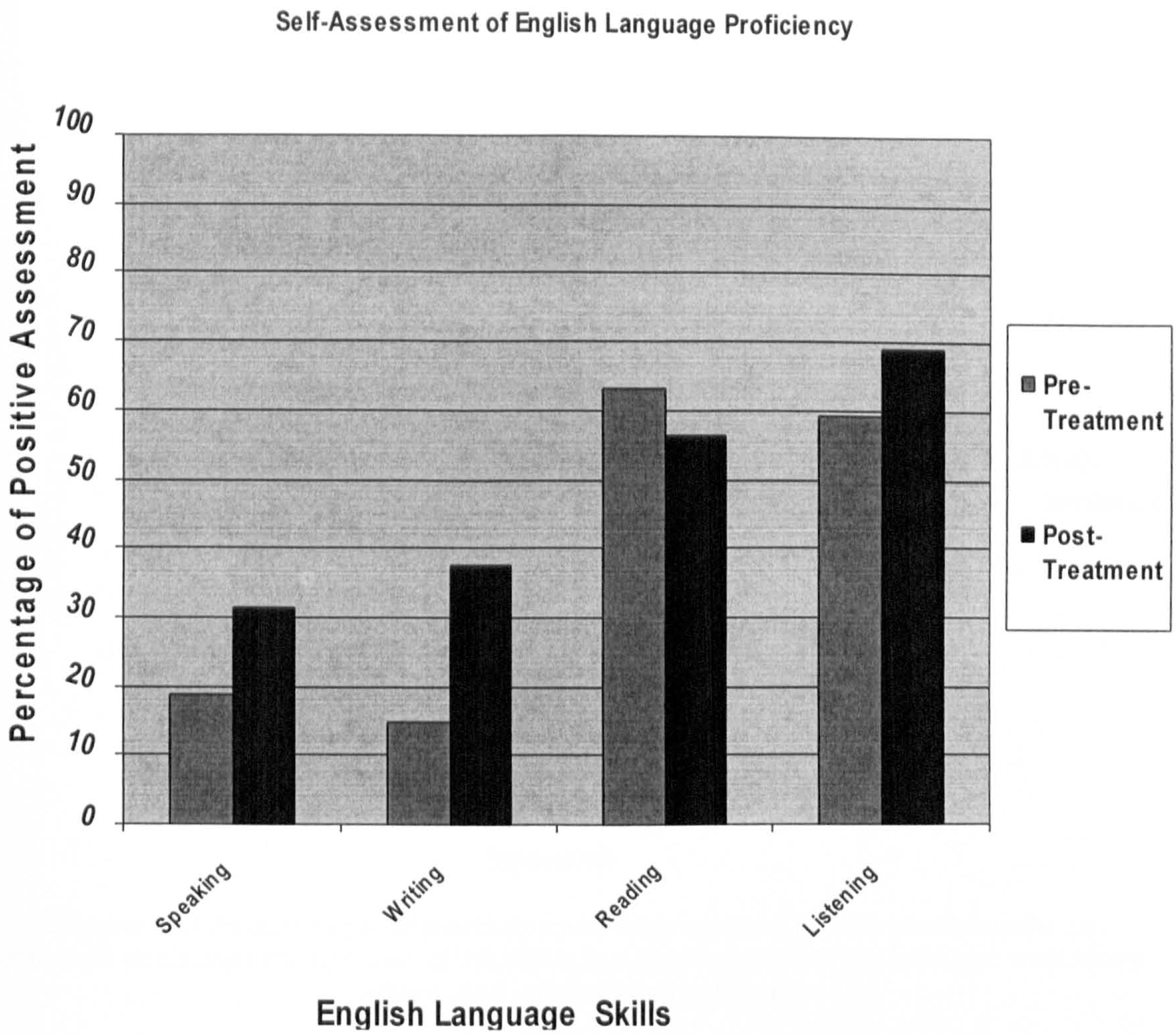

Figure 5.2 Percentage of participants who gave a positive self-assessment of their English language proficiency before and after the treatment

The results of the participants' self-assessment of their proficiency in the four English language skills revealed that more participants gave positive rating to their speaking, writing, and listening skills at the end, in comparison to the beginning of FSII (see Figure 5.2 and Appendix D61). The differences were 9.5% (listening), 12.7% (speaking) and 22.7% (writing) (see Appendix D61). A slightly lower percentage of respondents provided positive ratings of their reading skill after completing all the CMC task-based activities (see Figure 5.2). The difference was only 6.7% (see Appendix D61). Results of the sign tests revealed that although there were more positive than negative differences (more respondents gave higher than lower ratings

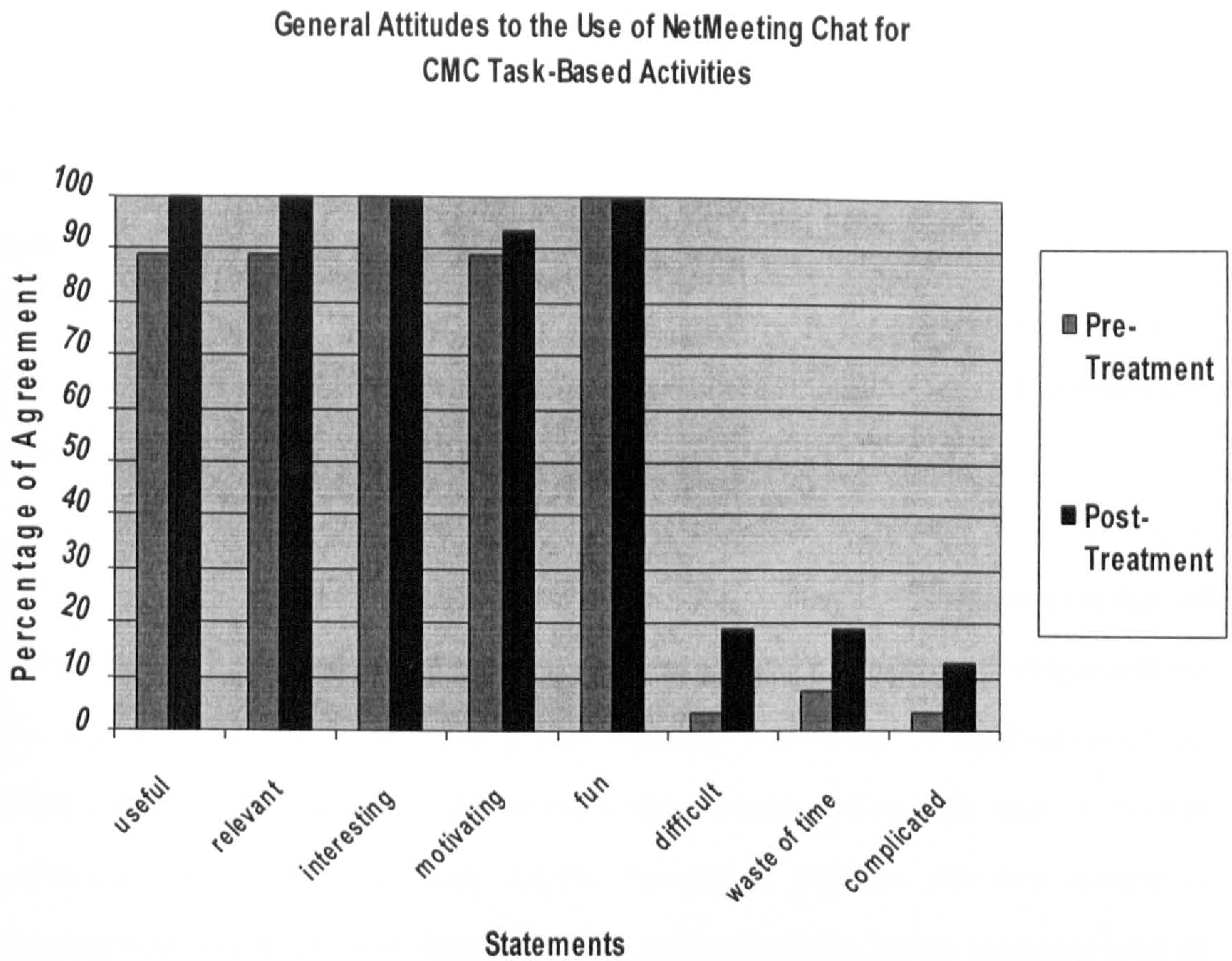

Figure 5.3 Percentage of participants who agreed to the statements on general attitudes to the use of NetMeeting Chat for CMC task-based activities before and after the treatment

after the treatment) for all four items in the English language proficiency self-assessment scale, they were not statistically significant with the value of $p>0.05$ (see Appendix D62).

The participants' general attitudes to the use of NetMeeting Chat for CMC task-based activities were very positive both at the initial and final stage of FSII (see Figure 5.3 and Appendix D63). At the beginning of the study, almost all the participants (88.9% to 100%) agreed that the use of the chat software was useful, relevant, interesting, motivating and fun (see Appendix D63). The percentage of agreement remained the same or increased (93.9% to 100%) at the end of the study (see Appendix D63). Only a small percentage of the participants agreed that the chat tool was difficult (3.7%), a waste of time (7.5%) and complicated (3.7%) before the treatment (see Figure 5.3). The percentage of agreement increased only slightly at the end of the treatment (see Figure 5.3). The increment ranged from 8.7% to 15% (see Appendix D63). Results of the sign tests were mixed. There were a similar number of positive and negative differences for items 1, 5 and 8, more positive than negative differences for items 3 and 6 and less positive than negative differences for items 2, 4 and 7 (see Appendix D64). These differences were not statistically significant, with the value of $p>0.05$ (see Appendix D64).

In the second attitude scale at the beginning of FSII, at least 70% of students agreed that NetMeeting Chat was effective as means of improving general communication skills, the skills of speaking, writing and reading, knowledge of English (such as spelling, vocabulary, grammar and pronunciation), and the specific skill of system requirements elicitation, but only 33.4% thought it was an effective means of improving listening skills (see Figure 5.4 and Appendix D65). Upon completion of all the CMC task-based activities, the percentage of agreement decreased slightly for the first two and last two statements (see Figure 5.4). The differences ranged from 4% to 14.1% (see Appendix D65). The percentage of agreement to the other three statements increased at the end of the study (see Figure 5.4). The increment was 2.4% for the writing, 6.1% for the reading, and 47.9% for the listening skills (see Appendix D65). A surprisingly high increment (47.9%) was found for the listening skill despite the text-based nature of the CMC tasks using NetMeeting Chat. Results of the sign tests indicated that there were more positive than negative differences for items 5 and 7 and less positive than negative differences for items 1, 2, 3 4 and 6 (see Appendix D66). These differences were not statistically significant, with the value of $p>0.05$ (see Appendix D66).

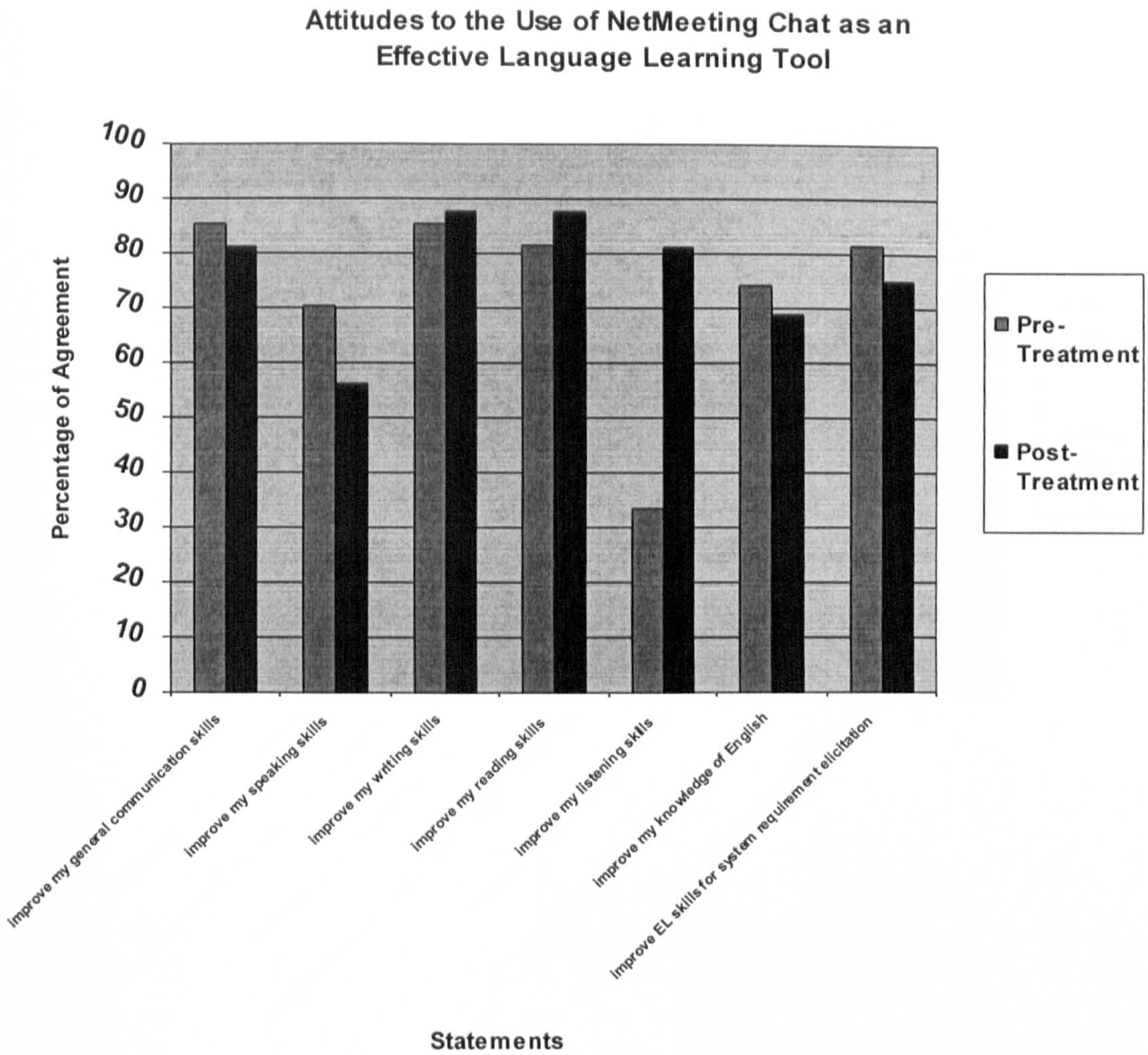

Figure 5.4 Percentage of participants who agreed to the statements on attitudes to the use of NetMeeting Chat as an effective language learning tool before and after the treatment before and after the treatment

The participants' responses to all the statements in the anxiety measurement scale indicated that one-third to two-thirds of them agreed with the statements at the beginning of FSII (see Figure 5.5 and Appendix D67). These statements were indicative of the participants' English language classroom anxiety. There was a decrease in the percentage of respondents who agreed with all the statements in the anxiety scale after they had completed all the CMC task-based sessions using NetMeeting Chat. This decrease ranged from 2.3% to 23.9% (see Figure 5.5 and Appendix D67). The greatest differences were found for the first four statements

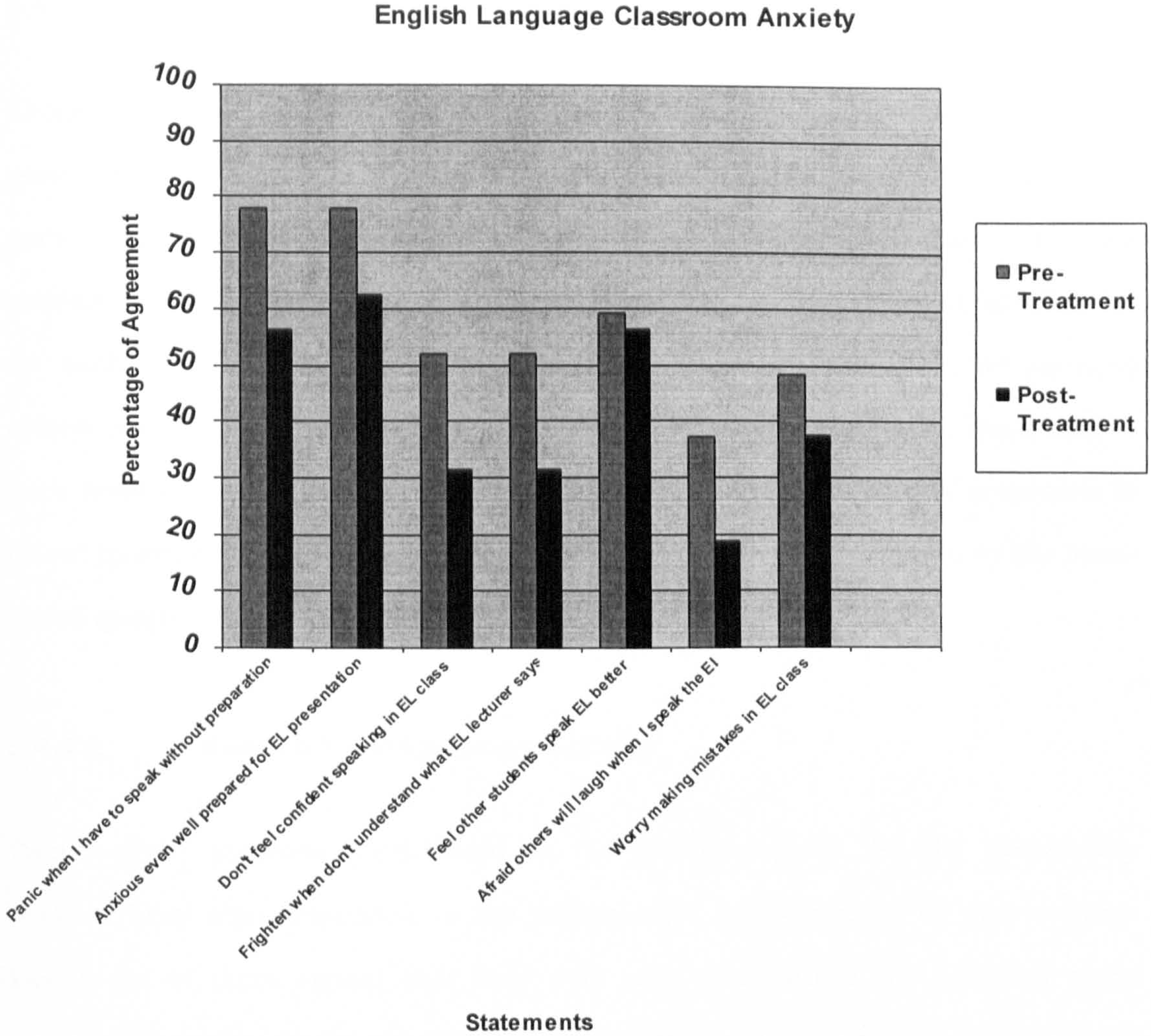

Figure 5.5 Percentage of participants who agreed to the statements on English language classroom anxiety before and after the treatment

(16.7% to 23.1%) which were indicative of communication apprehension or speech anxiety (see Appendix D67). The smallest difference was between the pre- and post-responses to the fifth statement (2.3%) which indicated fear of being less competent than other students (see Appendix D67). Results of the sign tests for the anxiety scale revealed that there were more positive than negative differences for items 3, 5, 6 and 7 (more respondents gave higher ratings after the treatment) and less positive than negative differences for items 1, 2 and 4 (see Appendix D68). These differences were not statistically significant with the value of $p>0.05$ (see Appendix D68).

5.4.2 Retrospective Questionnaires

Altogether, 27 participants responded to the retrospective questionnaires for the first session of the study, with 8 of them remaining for the final session. I designed the questionnaires to gather the students' feedback on each of the six CMC task-based activities. The number of respondents was equivalent to the number of participants for each task (see Table 5.5). Section 5.4.2 is divided into six sub-sections corresponding to the six sessions in the study. For the fifth session, responses to both version one and version two of the task are reported. Students' responses to closed questions were tabulated according to frequency. Their answers to the open-ended questions were analyzed using content analysis.

5.4.2.1 Session 1 – Preparatory Activity

Twenty-seven students participated in the guessing game for the preparatory session. They also responded to the retrospective questionnaire for this session. Twenty-six of them agreed that they were able to complete the guessing game successfully within five to ten minutes. The student who disagreed explained that it was because his partner did not follow the instructions provided for the task. His partner did not provide him with any clue although he was experiencing problems guessing the object.

Twelve of the students indicated that they had learned communication skills from this activity. They said that they had developed their ability to interact with each other, communicate what they were thinking to their partner and ask for information. They thought that the activity gave them practice in the skills of typing, reading, writing and speaking. It was also judged to improve their vocabulary, grammar and ability to form sentences. Twenty-six participants agreed that the guessing game was a useful preparatory activity because they were not familiar with NetMeeting Chat. One student was not sure about its usefulness as a preparatory activity. The students identified difficulty finding the right word to use when trying to explain something and understanding what their partner meant.

There were many things the participants liked about the activity. More than half of the participants suggested that the activity was pleasurable. They used words such as "fun", "interesting", "enjoyable", "relaxing", and "make new friends" to express their pleasure with the activity. They also mentioned that the activity was easy, helped to increase their confidence when communicating with each other in English, improved their English language skills, and developed their keyboarding skills. There were a few things they disliked about the activity. For example, slow responses from their partners, being able to chat with only one person and with someone at the same level of proficiency and being given a topic which was too limited. A few suggestions they made were to allow chatting with more than one person and to discuss an interesting topic on a current issue. One student suggested that the activity should be used as part of the activity in the English language module. Another student commented that she preferred this method of learning English because it was more effective.

5.4.2.2 Session 2 – Semi-Serious Activity

Twenty-five students participated in the semi-serious session which was a chat-based group discussion on the issue of bullying in schools. All these participants responded to the retrospective questionnaire for this session and agreed they were able to complete this activity. Almost all of them completed it within thirty minutes.

The majority of the students said that this activity helped them to learn how to communicate and conduct a group discussion on a serious topic in English via NetMeeting Chat, for example by exchanging, giving and sharing ideas with other members in the group and responding appropriately to opinions given by others. Other things they learned from the activity were that they could get more ideas and useful information through group discussion. A few students expressed difficulties with this activity. One student mentioned difficulty following the discussion when every member in the group wanted to "speak" or send their comments at the same time. Another student had a slight problem trying to detect which part of the written interaction was the question and which was the response.

Twenty-four of the 25 participants agreed that this activity was a useful semi-serious CMC task. More than half of them indicated that the activity was pleasurable by describing it as either "fun", "interesting" or "enjoyable". They also liked it because it allowed them to communicate with other students without feeling shy. They thought it encouraged them to create ideas related to the topic of discussion and share these ideas with members of their group. One student even pointed out that it was interactive and just like a debate, a form of practice to talk in front of people. A few others liked the activity because they thought it could improve their English language skills and vocabulary. Almost all of the students found nothing to dislike about the activity. The only thing two of them did not like was the length of time they had to wait for a response to their opinions from other group members. Participants suggested that more activities like this should be used in teaching English. They commented that they loved doing this kind of activity as it was fun and interesting.

5.4.2.3 Session 3 – Serious Activity A (Systems Analysis Interview)

Sixteen students participated in the first serious activity and responded to the retrospective questionnaire for this session. They were able to complete the activity within thirty minutes. All the participants agreed that this first serious activity was relevant to their academic needs as Computer Science undergraduates and future needs as Computer Science professionals. Eight of the participants claimed that they had learned how to conduct a proper systems analysis interview and ask relevant questions to their "client" when they role-played as "systems analysts". One of the eight even claimed that he had learned how to be a systems analyst. A few pointed out that the role-play as "clients" was an opportunity to learn how to respond to questions.

One student believed that this activity was almost the same as the type of systems analysis interviews they had to conduct for their Software Engineering module project (the students were taking this module during this study). Another student added that it was especially relevant to prepare them for their final year undergraduate degree project. A difficulty highlighted by three participants was that of creating questions that their "client" could understand.

There were several things that the participants liked about the activity. Eight of them found it to be fun and claimed to have increased their confidence. There were very few comments about things that they disliked. One student mentioned that he disliked having to wait for a slow response from his partner and felt it was a waste of time. Among the suggestions put forward by the participants were to allow more people to be connected and involved in the discussion, to conduct a more challenging activity (a CMC ESP task).

5.4.2.4 Session 4 – Serious Activity B (Systems Analysis Interview)

The second serious session, a systems analysis interview on probing for further information, was conducted with fourteen participants. They also responded to the retrospective questionnaire for this activity. One participant had difficulty describing his workflow when he was role-playing as a "client". Another student who role-played as a "systems analyst" was unclear about the missing information on his copy of the incomplete workflow diagram of his "client". Based on these comments, I designed a second version of the task for Session 4 to slightly reduce the level of difficulty for this activity (see Section 5.3.3.2 for a description of version two of Serious Activity B). This version provided a written description of the client's workflow diagram for students who role-played as "clients". It also gave students who role-played as "systems analysts" a copy of their client's workflow diagram which contained fewer missing work tasks. This version was used for the Main Study.

All the participants agreed that this activity was relevant for both their current academic and future professional needs. They liked the activity for the following reasons: 1) it was fun, 2) it gave them experience and knowledge about communication skills such as asking questions (through interviews) to get information and to probe for further information, 3) it helped to improve their English and 4) it was related to their studies. They did not mention anything they disliked about the activity.

A few participants provided suggestions and comments on this serious activity. One student suggested that the CMC ESP activities for the study should include interaction with more than two students. Another student recommended the use of NetMeeting Chat in English language classroom activities. The next two serious activities (Serious Activity C and D) incorporated the participants' suggestions for CMC ESP activities which involved interaction with more than two people. I designed these two activities to allow the students to interact in groups of four. Their responses to these activities are discussed in the following sub-sections.

5.4.2.5 Session 5 – Serious Activity C (Joint Application Development)

Sixteen students participated in the first version of Serious Activity C, which was a JAD or group discussion session on asking for clarification and confirmation of a combined user-level workflow diagram. The students also responded to the retrospective questionnaire. Only 5 of the 16 participants were able to complete version one of Serious Activity C. Four of them finished it within thirty minutes but one of the five took more than the allocated time. The rest of the participants were unable to complete it because they found it too difficult. A few of them mentioned that they were confused when trying to read and understand the given combined user-level workflow diagram. This caused the students who role-played as "systems analysts" to experience problems preparing questions to ask their "clients" for clarification and confirmation of the diagram. They pointed out that due to the confusion they did not know what to ask. The students who role-played as "clients" also experienced difficulty describing the flow of their work tasks based on their individual user-level workflow diagram.

In spite of these problems, the participants agreed that this type of activity was relevant for their current academic and future needs. One student commented that she liked the activity because she learned about workflow diagrams, although she was confused when reading her "client's" response. Another student liked it because she had the experience of communicating directly with her "client", although she had problems trying to understand the correct information she was given. This caused her to change the wrong information on the diagram. To solve these problems, a few students suggested the use of NetMeeting Whiteboard so that every person in the JAD session could see the same copy of the combined user-level workflow diagram on the online whiteboard. Every client would be able to see the changes made based on the discussion and verify the accuracy of the modification.

I designed a second version of Serious Activity C which took into consideration the students' suggestion to use NetMeeting Whiteboard for the activity (see Section 5.3.3.6 for a description of version two of Serious Activity C). A written description of the flow of work tasks and information between entities (persons or functional areas) were provided for the combined and individual user-level workflow diagrams of this activity. This was intended to enable the participants to have a better understanding of all the diagrams designed for this activity and to trace the flow of data between all the entities in the diagrams.

I conducted version two of Serious Activity C with sixteen participants. They also responded to the same type of retrospective questionnaire distributed to participants for version one. All the participants were able to complete the second version in between fifteen to thirty minutes. Among the things they learned from this activity were how to detect mistakes in the combined user-level workflow diagram through e-JAD discussions with "clients", and how to make the necessary corrections using NetMeeting Whiteboard when they role-played as "systems analysts". They also learned how to inform the "systems analysts" about the mistakes they found in the combined user-level workflow when role-playing as "clients". Five students mentioned they did not experience any difficulty with this task. Two students who role-played as "clients" claimed that they had experienced slight difficulty when trying to explain things to the participants who role-played as "systems analysts". From the pedagogical perspective, this activity was able to facilitate the occurrences of language related episodes or LREs (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) and negotiation of meaning (Long, 1983b; Varonis & Gass, 1985) (see Section 2.1.2.1) which would indicate that the process of language learning is taking place.

All the participants agreed that version two of Serious Activity C was relevant for both their current academic and future professional needs. They found it to be fun, interesting, easy and useful. None of the participants disliked the activity. The students needed less time to complete it compared with the first version. The second version of Serious Activity C was chosen for the Main Study.

5.4.2.6 Session 6 – Serious Activity D (Joint Application Development)

Eight participants participated in the final serious session. As with to the previous activity, this activity was also a JAD session which involved the exchange of opinions on a given user interface design prototype of an information system. All eight students responded to the retrospective questionnaire for this activity. They were able to complete this task in fifteen to thirty minutes.

The participants mentioned that they learned how to analyze and give their opinions about a user interface design, how to agree or disagree with an opinion, and the technique of brainstorming ideas. They also highlighted the difficulties they faced as "clients" to understand the given user interface design, to brainstorm ideas, comment on the design and give suggestions for improvement. At times they ran out of ideas to share with other members of their group. As "systems analysts", one of them mentioned that he experienced the problem of controlling a discussion with two "clients".

All eight participants agreed that this activity was relevant for their current academic and future professional needs. They found it to be fun, interesting and easy. It also taught them new communication skills such as brainstorming ideas, exchanging opinions and giving comments via NetMeeting. None of the participants disliked the activity.

5.4.3 Group Interviews

I conducted two group interviews with eight participants of FSII on the 5th of January 2004, after they had completed all six sessions of CMC ESP tasks. Three students were interviewed during the first group interview and five during the second interview. The aim of the interviews was to obtain the students' feedback on the tasks and find out if they were suitable to study the effects of the CMC ESP method. Findings from the interviews were triangulated with the results of the self-assessment and retrospective questionnaires.

5.4.3.1 Attitudes to the use of NetMeeting for CMC Tasks

Results on the thematic analysis of the students' interview transcripts revealed two general categories, "enjoyment" and "usefulness", as shown in Table 5.8. Coding of the transcripts according to these categories and their sub-categories was done using NVivo (version 2.0.161).

Table 5.8 Categories derived from the group interview transcripts

CATEGORIES		Net-Meeting (N=8)
ENJOYMENT		6 (75.0%)
USEFULNESS	Support for Communication	8 (100%)
	Language Learning	7 (87.5%)
	ESP Needs	6 (75.0%)
	Total	8 (100%)

In what follows, I have provided the English translation of interview transcripts in Malay and have written them in bold for ease of reading. Each interviewee is identifiable by an ID code consisting of three capital letters. My own extracts are represented by the letters "PS".

Enjoyment

Six of the students reported that using NetMeeting was enjoyable, fun and enabled them to get to know their classmates (see Table 5.8). For example, NNQ enjoyed it because she could do a lot of things such as conducting interview sessions (see NNQ's comments in Table 5.9). MFZ said it was fun as he was able to learn new things and how to communicate with people (see MFZ's comments in Table 5.9). KAZ and MFZ liked the social aspect of the tasks. For example KAZ mentioned it was fun and not boring because they were able to make new friends and MFZ said he was able to get to know his friends better (See KAZ and MFZ's comments in Table 5.9).

Table 5.9 Samples of comments on the reasons for enjoyment in using NetMeeting

CATEGORIES	COMMENTS
Opportunity to do a lot of things	***Because before using this NetMeeting never used it before right, after using it like it's really easy, we can do a lot of things like*** *interview interview session* ***and the technique of how to use NetMeeting. Feels like it's*** *useful,* ***we can adapt it in NetMeeting right. Really*** *best.* (NNQ – Interview 2)
Opportunity to learn new things and communicate with people	***I would like to tell you that initially I do not feel like coming to class because I have a lot of work to do but after attending the first day [session] it was really fun because we gain new knowledge, how to*** *communicate* ***with people because I am quite shy. Consequently it also taught me how to, in my group I was the SA (systems analyst) right, I have to*** *prepare* ***all the questions (interview questions) so it was really useful for me****.* (MFZ – Interview 1)
Enable to make new friends	*PS:* ***Do you think it is relevant to use this technique to learn the English language using the*** *chatting method?* *KAZ:* ***Because it's fun. Not*** *boring.* ***Fun. I get to make new friends****.* (KAZ – Interview 1)
Enable to get to know friends better	***We know that person but don't know really well right. Then we talked. After that through*** *chatting* ***[using NetMeeting] right got to know the person better****.* (MFZ – Interview 1)

Usefulness

Three categories of usefulness were identified from the interview data: 1) support for communication, 2) language learning and 3) ESP needs.

NetMeeting as a Means of Supporting Communication

All eight students interviewed indicated that the CMC tasks via NetMeeting were useful as a means of supporting communication by reducing communication anxiety, improving communication skills, increasing confidence, helping to generate more ideas and allowing planning of message (see Table 5.8). For example, MHZ said it helped to improve his English communication skills (see MHZ's comments in Table 5.10). He also mentioned that it helped to reduce feelings of nervousness and improved one of his classmates' use of English (see MHZ's comments in Table 5.10).

NJM felt it increased her confidence and felt that the training could be applied to future communication with real clients (see NJM's comments in Table 5.10). Both KAZ and MHZ agreed that it helped to generate more ideas during group discussions (see KAZ and MHZ's comments in Table 5.10). Six of the students indicated that the time lag which is present in this form of activity enabled them to prepare the questions for the interview sessions (see MUH and MHZ's comments in Table 5.10).

Table 5.10 Samples of comments on the usefulness of NetMeeting as a means of supporting communication

CATEGORIES	COMMENTS
Improved communication skills	*This session is very good for me for us to upgrade our English our proficient in English so that we learn how to communicate in English better. Before we didn't have any knowledge how to speak how to speak formally to a person. When we attend this session we attend this class, we know whether what is the better language to use to speak to the high rank level people like General Manager.* (MHZ – Interview 1)
Reduced level of anxiety	*I* ***think it helps to avoid from feeling nervous right. Nervous ... I've got a friend who experiences difficulty speaking English in public. The use of*** *NetMeeting chatting* ***we can see*** *improvement* ***in his use English right, OK. And then, there's improvement right. He used to be shy to speak in English. Not much*** *idea* ***but with the use of chat, NetMeeting, he has many*** *idea.* (MHZ – Interview 1)
Increased confidence	***NJM: When we want to*** *interview* ***someone right, definitely would feel nervous the first time but when we use NetMeeting really have the*** *confidence* ***like*** *confident* ***to conduct it so can use it as our training. From NetMeeting we can then*** *apply* ***it for future communication***.> ***PS: How can it be done , for example***? ***NJM: This*** *interview,* ***if someone did not have any experience*** *interview* ***someone else but with NetMeeting this person would gradually learn how to conduct proper*** *interview.* ***In a*** *confident* ***way***. (NJM – Interview 2)

CATEGORIES	COMMENTS
Helped to generate more ideas	***KAZ:*** ***Although the method, what we were discussing was like similar for example like bullying right we discussed in class we formed groups. We discussed face-to-face in groups. There were five people in the*** *group*. ***In comparison with face-to-face, using NetMeeting was different in terms of its content***.> ***PS:*** ***How was it different***? ***KAZ:*** ***The difference was if we use NetMeeting***= ***MFZ:*** =***there were more*** *idea* ***using NetMeeting***. ***KAZ:*** ***There were more*** *idea*. (KAZ and MHZ – Interview 1)
Allowed planning of message	*MUH:* ***This is slow that is fast. Like the process of speaking, the technique of asking*** *client,* ***if we use*** *computer,* ***we have to type so it's slower for the client to receive the information. If it's*** *face-to-face, when we ask, the client can respond.* *PS:* ***Is there any*** *advantage being slow using chat?* *MUH:* ***We can*** *prepare.* ***Can*** *prepare* ***the question***. (MUH – Interview 2) *MHZ:* ***If it's delayed we can structure the sentence. Produce*** *activity* ***which is of better quality in comparison with*** *communicate face-to-face,* ***we might leave out some information or provide the wrong information. If we can*** *communicate* ***using chat maybe we can check our book***, *check notes,* ***maybe based on what we had learned. If it's*** *face-to-face* ***and we want to refer, only briefly. If we use chat our response would be more relevant to what the client wants***.> (MHZ – Interview 1)

NetMeeting as a Means of Facilitating Language Learning

Seven of the students interviewed indicated that the use of NetMeeting for conducting the CMC ESP tasks was useful as a means of facilitating language learning (see Table 5.8). For example, MHZ said it encouraged him to use "formal language" (see MHZ's comments in Table 5.11). Another student, NWU, explained how it helped to improve her English (see NWU's comments in Table 5.11). MUH mentioned how it helped to improve vocabulary (see MUH's comments in Table 5.11). One student, KAZ, explained that he learned many new words through communication with his friends. It encouraged him to use words that he seldom otherwise used when communicating in English, as well as helping him to recall the English language that he had learned (see KAZ's comments in Table 5.11).

Table 5.11 Samples of comments on the usefulness of NetMeeting as means of facilitating language learning

CATEGORIES	COMMENTS
Encouraged the use of formal English	***When we want to communicate with the 'client' we would write using formal language. Write properly. Not like speaking to our friends.*** > (MHZ – Interview 1)
Improved English	***For example, all this while we do not know how to form sentences to ask about these companies. In this*** *interview* ***we realize how to form sentences to ask about the management, how to ask about anything related to the companies.*** (NWU – Interview 2)
Improved vocabulary	***We want to type to ask someone, we have to use vocabulary that we have never used before, during the*** *interview.* (MUH – Interview 2) ***There are many new words. I didn't know the word that he used. The word is simple but if we do not use it frequently, we would not have thought of using it. When our friend uses it then we would be able to recall it. When we seldom use it seldom speak in English, we might know a particular word but since we seldom use it we might have forgotten about it.*** (KAZ – Interview 2)

NetMeeting as a Means of Meeting ESP Needs

Six of the students interviewed mentioned that the CMC tasks they conducted via NetMeeting were useful in meeting both their present academic and future professional needs as Computer Science professionals (see Table 5.8). MHZ indicated this in his comments as shown in Table 5.12.

Table 5.12 Samples of comments on the usefulness of NetMeeting as a means of meeting ESP needs

CATEGORIES	COMMENTS
NetMeeting as a means of meeting ESP needs	*My experience in this session is very good for me for us to upgrade our English our proficient in English so that we learn how to communicate in English better. Before we didn't have any knowledge how to speak how to speak formally to a person. When we attend this session we attend this class, we know whether what is the better language to use to speak to the high rank level people like General Manager so by this session we learn how to how to* ***familiarize ourselves with things related to our future job profession*** *so that we have the information how to involve ourselves in the occupation job in the future so we* ***are not worried about what we need in future****, what is the,* ***what is to come in the future****.* ***We need early exposure from now, for instance in the context of learning SE [Software Engineering], the sessions really helped us for example recently we had a test, an SE test, because we had those sessions, we are able to apply what we have learnt like the use of milestone, all the things that we have learnt are related to what we are learning now so they are not useless as they provided us with the necessary training we require****.* (MHZ – Interview 1)

5.4.3.2 Comments and Suggestions on the CMC ESP Tasks via NetMeeting

In general, the students were satisfied with the selection, grading and sequencing of the tasks. They liked doing less serious and game-like activities before attempting the serious ones. All the students agreed that they were not bored with the activities although they had to exchange roles and perform another similar type of activity for each of the four serious tasks. One student, MFZ, pointed out that even though the serious tasks were repetitive and they had to role-play as systems analysts or clients several times, he felt positive about them as it made him more familiar with the type of tasks he would encounter in his academic and professional life (see MFZ's comments in Table 5.13). The students also agreed that there were differences between all four serious activities, for example, in terms of content, concerning what they had to "say", their role and job specifications (see MHZ and MFZ's comments in Table 5.13).

There were a few comments with reference to the design and implementation of the tasks. The students were satisfied with the first two sessions, the preparatory (guessing game) and semi-serious (group discussion on current issues) activities, but made a few suggestions for improving the serious activities. For Serious Activities A and B (systems analysis interview practice), they suggested that students who role-played as "systems analysts" should be given a copy of their "client's" organizational chart, activity table or workflow diagram containing some of the missing information, rather than a blank diagram to fill in. MHZ mentioned that although blank diagrams would be used in real systems analysis interviews, as practice activities for the English class, they preferred to be given more information (see MHZ's comments in Table 5.13).

For Serious Activities C and D (JAD practice) which entailed group discussion between students who role-played as "systems analysts" and "clients", the participants indicated that there should not be more than four people for each group. They thought that discussion in larger groups would be chaotic and difficult to follow. Real e-JAD sessions are anonymous. For this study however, the students were not instructed to be anonymous since the activities involved only four people and they were classmates. During the interview, all the students agreed that they need not be anonymous during the tasks. All the students interviewed agreed that the second version of Serious Activity C was better than the first. They did not experience any problems with Serious Activity D. The students indicated that the input on content and language during the pre-task phase of every CMC task was useful. They suggested that feedback on the grammatical accuracy and appropriateness of their interaction should be given after they had completed each task. This suggestion influenced the design of the post-task phase of the tasks for the Main Study.

Table 5.13 Samples of comments and suggestions on the CMC tasks via NetMeeting

CATEGORIES	COMMENTS
CMC tasks were repetitive (sustained-content) but there were differences	*MFZ:* ***Sometimes it's [the tasks] like it's repetitive, we used the same thing. For example, we role-played as SA [systems analysts] and then I became the client, after that probably next we role-played as SA again. Sometimes two or three times we role-played as SA. I think that thing is the same thing so we are familiar with it.*** *PS:* ***But do you think that the activities were different, the four [serious activities] of them or were they the same****?* *MFZ:* ***There were differences.*** *MHZ:* ***There were differences. In terms of*** *content,* ***in terms of what we have to 'say' [write], our roles. Sometimes we role-played as SA [systems analyst], sometimes we role-played as GM [general manager].>*** *MFZ:* ***We would know their job specifications.*** *MHZ:* ***Their jobs would be different. Responsibilities.*** (MHZ and MFZ – Interview 1)
Preferred to be given more information for the task diagrams	*MHZ:* ***But for us, we really we need the clue as*** *guideline because if it's blank [the diagrams] we will start to what=* *PS: =panic?* *MHZ:* ***Yes.*** (MHZ – Interview 1)
Face-to-face tasks would not provide sufficient guidance and preparation time	*PS:* ***Imagine that*** *you* ***did not learn using NetMeeting and*** *you did the activities you* ***did straight away*** *face-to-face.* *All the students interviewed replied:* ***No*** *guideline.* *MUH:* ***Just ask anything that we felt like asking.*** *NJM:* ***If we ask questions, it's like we would just simply ask any question.*** (MUH and NJM – Interview 2)
CMC tasks prepared them for systems analysis interviews	***If we were to learn using NetMeeting, we would be able to know when we interview client when we are choosing which company to interview, when we learn this we would say what we had practiced, we would already have had the experience on what to ask.*** (MUH – Interview 2)

During the interview sessions, the students were asked how they would feel if the CMC task-based activities were conducted face-to-face rather than via NetMeeting. All of them agreed that face-to-face tasks would not provide sufficient guidance. MUH mentioned that in a face-to-face situation, she would simply ask anything that she felt like asking, and NJM said that she would just ask the questions that came into her head (see MUH and NJM's comments in Table 5.13). Although they felt that chat-based communication was slow, it was more focused. They suggested it would be useful to conduct the tasks via a chat environment and then face-to-face to help increase their confidence.

In terms of implementation, all the students agreed that the CMC task-based activities should be included in the earlier semesters of their Computer Science curriculum. They thought that it should be part of the activities for their English Language II or EAC module offered in semester two of their six-semester Computer Science programme. (The Software Engineering module runs in the same semester, and the Systems Analysis and Design Methods module runs in the following semester.) They suggested that the tasks should be performed after the mid-semester break, as this would enable them to have some background knowledge about software or systems analysis and design through the Software Engineering module. It would also prepare them for the systems analysis interviews and discussion sessions they would have to conduct for the Software Engineering and the Systems Analysis and Design Methods module project (see MUH's comments in Table 5.13).

5.5 Discussion

The results of the descriptive statistics for the self-assessment questionnaires indicated that at the end of the study, almost all the participants still agreed that the proposed method of using text-based synchronous CMC tools for conducting the CMC ESP tasks were useful, relevant, interesting, motivating and fun. Only a very small percentage of them agreed that it was difficult, a waste of time or complicated. More than half of them agreed that this method of instruction was effective for language learning. The findings of the questionnaires also indicated that the CMC ESP method had the potential to reduce their English language communication anxiety. Fewer participants indicated anxiety in the post self-assessment questionnaire than in the pre self-assessment questionnaire. However, the results of the inferential statistics using the sign test revealed that the positive and negative differences for all items in the self-assessment questionnaires were not significant. The statistical results of the questionnaires were inconclusive because from a total of 27 participants, the 16 who stayed on to the end of the study were self-selecting, and the number of participants was too small. In the Main Study, the same pre- and post-treatment self-assessment questionnaires were used with an equal number of participants.

The retrospective questionnaires and interviews also revealed that the participants enjoyed doing each of the CMC tasks using NetMeeting Chat and indicated that the tasks were useful and relevant in meeting their ESP needs. They claimed that their English language communication skills had improved and that they felt more confident about communicating in English.

A few students did experience slight difficulties with a few of the tasks such as trying to understand what their partner meant, making others understand what they meant and finding the right words to use. These problems would have resulted in the occurrences of language related episodes or LREs (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) and negotiation of meaning (Long, 1983b; Varonis & Gass, 1985) (see Section 2.1.2.1). Episodes of LREs and negotiation of meaning which took place in this study could provide the students with a trigger for second language acquisition and would indicate that the process of language learning is taking place. Slight changes were made to the design and implementation of the CMC ESP tasks with reference to the participants' comments and suggestions for improvement.

5.6 Summary and Implication for Main Study

The findings of the self-assessment questionnaires, retrospective questionnaires and group interviews indicated that the proposed types of CMC task-based activities were suitable for investigating the effects of the CMC ESP method on Computer Science students at UTM. These tasks were therefore used for the next stage of this research, the Main Study, which focused on the effects of the CMC ESP method on the development of Computer Science students' oral communication skills when using English for systems analysis and design.

CHAPTER 6

MAIN STUDY

6.0 Introduction

The CMC ESP tasks that I designed and conducted with the first year Computer Science students at UTM in FSII via NetMeeting Chat were found to be suitable for investigating the effects of the CMC ESP method on the participants. The students claimed that the CMC ESP method was useful, enjoyable and relevant to their ESP needs. These factors suggest the potential of CMC ESP tasks as useful language learning materials. Exposure and training to these types of tasks via text-based synchronous CMC may lead to an increase in competency in oral communicative skills, as suggested by the findings of several CMC studies (Beauvois, 1997; Chang, 2002; Kost, 2004; Payne & Ross, 2005; Payne & Whitney, 2002).

On the basis of the findings from FSII, I conducted my Main Study over a seven-week period (6th January 2004 – 20th February 2004) during the second semester of UTM's 2003/2004 academic year (see Appendix B4 for the timeline of the Main Study). In this chapter, I will present the aim and research questions of this study. This will be followed by a description of the method used and a presentation of findings. Finally, I will discuss the implications of this study for the Follow-up Study.

6.1 Aim of the Study

The aim of the Main Study was to investigate the impact of synchronous CMC use on the oral skills of ESP learners, with reference to the types of communication tasks that they would need to perform in their studies and in their future profession. It specifically aimed to discover whether the CMC ESP method in which synchronous CMC is used to conduct CMC ESP tasks would provide Computer Science students at UTM the opportunities to develop their ESP oral skills of interviewing and group discussion for systems analysis and design.

6.2 Research Questions

Two main research questions were addressed in the Main Study:

1. Does the CMC ESP method provide opportunities for the development of Computer Science students' interviewing skills for systems analysis and design?

2. Does the CMC ESP method provide opportunities for the development of Computer Science students' group discussion skills for systems analysis and design?

To answer the above research questions, this study used the one-group pre-test and post-test pre-experimental research design to test the following null hypotheses:

1. There would be no significant difference between the pre- and post-treatment interview test mean scores.

2. There would be no significant difference between the pre- and post- treatment group discussion test mean scores.

To test the first null hypothesis, the following null hypotheses were tested:

a. There would be no significant difference between the pre- and post- treatment interview test mean scores for task fulfillment.

b. There would be no significant difference between the pre- and post- treatment interview test mean scores for language.

c. There would be no significant difference between the pre- and post- treatment interview test mean scores for communicative ability.

To test the second null hypothesis, the following null hypotheses were tested:

a. There would be no significant difference between the pre- and post- treatment group discussion test mean scores for task fulfillment.

b. There would be no significant difference between the pre- and post- treatment group discussion test mean scores for language.

c. There would be no significant difference between the pre- and post- treatment group discussion test mean scores for communicative ability.

The students' responses to the attitude questionnaires and their chat transcripts were analyzed to triangulate the findings of the above tests.

6.3 Method

This section will describe the participants of the study, the research instruments and procedure.

6.3.1 Participants

The participants selected for the Main Study (treatment group) were a class of 32 first year Computer Science students at UTM. They were taking their English for Academic Communication or EAC (UHB1322) module during the second semester of their 2003/2004 academic year and had been assigned to Section 29 of the EAC module. They were in the same cohort as the FSII participants who were assigned to Section 30 of the EAC module (see Section 5.3.1). The students in Section 31 were the control group used as a comparison group to study the long term effects of the treatment, discussed in Chapter 7. All these Computer Science students were also taking their Software Engineering (SCK1233) module in the same semester.

The Main Study participants were all Malaysians of various ethnic backgrounds between the ages of 19 to 21. Their MUET scores ranged from Band 2 to Band 4 (Band 1 indicates the lowest level and Band 6 the highest level of proficiency in English). Based on their MUET results, they were divided into three subgroups; Band 2, Band 3 and Band 4, as shown in Table 6.1. The participants' raw MUET scores were not available for statistical analysis but the students in each proficiency group seemed to be of about equal proficiency level.

Table 6.1 Distribution of MUET results according to band for the participants of the Main Study

MUET Level	Main Study Participants (N=32)
Band 2	n=7
Band 3	n=14
Band 4	n=11

6.3.2 Equipment and Software

The equipment used in the Main Study was similar to that used in FSI (see Section 4.3.2). It was a digital language laboratory which was equipped with 36 networked computers, preinstalled with CMC software. The software comprised Windows NetMeeting version 3.01 for text-based interactions (see Section 4.3.2.1) and Divace Duo for audio-based interactions (see Section 4.3.2.2). The digital language laboratory was located in the Department of Modern Languages in UTM.

6.3.3 CMC ESP Tasks

The CMC ESP tasks used in the Main Study were similar to the ones tested during FSII (see Section 5.3.3). They comprised six activities which were conducted over six sessions: a preparatory session, a semi-serious session and four serious sessions. The first or preparatory session was a guessing game. The second session was a semi-serious group discussion. The following four sessions were serious activities or sustained-content ESP tasks. In FSII, participants had experienced problems with the first versions of the second and third serious activities, so new improved versions had been created for the Main Study.

During FSII, each of the six CMC ESP tasks was conducted over two phases: pre-task and during-task. In the Main Study there were three phases: pre-task, during-task and post-task (see Figure 6.1; adapted from Willis's (1996) framework for task-based learning). The first two phases were similar to FSII. In the pre-task phase of each session, students were provided with content input relating to systems analysis and design, relevant language input, and practice exercises. This phase lasted for only a few minutes in the first two sessions, and for up to an hour (one class period) in subsequent sessions (examples of the instruction sheets and input handouts are provided in Appendix D).

In the during-task phase the students conducted communicative activities in pairs or in groups of four (as instructed), communicating with each other in English via NetMeeting's chat feature. They worked in pairs to conduct the preparatory activity

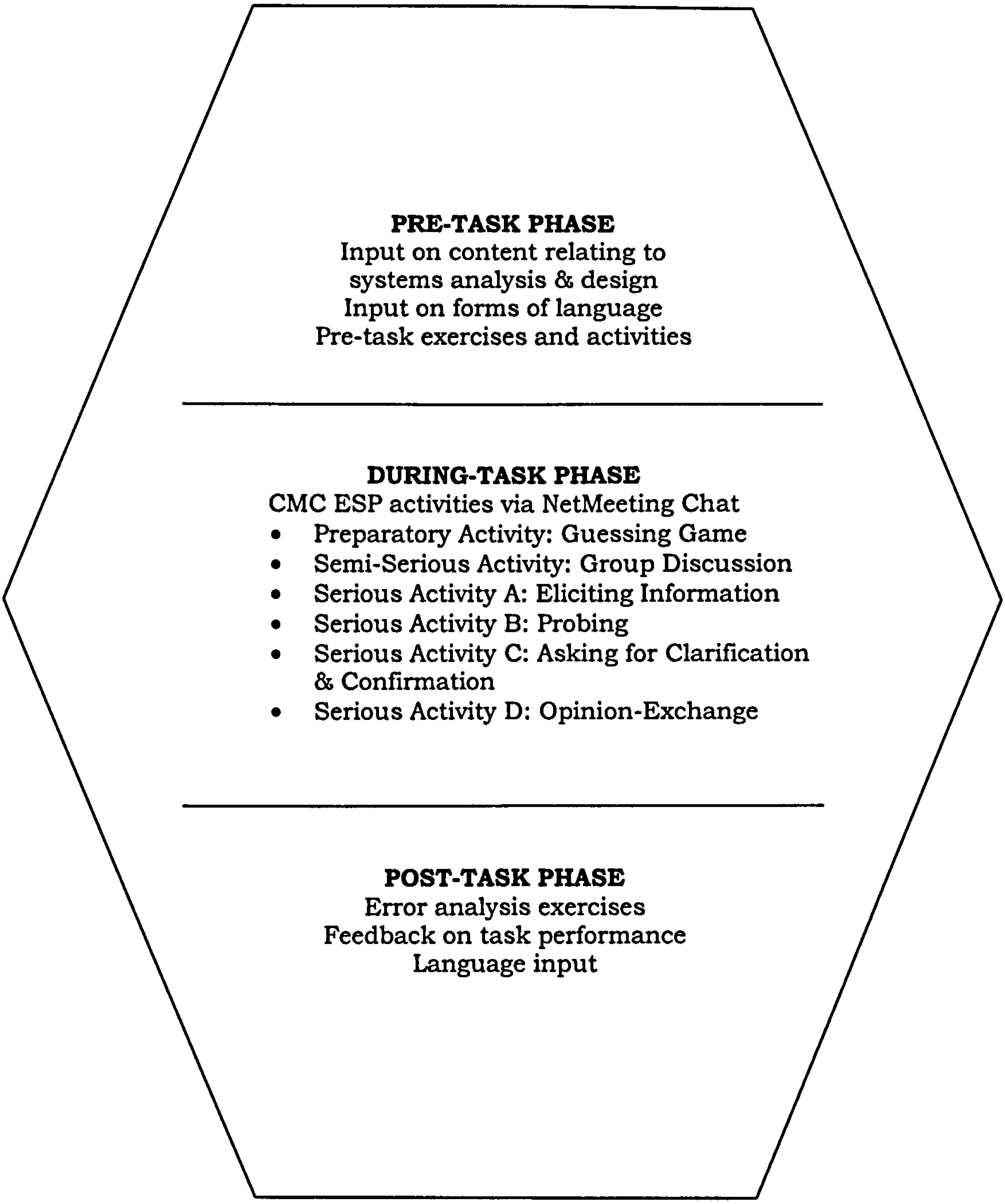

Figure 6.1 CMC ESP tasks framework

(see Appendix D1) and in groups of four for the semi-serious activity (see Appendices D2 and D3). For each of the four serious sessions the students played the role of systems analysts or clients. Once the first task was completed, they were instructed to switch their roles and complete another similar type of task concerning the development of another system for a different company (see Appendices D4 to D57 for samples of the task sheets). The during-task phase lasted for about two hours (two class periods).

During the new post-task phase of the sessions introduced for the Main Study, students were being debriefed; attention was being drawn to some of the language and communication problems that they had experienced during the task, useful words and phrases, and common language errors. The whole post-task phase lasted for either one or two class periods, depending on need.

Almost all communication practice was offered through the medium of NetMeeting, but students were provided with a very brief opportunity to conduct the same type of activity via a synchronous audio CMC system called Divace Duo, because in prior discussions with the students they had expressed an interest in experiencing this medium. Students were allowed to use Divace Duo for five to ten minutes in four (serious sessions) of the six sessions. There was, however, very minimal exposure to audio-based CMC (a total of about 30 minutes in the 28 hour treatment period), and it was not considered sufficient to influence the students' communicative development in any significant way. A summary of some of the activities conducted at different phases of the CMC ESP tasks in the Main Study is provided in Table 6.2.

Table 6.2 Examples of activities in CMC ESP tasks framework

Phase	Activities	Examples
Pre-task	Input on content relating to systems analysis & design	How to prepare, conduct and close a systems analysis interview, interview structures and types of questions. Probing skill in a systems analysis interview. Information gathering techniques of Joint Application Design/Development (JAD). Definition & principles of user interface design.
	Input on forms of language in the context of systems analysis & design	Elicit information. Probe for further information. Ask for clarification & confirmation. Ask for & responding to opinions/suggestions.
	Pre-task exercises & activities	Identify interview structures such as opening & closing moves from transcripts of systems analysis interviews. Identify types of interview questions (open-ended, closed & probing) from transcripts of systems analysis interviews. Brainstorm ideas on what the students like & dislike about the user interface design of a web page & suggestions for improvement. Practise using forms of language for systems analysis & design. An overview & written instruction of tasks using NetMeeting Chat for the next phase.
During-task	CMC ESP activities via NetMeeting Chat	Students conduct the CMC ESP activities via NetMeeting Chat in pairs or groups of four. Students assume the role of systems analysts or clients during each serious activity. Their roles are reversed when the same serious activity is repeated.
Post-task	Error analysis exercises	Students analyze transcripts of their chat-based activity for spelling & grammatical errors & correct them.
	Feedback on task performance	The instructor draws students' attention to some of the language and communication problems they experienced during the task.
	Language input	The instructor provides students with input on useful phrases and words, and grammar such as parts of speech, tenses, subject-verb agreement & forms of 'wh' questions. The instructor provides a list of sentences with common types of grammatical errors taken from transcripts of students' chat-based interaction for students to analyze & correct.

6.3.4 Data Collection Instruments

Both quantitative and qualitative instruments were used to answer the research questions in Section 6.2. The quantitative instruments were the pre- and post-treatment self-assessment questionnaires and oral assessment whereas the qualitative ones were the chat transcripts.

6.3.4.1 Pre and Post Self-Assessment Questionnaires

The purpose of the pre- and post-treatment self-assessment questionnaires was to measure the difference between the participants' level of English language proficiency, attitude and anxiety at the beginning and at the end of the study. Both questionnaires were divided into three main sections: Section I – Personal Information, Section II – English Language Proficiency Self-Assessment, and Section III – Attitude and Anxiety Self-Assessment (see Appendix E1). These questionnaires were the same as the pre and post-treatment self-assessment questionnaires used in FSII (see Section 5.3.4.1 for a detailed description of the questionnaires).

6.3.4.2 Oral Assessment

This section will describe the oral assessment designed for the Main Study. There were two types of oral assessment: interviews and group discussions. Each type of oral assessment had two forms, the pre-treatment tests and the post-treatment tests. A rating and banding scale was designed for both types of oral assessment. This was adapted from the rating and banding scale used for the speaking component of MUET.

All the interview and group discussion tests and the rating scale were piloted with a group of eight Computer Science student volunteers who had participated in all six CMC ESP tasks during FSII. Four senior English language instructors at UTM who had at least ten years of teaching experience volunteered to assess the pilot students' performance in the tests. They also evaluated both forms of oral assessment and the rating scales. One of the language instructors had a PhD in language testing and another was involved in the development and testing of national level oral assessment and rating scales for English language learners in Malaysia.

Two Computer Science lecturers checked both forms of the interview and group discussion tests for content validity. They verified that the test content represented what was claimed to be tested: the Computer Science students' ability to conduct interviews and group discussions for computer systems analysis and design. An indication of the reliability of the oral assessment was that in the pilot study, there was good correspondence between the results of the oral assessment and the banding for the MUET. Students with a high level of English language proficiency (based on their MUET level) had higher scores in the tests than those with lower MUET scores.

Changes were made to the oral assessment instruments based on findings from the pilot. The Main Study participants were given more time to prepare and conduct the interviews but less time for discussion in the group discussion tests (see Appendix E2 for a sample of the oral assessment instructions). A few minor modifications were made to the descriptors in the rating scales in response to comments from the language instructors who used the scales to assess the pilot group's performance in the oral assessment (see Appendices E13 and E14 for a sample of the rating scales).

The interview tests aimed to assess the participants' interviewing skills, and their ability to elicit information and probe for further information about a process. Participants were instructed to role-play a systems analyst working for a Software House, and conduct a one-to-one face-to-face interview with an assigned "lecturer client" to elicit and probe for further information to help in the design of a computerized loan application system. The students then had to design a computerized personal loan application system (Interview test – Form A; see Appendix E3) or a computerized car loan application system (Interview test – Form B; see Appendix E6) for the pre- and post- treatment interview tests. They were given two minutes to read the instructions, three minutes to prepare interview questions and seven minutes to conduct the interview session (see Appendices E3 and E6).

I gave each participant a form to prepare their interview questions for both forms of interview tests (see Appendices E4 and E7). I then handed answer guides to interview questions to the "lecturer client" prior to the interview tests to control what the "lecturer client" would say during the interview (see Appendices E5 and E8). I also gave copies of these answer guides to language instructors who volunteered to assess the participants' performance in the tests.

The group discussion tests aimed to assess the participants' skill in exchanging opinions in the context of system improvement and development. Students were assigned to work in groups of four and conduct a face-to-face discussion in which they had to express their likes, dislikes and suggestions for the improvement of a departmental website (which they had been given time to browse prior to the test). They were given one minute to read the instructions, ten minutes to evaluate the website and prepare their arguments, and fifteen minutes to conduct the group discussion session (see Appendix E9 and E11).

For the pre- and post-treatment group discussion tests, every participant discussed the website of the Department of Computer Systems and Communications (Group discussion test – Form A; see Appendix E9) or the website of the Department of Software Engineering (Group discussion test – Form B; see Appendix E11). Each student was given a form to prepare notes on their evaluation of the websites (see Appendices E10 and E12).

Interview test performance was assessed using an interview rating scale (see Appendix E13). Group discussion test performance was evaluated using a group discussion rating scale (see Appendix E14). These scales consisted of three general descriptors and their respective detailed descriptors (see Table 6.3). The highest possible score for each general descriptor was 18 and for each test was 54 (adding scores for all three general descriptors). The participants were assigned a proficiency level for each test using a banding scale which ranging from Band 1 (lowest level) to Band 6 (highest level) (see Table 6.4).

Table 6.3 General and detailed descriptors for the rating scale of the interview and group discussion tests

General Descriptors	Detailed Descriptors	
	Interview Test	**Group Discussion Test**
Task fulfillment	Understanding of task Relevance & adequacy of information elicited	Understanding of task Development of opinions/views Relevance & adequacy of opinions/views
Language	Accuracy Vocabulary Pronunciation	Accuracy Vocabulary Pronunciation
Communicative ability	Fluency Confidence	Fluency Confidence Interaction skills

Table 6.4 Interview and group discussion tests banding scale

Band	Description	General Descriptors	Total
6	Very Good Speaker	16-18	46-56
5	Good Speaker	13-15	37-45
4	Competent Speaker	10-12	28-36
3	Modest Speaker	7-9	19-27
2	Marginal Speaker	4-6	10-18
1	Limited Speaker	0-3	0-9

6.3.4.3 Chat Transcripts

The transcripts for the participants' text-based interactions during all six sessions of the CMC ESP tasks via NetMeeting Chat were collected for the Main Study. They were analyzed to find evidence of language related episodes or LREs (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) and negotiation of meaning (Long, 1983b; Varonis & Gass, 1985) (see Section 2.1.2.1). These second language acquisition tools were chosen because evidence of their occurrence in the chat transcripts might indicate that language learning had taken place during the chat interaction.

The analysis of the students' chat transcripts focused on the context of language usage rather than the quantity of occurrences, to support the quantitative findings of the oral assessment. The purpose was not to analyze the students' chat interactions in depth. A large number of LREs and negotiation of meaning episodes in the chat transcripts might not necessarily indicate that the students were producing language appropriately in the context of the tasks. The quality rather than quantity of these language learning occurrences might however indicate that learning was taking place during the chat interaction.

6.3.5 Procedure

I conducted the Main Study over a seven week period (6th January 2004 – 20th February 2004) during the second semester of UTM's 2003/2004 academic year (see Appendix B4 for the Main Study timeline according to semester). The participants were 32 first year Computer Science students in Section 29 of the EAC module who were in the same cohort as the FSII group. The 14-week EAC module runs from Week 1 to Week 15 of the semester. There was no class in Week 8 because it was the semester break. The study was carried out from Week 9 to Week 15. All of the students volunteered to participate in all the six sessions of CMC ESP task-based activities. These activities replaced the general oral communicative component of the

EAC module, which had been based on Science and Technology themes such as cancer, pollution, locomotives and space exploration (Department of Modern Languages, 2001). The distribution of assessment marks for the EAC module is shown in Table 6.5. For the EAC module assessment, the participants were awarded 10 marks for participating in the self-access activities (CMC ESP tasks via NetMeeting Chat) and their marks for group discussion were awarded based on their performance in the post-treatment group discussion test. Scores were calculated by dividing each participant's score for the group discussion test with the total score (54) and multiplying it by 10.

Table 6.5 English for Academic Communication module assessment marks

Assessment		**Marks (Total: 100%)**
Coursework (70%)	Project Work	15%
	Practice Activities	20%
	Oral Presentation	15%
	Group Discussion	10%
	Self-Access Activities	10%
Final Examination (30%)	Outlining	10%
	Guided Notes	10%
	Essay Writing	10%

The participants met for two hours (two class periods) each session, in a digital language laboratory equipped with at least 30 networked computers that were pre-installed with Windows NetMeeting. I conducted each of the six sessions with the participants in three phases: pre-task, during-task and post-task (see Figure 6.1).

During the pre-task phase, input on useful expressions and phrases was provided to help the participants with activities in the during-task phase (see Appendices D3, D5, D11, D21 and D46). For all four serious sessions, they were provided with input on content related to systems analysis and design. The during-task phase required participants to conduct the CMC ESP activities assigned for the particular class session via NetMeeting Chat. They were instructed to save copies of their chat transcripts at the end of each CMC ESP session in a shared computer folder. I then compiled electronic copies of the transcripts for the purpose of analysis. During the post-task phase, participants were provided with feedback on their task performance, relevant language input and error analysis exercises. A summary of some of the activities conducted at different phases of each task in the study is provided in Table 6.2. The number of students, the timeline and sequence of sessions for the Main Study are shown in Table 6.6. Each participant in this study is uniquely identified by the letters "L" (Band 2), "M" (Band 3) or "H" (Band 4), which indicates their English language proficiency based on their MUET level and a number, for the purpose of anonymous identification. The students who were absent in each of the sessions are shown in Table 6.6.

During the first week of the Main Study, all 32 participants were given the pre-treatment oral assessment. Upon completion of all the CMC ESP activities via NetMeeting Chat, they were given the post-treatment oral assessment. All the oral assessment sessions were video recorded and then digitized into mp3 files that can be played using media player software. Copies of the digitized recordings were made and distributed to five UTM language instructors who volunteered to evaluate the participants' performance in the oral assessment. A training session was carried out with these instructors using samples of digitized recordings of the pilot participants' oral assessment and the rating scale for the oral assessment.

I distributed the pre-treatment self-assessment questionnaire to the participants of the Main Study at the end of the first session (Week 9, 10th January 2004, n=32), and the post-treatment version after I had conducted all six sessions of the study (Week 15, 17th February 2004, n=32). All the 32 students who responded to the post-treatment self-assessment questionnaire also responded to the pre-treatment version.

Table 6.6 Main Study CMC ESP activities timeline

CMC ESP ACTIVITIES	PHASE	NUMBER OF PARTICIPANTS (N=32)
Week 9 & 10 (10th & 13th January 2004) Session 1: Preparatory Activity *Guessing Game*	Pre-task (10.01.04: Saturday, 11am-1pm)	32
	During-task (10.01.04: Saturday, 11am-1pm)	**32**
	Post-task (13.01.04: Tuesday, 8am-10am)	32
Week 10 (13th & 15th January 2004) Session 2: Semi-Serious Activity *Group Discussion*	Pre-task (13.01.04: Tuesday, 8am-10am)	32
	During-task (13.01.04: Tuesday, 8am-10am)	**32**
	Post-task (15.01.04: Thursday, 8am-10am)	29 (Absentee: L7, M11, H8)
Week 10-12 (15th, 20th & 27th January 2004) Session 3: Serious Activity A *Eliciting Information*	Pre-task (15.01.04: Thursday, 8am-10am)	29 (Absentee: L7, M11, H8)
	During-task (20.01.04: Tuesday, 8am-10am)	**31** (Absentee: L7)
	Post-task (27.01.04: Tuesday, 8am-10am)	31 (Absentee: L3)
Week 12-13 (29th January & 3rd February 2004) Session 4: Serious Activity B (Version 2) *Probing*	Pre-task (29.01.04: Thursday, 8am-10am)	31 (Absentee: M5)
	During-task (29.01.04: Thursday, 8am-10am)	**31** (Absentee: M5)
	Post-task (03.02.04: Tuesday, 8am-10am)	25 (Absentee: L1, L3, L6, M9, M10, H6, H10)
Week 13-14 (6th & 10th February 2004) Session 5: Serious Activity C (Version 2) *Asking for Clarification and Confirmation*	Pre-task (06.02.04: Friday, 10am-12pm)	29 (Absentee: L1, L6, H11)
	During-task (06.02.04: Friday, 10am-12pm)	**29** (Absentee: L1, L6, H11)
	Post-task (10.02.04: Tuesday, 8am-10am)	23 (Absentee: L3, L7, M3, M10, M11, M13, M14, H1, H3)
Week 14-15 (13th & 17th February 2004) Session 6: Serious Activity D *Opinion Exchange*	Pre-task (13.02.04: Friday, 10am-12pm)	31 (Absentee: L7)
	During-task (13.02.04: Friday, 10am-12pm)	**31** (Absentee: L7)
	Post-task (17.02.04: Tuesday, 8am-10am)	32

6.4 Findings

This section will present the findings of the Main Study. Section 6.4.1 will describe the results of the self-assessment questionnaires before and after the treatment. Section 6.4.2 will present the results of the oral assessment. Section 6.4.3 is a summary of the analysis of the participants' chat transcripts for evidence of language related episodes or LREs (Swain, 1998; Swain & Lapkin, 1995, 1998, 2001) and negotiation of meaning (Long, 1983b; Varonis & Gass, 1985) (see Section 2.1.2.1).

6.4.1 Pre and Post Self-Assessment Questionnaires

Thirty-two participants responded to the self-assessment questionnaire at the beginning and at the end of the Main Study. The responses to each item for both questionnaires were tabulated in percentages (see Appendix E1 for the descriptive statistics of the questionnaire data in percentages). The respondents' positive self-assessment of their proficiency in the four English language skills was calculated by adding the percentages of those who agreed that they were "good" or "very good" in these skills. Their degree of agreement was calculated by adding the percentages of participants who "agreed" and "strongly agreed" to each statement in the attitude and anxiety scales. The sign test was then used to conduct inferential statistics and test for significant differences between the students' responses to items in the pre- and post-treatment self-assessment questionnaires.

The results of the participants' self-assessment of their proficiency in the four English language skills revealed that there were higher percentages of participants who gave positive rating to their speaking, writing, listening and reading skills at the end compared to the beginning of the Main Study (see Figure 6.2). The differences were 18.7% (speaking), 28.1% (writing), 31.3% (reading), and 28.1% (listening) (see Appendix E19).

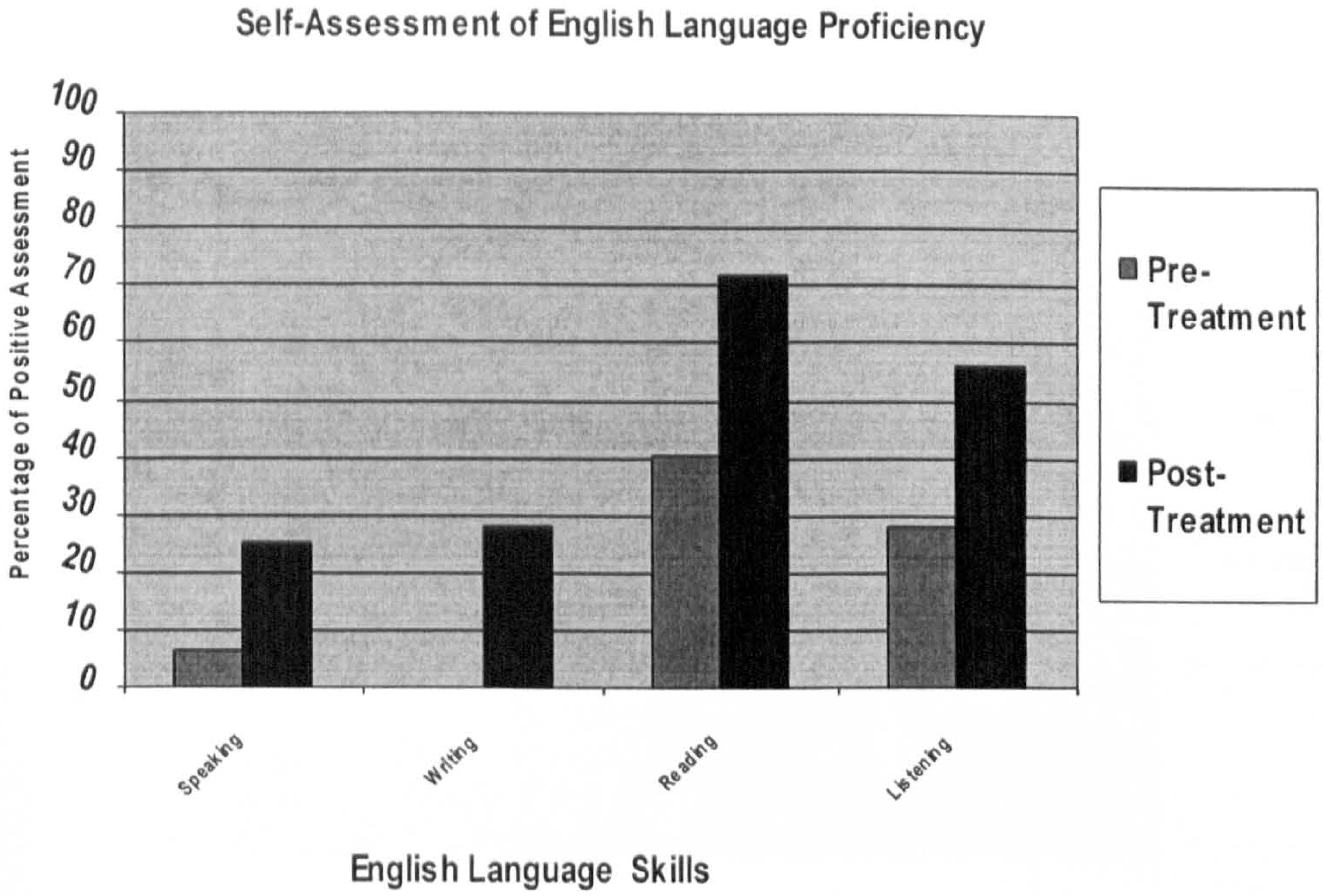

Figure 6.2 Percentage of participants who gave a positive self-assessment of their English language proficiency before and after the treatment

Results of the sign tests revealed that although there were more positive than negative differences (more respondents gave higher than lower ratings after the treatment) for all four items in the English language proficiency self-assessment scale, this was only statistically significant for the reading and writing skills with the value of $p<0.05$ (see Appendix E20). These results could be due to the text-based nature of the CMC ESP method which required the students to constantly write and read their questions or responses online via NetMeeting as well as read their interlocutor's responses.

The participants' general attitudes to the use of NetMeeting Chat for CMC task-based activities were positive both at the initial and final stage of the Main Study with at least 50% of the participants agreeing that the use of NetMeeting Chat forCMC task-based activities were useful, relevant, interesting, motivating and fun (see Figure 6.3). The percentage of agreement on usefulness increased from 90.7% to 96.9% but remained the same (87.5%) for relevance at the end of the study (see Appendix E21). The percentage of students who agreed that the use of NetMeeting

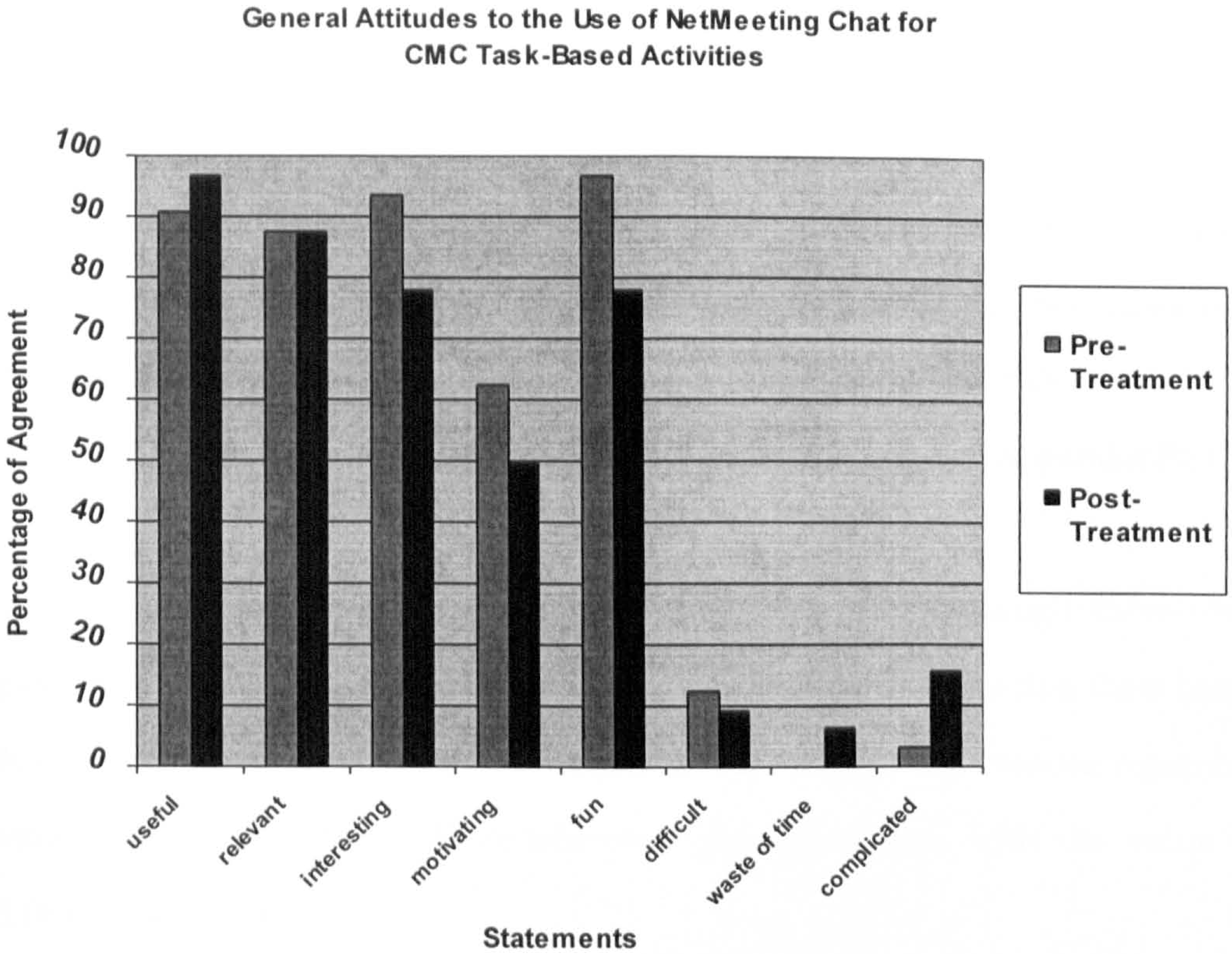

Figure 6.3 Percentage of participants who agreed to the statements on general attitudes to the use of NetMeeting Chat for CMC task-based activities before and after the treatment

for the CMC ESP tasks was interesting, motivating and fun decreased slightly upon completion of all the activities (see Figure 6.3). The differences were 15.7% (interesting), 12.5% (motivating) and 18.7% (fun) (see Appendix E21).

Results of the sign tests revealed that there were fewer positive than negative differences for all the first five statements of the general attitude scale. These findings indicated that more participants gave a lower rating to the statements after the treatment. These differences were only significant for the statement that the use of NetMeeting Chat for CMC task-based activities was fun, with the value of $p<0.05$ (see Appendix E22). This was probably because the feeling of excitement that is normally associated with the use of a technology in language learning had decreased over time.

At the beginning of the study none or only a small percentage of the participants agreed with the negative statements that NetMeeting Chat would be difficult (12.5%), a waste of time (0%) and complicated (3.1%) (see Figure 6.3 and Appendix E21). At the end of the study, the percentage of participants who agreed that the tasks were difficult decreased but the percentage of participants who agreed that the tasks were a waste of time and complicated increased (see Figure 6.3). The differences were 3.1% (difficult), 6.3% (a waste of time) and 12.5% (complicated) (see Appendix E21).

Results of the sign tests for these statements indicated that although there were more positive than negative differences relating to the use of NetMeeting Chat being difficult and a waste of time, and more negative than positive differences regarding use being complicated, these differences were not significant, with the value of $p>0.05$ (see Appendix E22).

At least 75% of the participants remained positive that NetMeeting Chat was an effective language learning tool for improvement of their general communication skills, the skills of writing and reading, knowledge of English (such as spelling, vocabulary, grammar and pronunciation), and the specific skill of system requirements elicitation, but less than 50% remained positive that it improved their listening and speaking skills (see Figure 6.4 and Appendix E23). The percentage of participants who agreed that the use of NetMeeting Chat improved their speaking and reading skills decreased by 3.1% (see Appendix E23). There was no difference in attitude towards improvement of their general communication skills (90.6%) and English language skills for system requirement elicitation (78.2%) but there was an increment in agreement for the rest of the statement (see Figure 6.4 and Appendix E23). The increment was 9.4% for writing, 3.3% for listening and 12.5% for knowledge of English (see Appendix E23). An increment was found for the listening skill despite the text-based nature of the CMC tasks.

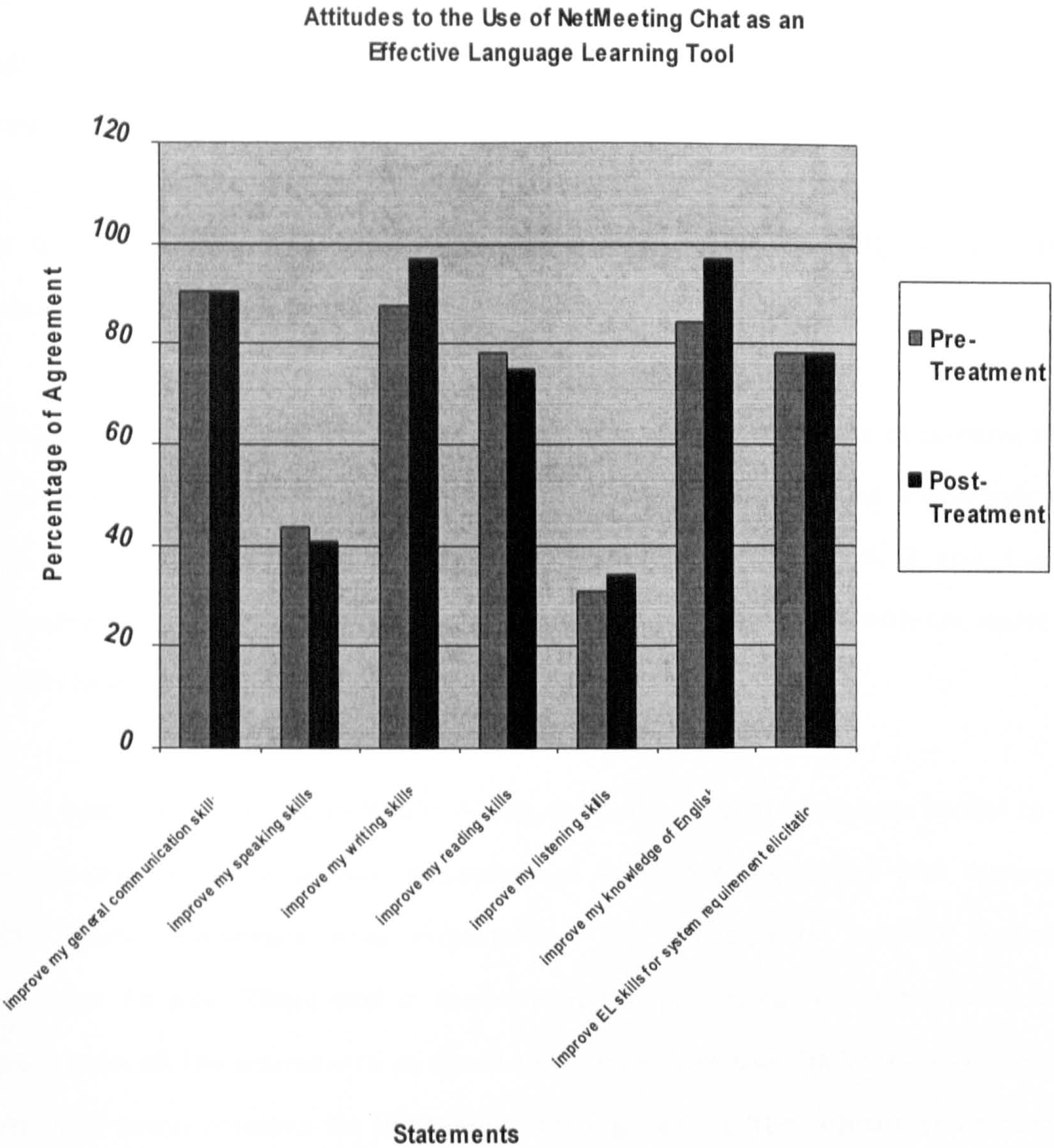

Figure 6.4 Percentage of participants who agreed to the statements on attitudes to the use of NetMeeting Chat as an effective language learning tool before and after the treatment

Comprehension of speech in the target language increases if learners acquire: 1) knowledge of the linguistic structures of the target language, 2) the ability to apply their own structured knowledge or prior knowledge and 3) the ability to pay close attention to and remember the speaker's utterances (Sakuma, 2000) . In this study, more participants agreed that the use of NetMeeting for conducting the CMC ESP tasks helped to improve their listening skills after the treatment, probably because this method of language learning provided them with exposure and practice with linguistic structures used in oral communication during systems analysis and design. The synchronous nature of interaction via NetMeeting also required them to pay close attention to their interlocutor's questions and answers so that they would not be "lost" in the midst of the text-based interaction, especially in an e-JAD session which involved more that two interactants.

Results of the sign tests were mixed. There were similar numbers of positive and negative differences for items 5 and 7, more positive than negative differences for item 6 and less positive than negative differences for items 1, 2, 3 and 4 (see Appendix E24). These differences were not statistically significant, with the value of $p>0.05$ (see Appendix E24).

At the beginning of the Main Study, 43.8% to 78.1% of the participants agreed to all the statements in the anxiety measurement scale (see Figure 6.5 and Appendix E25). These statements were indicative of the participants' English language classroom anxiety. There was a decrease in the percentage of respondents who agreed with all the statements in the anxiety scale after they had completed all the CMC task-based sessions via NetMeeting (see Figure 6.5). The percentage decreased by between 12.5% and 37.5% (see Appendix E25). The greatest differences were found for the first three and last two statements (21.9% to 37.5%) which were indicative of communication apprehension, fear of being less competent or making mistakes (see Appendix E25). The smallest difference was between the pre- and post-responses to the fourth (15.7%) and fifth (12.5%) statements which indicated communication apprehension or fear of being less competent than other students (see Appendix E25).

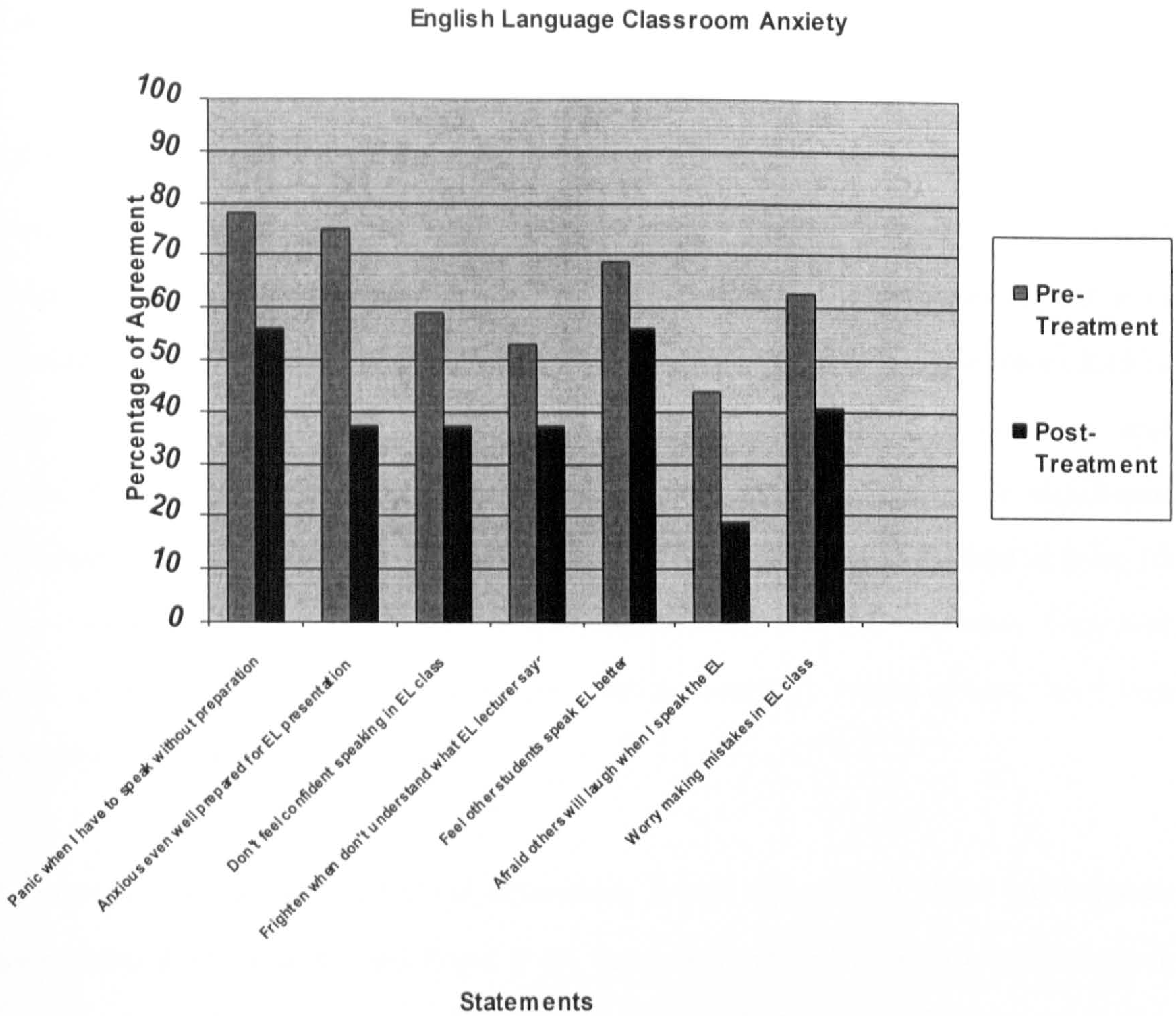

Figure 6.5 Percentage of participants who agreed to the statements on English language classroom anxiety before and after the treatment

Results of the sign tests for the anxiety scale revealed that there were fewer positive than negative differences (more respondents gave lower than higher ratings after the treatment) for all 7 items in the scale. These differences were significant for items 1, 2, 4 and 7 with the value of $p<0.05$ (see Appendix E26). Items 1, 2 and 4 were indicative of speech anxiety and item 7, fear of making mistakes. These results suggest that synchronous CMC may have helped to reduce the participants' anxiety when speaking in English.

6.4.2 Oral Assessment

All 32 students in the Main Study participated in pre- and post-treatment interview tests as well as the pre- and post-treatment group discussion tests. Their overall score and score for the detailed and general descriptors of the oral assessment were calculated by finding the mean of these scores by five raters (see Appendices E15 to E18). The students' mean scores for the pre- and post-treatment interview and group discussion tests were calculated to conduct statistical tests for significant difference. All five raters who volunteered to rate the oral assessment had at least 10 years' experience teaching English language proficiency and ESP modules. They had been given prior training in using the oral assessment rating scales, and had practice assessing a pilot group.

To discount any possible effects of differences in test design, half of the participants used Form A while half used Form B for the interview and group discussion tests pre-treatment. This procedure was then reversed for the post-treatment tests.

All the five raters marked the students' oral assessment in the Main Study (see Figure 6.6 and Figure 6.7 for the mean scores of oral assessment according to raters). Interrater reliability for all five raters was very high with a Cronbach Alpha value of 0.94 for the pre-treatment interview test scores and 0.84 for the post-treatment interview test scores (see Table 6.7). As for the group discussion tests, interrater reliability for all 5 raters was also very high with a Cronbach Alpha value of 0.90 for the pre-treatment group discussion test scores and 0.80 for the post-treatment group discussion test scores (see Table 6.7).

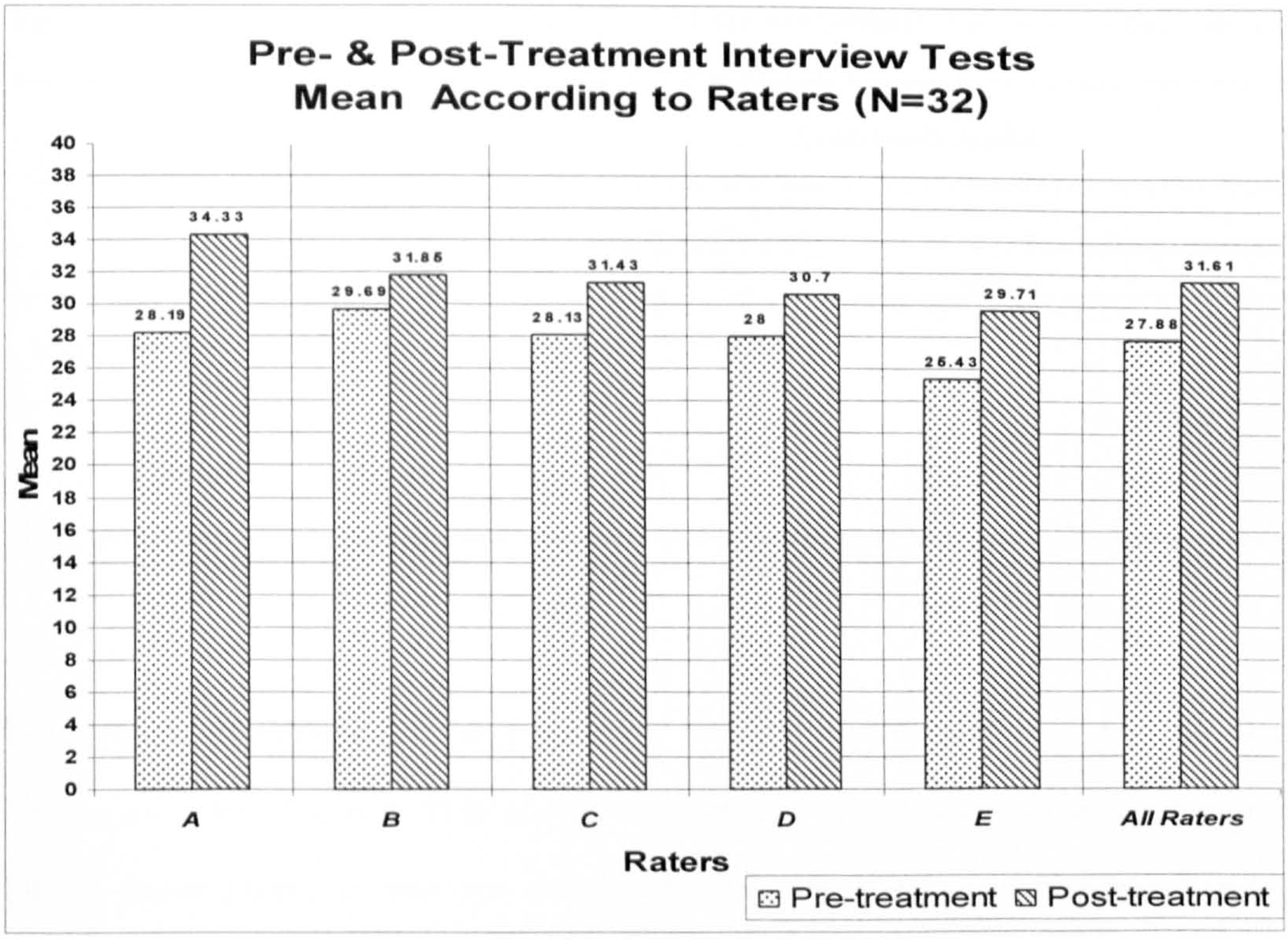

Figure 6.6 Graph for pre- and post-treatment interview tests mean scores according to raters

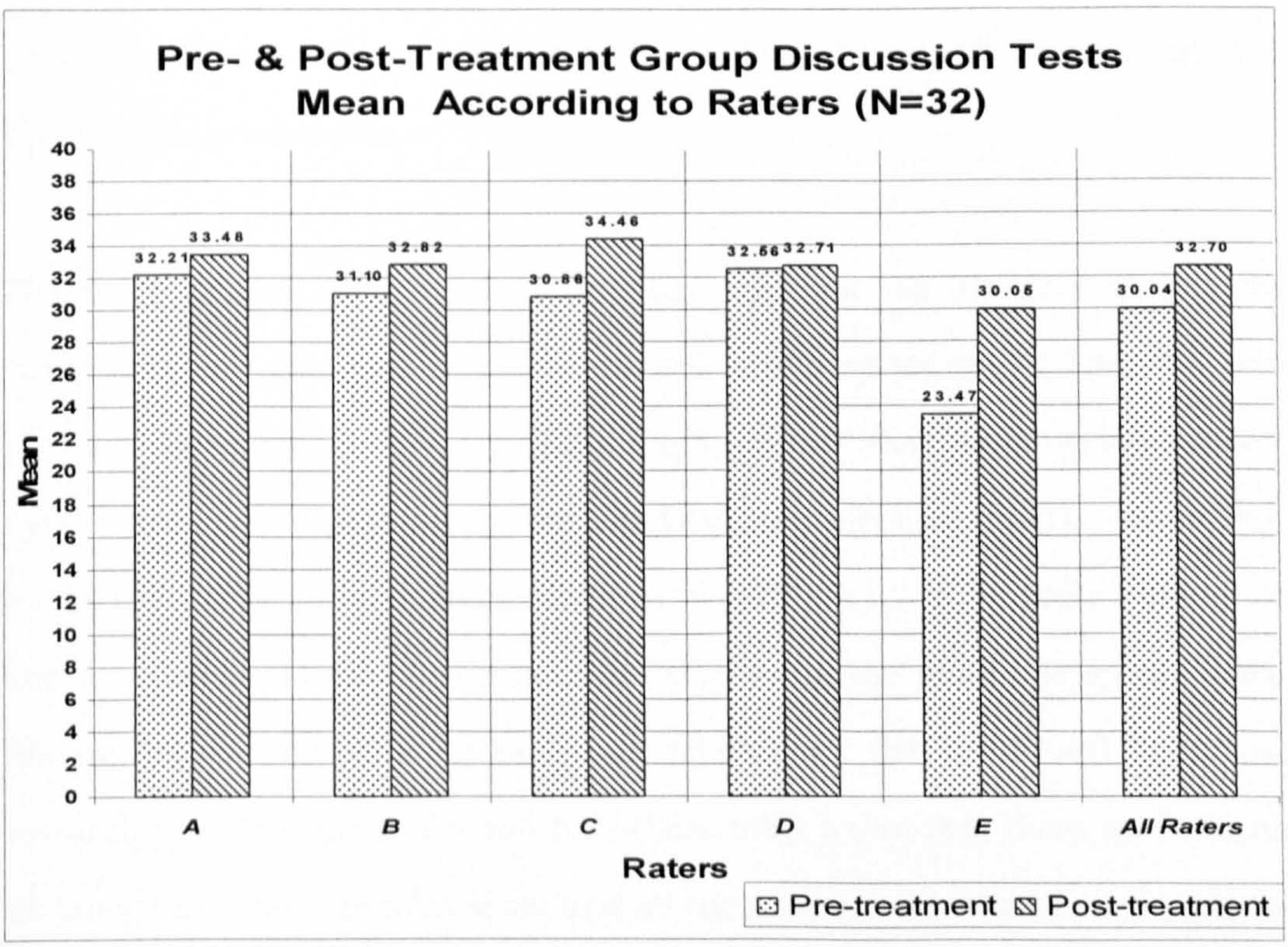

Figure 6.7 Graph for pre- and post-treatment group discussion tests mean scores according to raters

Table 6.7 Cronbach Alpha value of oral assessment for interrater reliability

Oral Assessment	Cronbach Alpha	
	Pre-Treatment	**Post-Treatment**
Interview	0.94	0.84
Group Discussion	0.90	0.80

The paired samples t-test was used to test all null hypotheses for the research questions in Section 6.2. This statistical test was selected because the mean scores for all participants in the pre-treatment and post-treatment interview and group discussion tests were from related samples and were found to be parametric or have normal distribution using the one-sample Kolmogorov-Smirnov distribution test. The paired samples t-test can be used to test for significant difference of mean scores between related samples.

The mean scores and standard deviation (SD) for all the general and detailed descriptors and the total scores in the pre- and post-treatment interview tests are provided in Appendix E27 (see Figure 6.8 for interview tests' general descriptors mean scores and Figure 6.9 for the interview tests' detailed descriptors mean scores in the form of graphs). Differences of mean for both interview tests were calculated and were analyzed for significant difference using the paired samples t-tests. The findings of the paired samples t-tests rejected all the three null hypotheses for research question one in Section 6.2. These tests reveal that there was a significant difference between the total score and all the general and detailed descriptor means in the pre- and post-treatment interview tests, at the alpha level of 0.05, with all the values resulting in $p<0.05$ (2-tailed) (see Appendix E28). There was an average

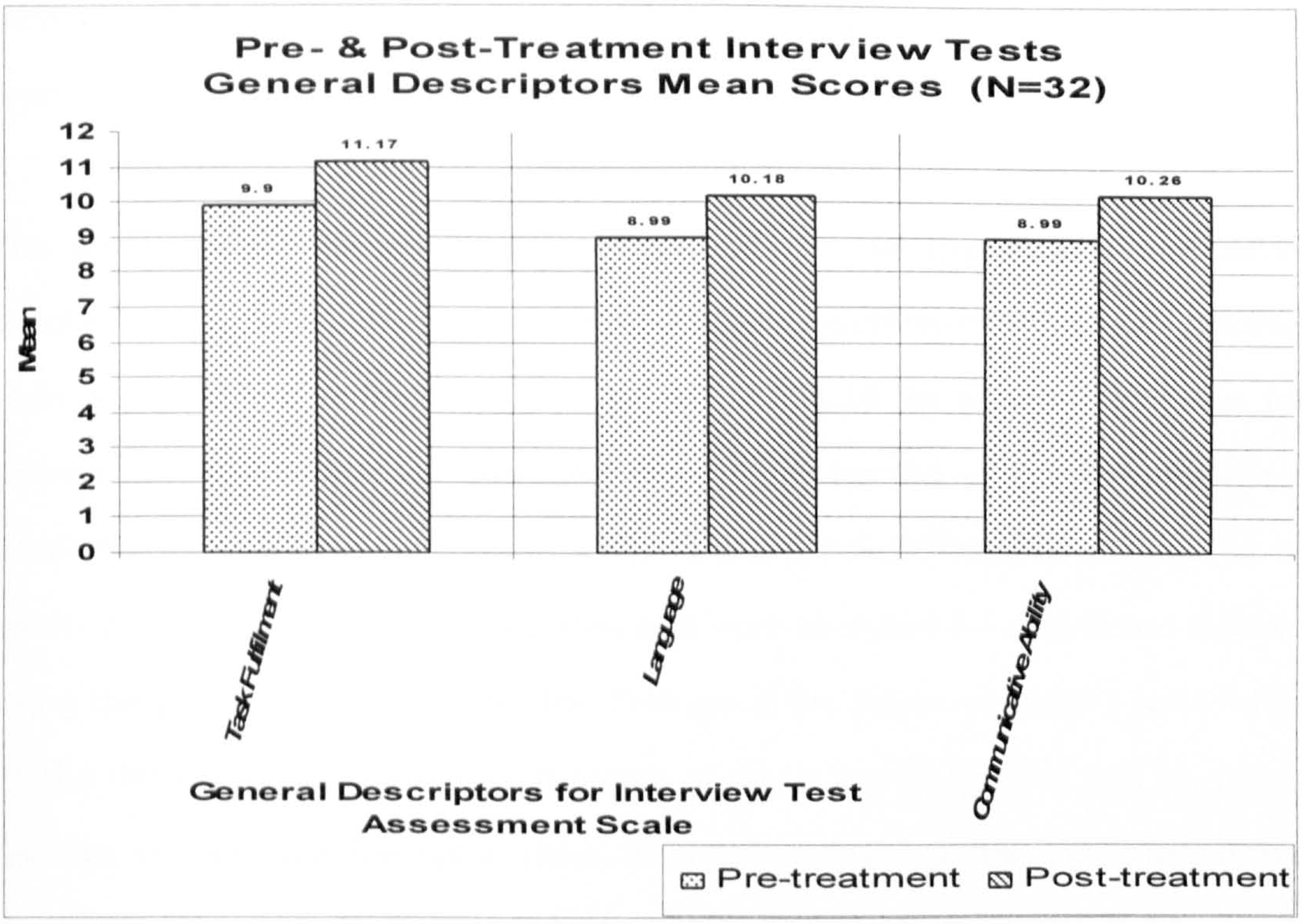

Figure 6.8 Graph for pre- and post-treatment interview tests general descriptors mean scores

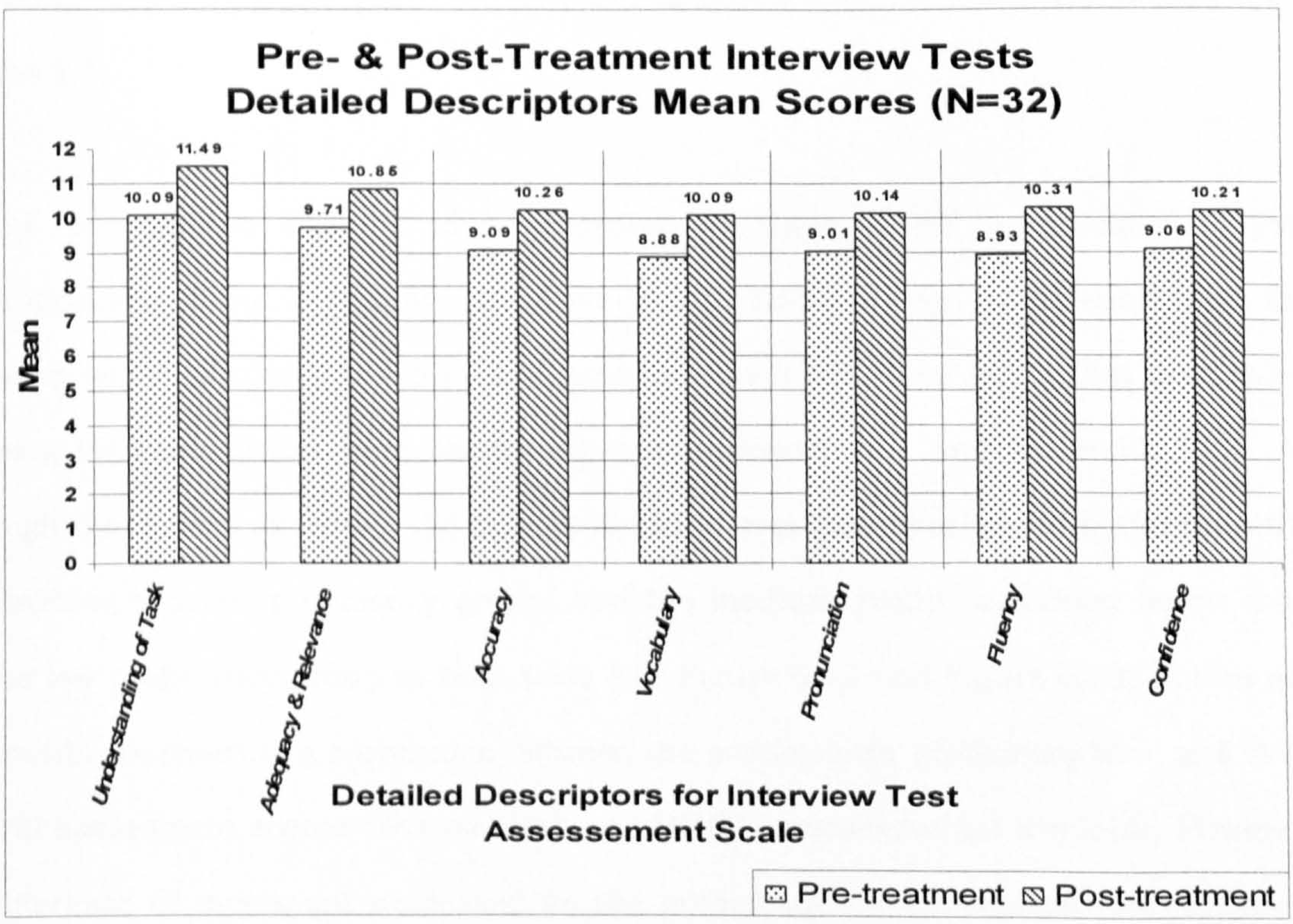

Figure 6.9 Graph for pre- and post-treatment interview tests detailed descriptors mean scores

increment of 3.7 marks in the overall score from the pre-treatment to the post-treatment interview tests.

The mean scores and standard deviation (SD) for all the general and detailed descriptors and the total scores in the pre- and post-treatment group discussion tests are provided in Appendix E29 (see Figure 6.10 for group discussion tests' general descriptors mean scores and Figure 6.11 for the group discussion tests' detailed descriptors mean scores in the form of graphs). Differences of mean for both group discussion tests were calculated and were analyzed for significant difference using the paired samples t-tests. The findings of the paired samples t-tests rejected all the three null hypotheses for research question two in Section 6.2. As with the findings for the interview tests, these tests also found that the difference between the total score and all the general and detailed descriptor means of the pre- and post-treatment group discussion tests were significant at the alpha level of 0.05 with all values resulting in $p<0.05$ (2-tailed) (see Appendix E30). The average increment of overall score from the pre-treatment to the post-treatment group discussion tests was 2.7.

The participants were divided according to their MUET level, Band 2 (low proficiency), Band 3 (medium proficiency) and Band 4 (high proficiency), and the mean scores for both the pre- and post-treatment interview and group discussion tests for each group were calculated (see Appendix E31 and Appendix E32). As might have been expected, the high proficiency level group performed better than the medium and low proficiency group, and the medium group performed better than the low proficiency group in both tests (see Figure 6.12 and Figure 6.13). It was not possible to conduct a correlation between the participants' proficiency level and their oral assessment scores because their raw MUET scores were not available. However, difference of increment decreased as the proficiency level increased (see Appendix E31 and Appendix E32).

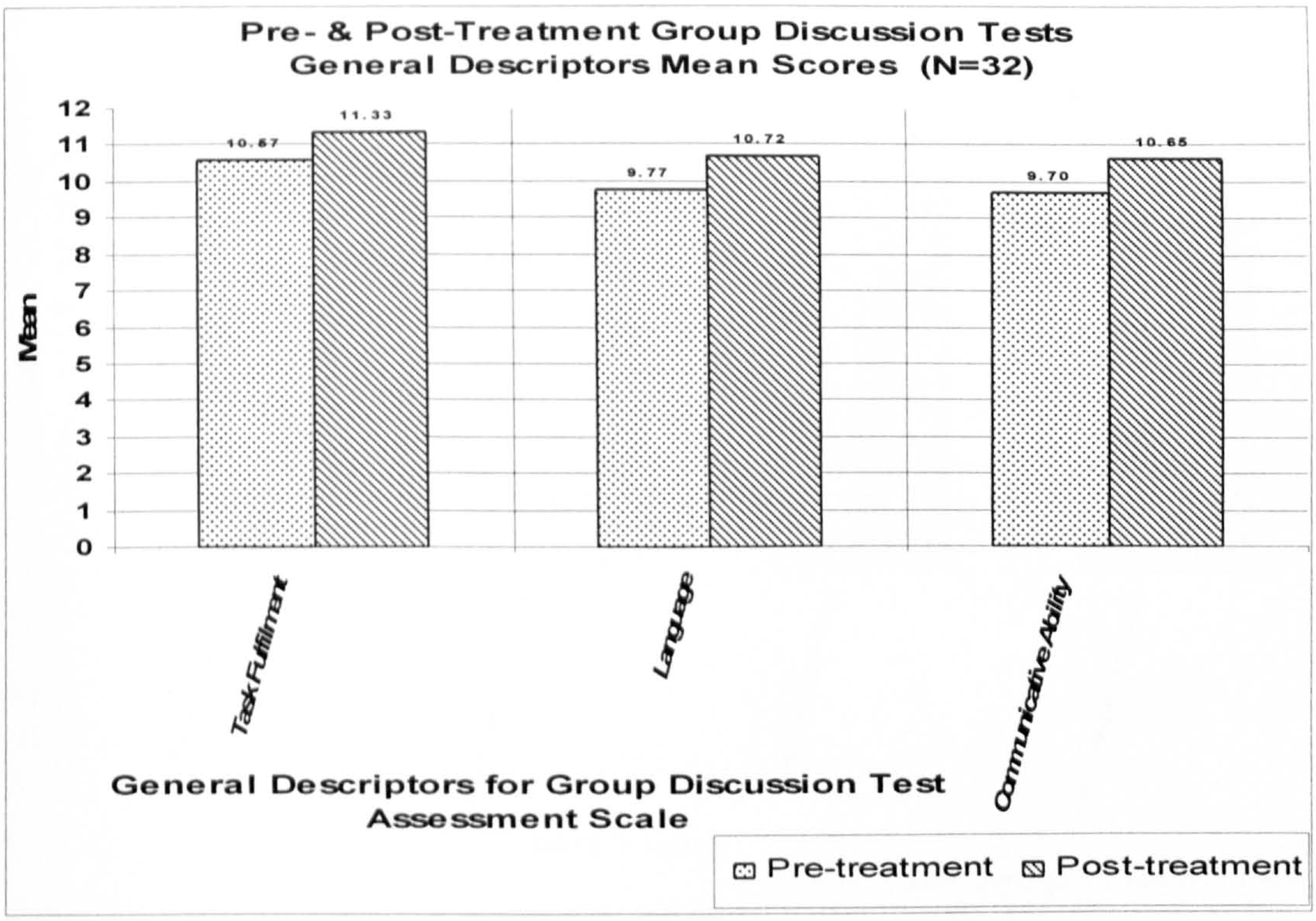

Figure 6.10 Graph for pre- and post-treatment group discussion tests general descriptors mean scores

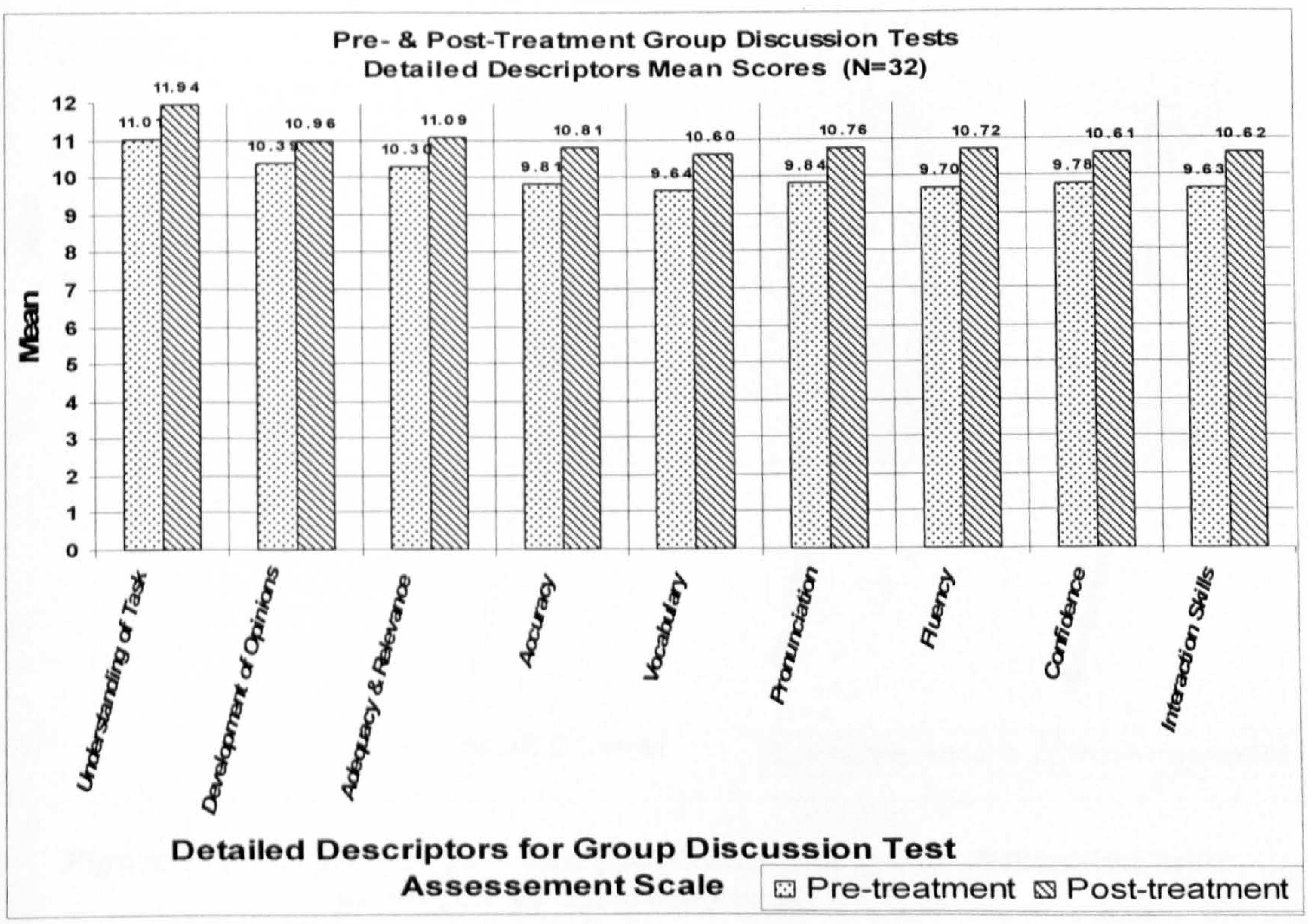

Figure 6.11 Graph for pre- and post-treatment group discussion tests detailed descriptors mean scores

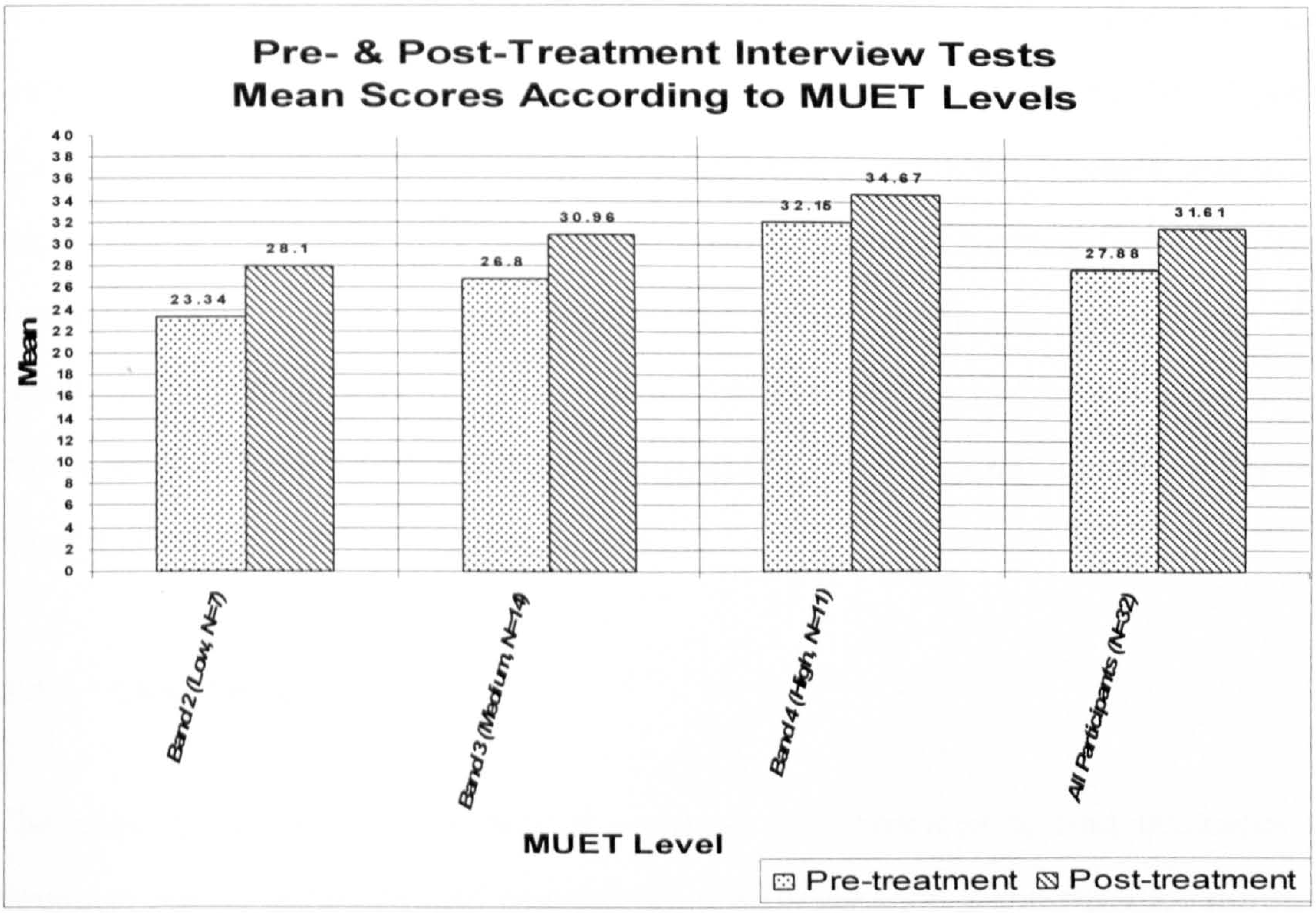

Figure 6.12 Graph for pre- and post-treatment interview tests mean scores according to MUET level

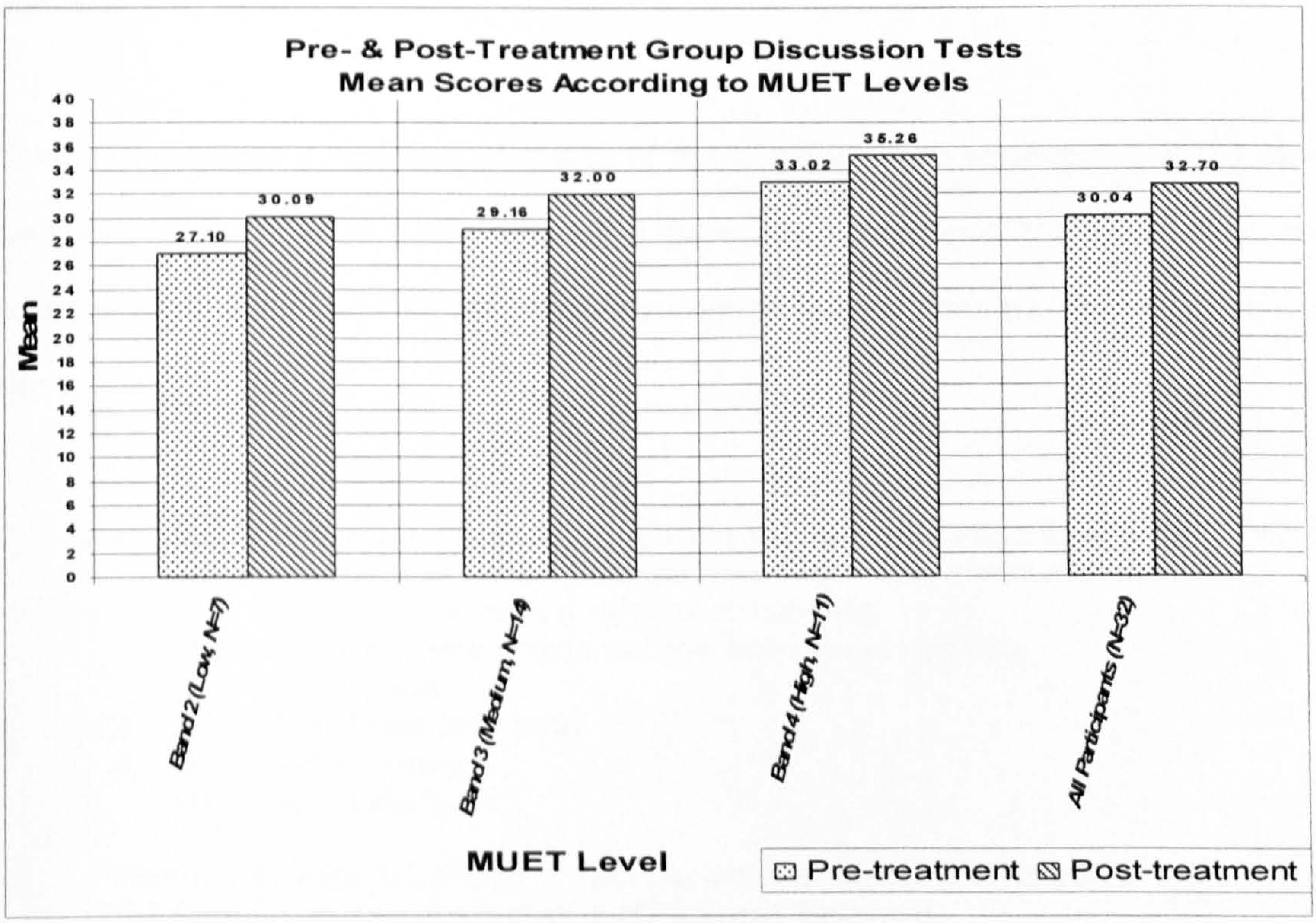

Figure 6.13 Graph for pre- and post-treatment group discussion tests mean scores according to MUET level

When the difference of mean scores between the pre- and post-treatment interview tests were calculated for significance according to the participants' MUET level (Band 2, Band 3 and Band 4) using the paired samples t-tests, it was found to be significant at the alpha level of 0.05, with all the values resulting in $p<0.05$ (see Appendix E33). A similar test was conducted for the group discussion tests. The results were slightly different. There was a significant difference between the mean scores for the Band 2 and Band 3 group ($p<0.05$) but it was not significant for the Band 4 group ($p<0.05$) (see Appendix E34).

6.4.3 Chat Transcripts

The chat transcripts for the serious sessions were analyzed to find instances of language related episodes and negotiation of meaning. The transcripts for the first two sessions were not used because they were practice sessions and did not simulate ESP tasks.

Table 6.8 provides descriptive statistics of the turns for each serious activity. A turn was counted in the chat transcripts when there was a transfer of the "floor" from one interactant to the other. In the following excerpt from a chat transcript, there are three turns.

1. M2: Good morning to all the clients.we are the system analysis from berjaya sofware house.In the previous interview I'm afraid there's been a misunderstanding.
   M2: I'm sorry,there seems to have been some missing information.
2. L4: What I can help you?
3. H7: good morning.
   H7: may i help you?

(Serious Activity 1C, Group 7 – M2 (systems analyst), M13 (scribe), L4 (client – driving instructor) & H7 (client – lecturer))

Table 6.8 Total number and mean number of chat turns in the serious activities' chat transcripts

Serious Activity	**Systems Analysts**		**Clients**		**All Participants**		
	Turns	***M***	**Turns**	***M***	**N**	**Turns (%)**	***M***
A	361	11	351	11	31	712 (30.9%)	11
B	270	8	264	8	31	534 (23.2%)	8
C	191	6	204	6	29	394 (17.2%)	6
D	277	9	384	12	31	661 (28.7%)	11

This method of calculating turns was used because unlike conversation, in which every interactant has equal access to the same communication channels simultaneously (as suggested by Sacks, Schegloff, & Jefferson, 1974), in the CMC environment "only one interactant at a time can use a given channel" and therefore, "disrupted turn adjacency is the rule rather than the exception" (Smith, 2003a).

The total number of turns and the mean number of turns for all students who role-played "system analysts" or "clients" in each serious activity were calculated using Microsoft Excel (see Table 6.8). Serious Activity A had the highest number of turns (712), followed by Serious Activity D (661), Serious Activity B (534) and then Serious Activity C (394). It is possible that there were more reasoning operations for Serious Activity A. One indication is that there were more number of turn-taking which occurs.

The students who role-played "systems analysts" were found to take more turns in Serious Activities A and B than those who role-played "clients". The results were reversed for Serious Activities C and D. These results suggest that Serious Activities A and B, which are information gap tasks that involved a one-way flow of information from the sending to the receiving interactant, probably required the interactants who role-played as systems analysts to take more turns to request information from those who role-played as clients. On the other hand, the other two tasks, Serious Activity C and D, which are jigsaw and opinion-exchange type tasks involving a two-way flow of information among interactants probably required the interactants who role-played as clients to take more turns supplying information to the interactants who role-played as systems analysts.

6.4.3.1 Language Related Episodes

Further analysis of the chat transcripts revealed that there were 25 instances of language related episodes (see Table 6.9 for the frequency of language related episodes in the transcripts of serious activities). For example, in Table 6.10, H6 conducted self-correction. H6 meant to say "what do you think" but slipped by saying "how do you think" (see H6's transcript in Table 6.10). In another instance, one student, M8, questioned another student's language use. M8 did not clearly feel that H2's use of the simplified form of a word was acceptable in a formal interview situation (see M8's transcript in Table 6.10). The word "sori" which is commonly used in the Malaysian context, was deliberately used by H2 instead of "sorry" (see H2's transcript in Table 6.10). There was one case of language related episode which genuinely seemed to relate to the process of second language acquisition. One participant, M9, questioned her own language use when she produced a grammatically incorrect question but referred to it a little bit later and explicitly self-corrected (see M9's transcript in Table 6.10).

These results revealed that the CMC ESP method was able to provide participants with conditions for noticing of errors. These could be due to the technology affordance of text-based synchronous CMC which enables participants to view and reflect upon their own and their interlocutor's written messages on the computer screen.

Table 6.9 Frequency of language related episodes in the serious activities' chat transcripts

Serious Activity	Frequency of Language Related Episodes
A	5
B	10
C	1
D	9
Total	25

Table 6.10 Samples of language related episodes from the chat transcripts

CATEGORIES	SAMPLES
Conduct self-correction	H6: How do you think? H6: Oops,what do you think? *(Serious Activity 2D, Group 4 – M1 (systems analyst), M7 (scribe), H9 (client – check in/out counter clerk) & H8 (client – booking counter clerk),*
Question interlocutor's (others) language use	H2: sori because i don't understand M8: After the customer makes the complaint, the General manager would then provide the customer with the feedback on the customer' complaint. H2: ok thanks... L7: the customer will provide the Booking Counter Clerk with his booking information.then the Booking Counter Cleark will provide the customer with feeadback on the Customer's booking after receiving information from the Check IN/Out Counter Clearkon list of unavailable rooms M8: what don't you use the correct english spelling, because there will be misunderstanding if you use the simple spelling. M8: I mean Pn Complaint about your sori, why don't you type sorry. *(Serious Activity 2C, Group 1 – H2 (systems analyst), M4 (scribe), M8 (client – general manager) & L7 (client – booking counter clerk))*
Question own language use	M9: Who are the peoples that you are deal with? M4: we always have to communicate with client who come to check in/out, booking rooms and serve customer. M4: Form that we use in are booking rooms by using Rooms of approval form, renting of room by using Report approval form. M9: Sorry...i have a problem with the question "who are the people that you deal with"Can you repeat the answer? *(Serious Activity 2A, Group 7 – M9 (systems analyst), M4 (client))*

6.4.3.2 Negotiation of Meaning

When the chat transcripts were analyzed for indicators of negotiation of meaning, I found numerous instances of clarification requests, confirmation checks and comprehension checks in all four serious activities (see Table 6.12). Serious Activity D (opinion-exchange task) had the highest number of instances of negotiation of meaning followed by Serious Activity A (information gap task), Serious Activity B (information gap task), and finally Serious Activity C (jigsaw task) (see Table 6.11). Pica et al. (1993) suggest that jigsaw tasks provide the best opportunity for learning in comparison with other task types such as information gap, problem-solving, decision-making or opinion-exchange. On the other hand, Smith (2003b) suggests that jigsaw tasks do not necessarily provide more opportunity for learning. These results contradicted Pica et al.'s (1993) but supported Smith's (2003b) claim because Serious Activity D, the opinion-exchange task, had the highest instances of negotiation of meaning while the jigsaw task type, Serious Activity C, produced the fewest instances of negotiation of meaning.

Table 6.11 Frequency of negotiation of meaning instances in the serious activities' chat transcripts

Serious Activity	Clarification Requests	Confirmation Checks	Comprehension Checks	Frequency
A	7	4	3	14
B	5	3	3	11
C	3	4	2	9
D	7	6	1	15
Total	22	17	12	49

According to P. Robinson (2001b) , complex tasks that require a lot of information processing result in more negotiation of meaning than simpler ones. Serious Activity

D, an opinion-exchange task, might have been the most complex task. This could have explained why it had the highest instances of negotiation of meaning. On the other hand, Serious Activity C, the jigsaw task, might have been the easiest task and therefore it could be the reason why it had the fewest instances of negotiation of meaning.

Table 6.12 Samples of negotiation of meaning from the chat transcripts

SERIOUS ACTIVITY	SAMPLES
A	**Eliciting Information (Clarification Requests)** L2: how they do the job. L1: <u>i'm not clear with your question.</u> *(Serious Activity 1A, Group 10 – L2 (systems analyst) & L1 (client))* M10: can you tell me about the organizational structure of semarak dring school? M8: <u>Actually i don't understand about what do you mean.</u> M10: ok,in semarak driving school ,you have a organizational structure right,such as general manager,operation manager and so on.so,can you teel me,how many people had working under the general manager? *(Serious Activity 1A, Group 12 – M10 (systems analyst) & M8 (client))* M11: can you tell me what kind of people that normally join in your driving school H1: <u>what do u want to know?</u> *(Serious Activity 1A, Group 13 – M11 (systems analyst) & H1 (client))*
	Eliciting Information (Confirmation Checks) L1: <u>are you mean type people interact with.2 people are clients and clerk</u> L2: no L2: i mean how your worker do the responsibilities.what form they use L2: manual or use any computer L2: or mechine L1: ok. *(Serious Activity 1A, Group 10 – L2 (systems analyst) & L1 (client))* H6: If you don't mind,can you explain to me what is a different between the driving instructor and lecturer? H7:: i am not sure about the lecturer'sresponsibility. H6: <u>are you mean that the lecturer is who teach the student about the rules on the road,the meaning of the sign board</u> H7: i think so H6: <u>and the driving instructor is the person who are conduct student how to drive the car</u> H7: yes,one of my job responsibilities is conduct driving lessins *(Serious Activity 1A, Group 11 – H6 (systems analyst) & H7 (client))*

SERIOUS ACTIVITY	SAMPLES
A	**Eliciting Information (Comprehension Checks)** L1: ok.The organizational structure begins with General Manager,i mean the important person in the organizational.Its devide by 3,Human Resource Develpoment Manager,Accounts Manager and Operations Manager. There are 4 type of person Under Accounts Manager .4 OF THEM ARE clerk, Driving Instructor,Lecturer and QTI officer L1: it that clear L2: yup *(Serious Activity 1A, Group 10 – L2 (systems analyst) & L1 (client))* L1: 2.collectclient attendance.3.submit available date and time for conducting driving lessons to clerk and lastly is collect client driving lesson schedule from clerk L1: are you understand L2: ya............ *(Serious Activity 1A, Group 10 – L2 (systems analyst) & L1 (client))* M3: Are ypu clear? H11: Right.I think that's a clear explainations from you. *(Serious Activity 2A, Group 4 – H11 (systems analyst) & M3 (client))*
B	**Probing (Clarification Requests)** H4: ok,may i know the workflow between you and the booking counter clerk? M8: Besides i would then provide the customer with feedback of their complaint. M8: Yes, you can. But i don't know how do you want me explain it. H4: ok,what will the booking counter clerk provide you with? *(Serious Activity 2B, Group 8 – H4 (systems analyst) & M8 (client))* L5: okay, firstly can you tell me about your workflow as driving instructor? H7: there are two type of workflow.which one you want to know? L5: i think better you tell me the main workflow. H7: ok.i will tell you about the workflowe between me and customer. *(Serious Activity 1B, Group 6 – L5 (systems analyst) & H7 (client))* L1: can you decribe the flow of work tasks? H2: with who?? L1: customer H2: ok... H2: the customer can submit a formal complain to me if he/she is not satisfied with any booking or rental. *(Serious Activity 2B, Group 1 – L1 (systems analyst) & H2 (client))*
	Probing (Confirmation Checks) H2: as a GM, i must interact with three person.. not only the you aks..?? H2: ...the one you ask... sorry L1: sory you interact with 3 person ,right H2: yes *(Serious Activity 2B, Group 1 – L1 (systems analyst) & H2 (client))* M13: i understand..so, u still has one more person that u interact as a maneger right? L3: yes, your right. *(Serious Activity 2B, Group 14 – M13 (systems analyst) & L3 (client))*

<table>
<tr><th>SERIOUS ACTIVITY</th><th>SAMPLES</th></tr>
<tr><td>B</td><td>Probing (Comprehension Checks)

L1: After the customer has signed his attendance,the driving Instructor will CONDUCTS TRAINING SESSION FOR THE CUSTOMER
L1: <u>is that clear?</u>
H2: i think so.... is there any problem when you interact either with your clerk or your customers?
(Serious Activity 1B, Group 1 – H2 (systems analyst) & L1 (client))

H11: yes,there is.the customers can submit a formal complaint to me if the customers are not satisfied any of booking or rental
H11: <u>Are you clear?</u>
M12: yes, thanks for you information and your time.
H11: You are welcome
(Serious Activity 2B, Group 16 – M12 (systems analyst) & H11 (client))

L5: the first work flow is between me and the booking counter clerk
L5: and then between the check in/out counter clerk
L5: and the last between me and the customer
L5: <u>you have got it?</u>
H7: yes.thank you.
L5: you are welcome
(Serious Activity 2B, Group 6 – H7 (systems analyst) & L5 (client))</td></tr>
<tr><td>C</td><td>Asking for Clarification & Confirmation (Clarification Requests)

H2: after the customer make a complaint... and then you do nothing.. imposibble
M8: noooo, there must be misunderstanding here.
H2: <u>can you clear it..???</u>
H2: sori because i don't understand
M8: After the customer makes the complaint, the General manager would then provide the customer with the feedback on the customer' complaint.
H2: ok thanks...
(Serious Activity 2C, Group 1 – H2 (systems analyst), M4 (scribe), M8 (general manager) & L7 (client – booking counter clerk))

M13: okay..i will provide him with customer's booking information
M13: then, I also submit a list of rooms that are booked by customers to the clerk..
M13: i mean check in/ out clerk
H7: <u>can you state your information clearly?</u>
H7: i cant get what you mention actually
(Serious Activity 2C, Group 7 – L4 (systems analyst), H7 (scribe), M2 (general manager) & M13 (client – booking counter clerk))</td></tr>
</table>

SERIOUS ACTIVITY	SAMPLES
C	**Asking for Clarification & Confirmation (Confirmation Checks)** H4: i think you had confused about the workflow between me and the clerk.I'm the one who are suppose to provide the attendance list to the clerk and not the other way round. H3: Oh, i see.The lecturer provide the attendance list to the Clerk and is not the other way round.When the Lecturer has completed his lectures on Driving Codes, he will hand over the list of participants to the Clerk.That's all about the wokflow between the Lecturer and the Clerk.Am i right,H4? H4: No,you are wrong.Actually,the clerk will provide me with a list of participants who will be attending my lectures before i conduct the lectures. *(Serious Activity 1C, Group 2 – H3 (systems analyst), L5 (scribe), M12 (driving instructor) & H4 (client – lecturer))* H1: still,the clerk provides u the dates n times of lectures right? M1: you're welcome M7: Yes, other informations are true. sorry for that. *(Serious Activity 1C, Group 4 – H8 (systems analyst), H1 (systems analyst), L2 (scribe), M1 (driving instructor) & M7 (client – lecturer))*
	Asking for Clarification & Confirmation (Comprehension Checks) H2: i have told you the relationship between me and the clerk before, are you clear or not? *(Serious Activity 1C, Group 1 – M8 (systems analyst), L7 (scribe), H2 (driving instructor) & M4 (client – lecturer))* M8: Ok, do you mean you don't understang the question the i m asking just now. M8: Ok, why don't you tell me how do youn want me to ask this questoin. H2: i understand... but i'm not taking all the information you mean... i just receive from the clerk.... the other information is customer information... get it? L7: ok, *(Serious Activity 1C, Group 1 – M8 (systems analyst), L7 (scribe), H2 (driving instructor) & M4 (client – lecturer))*
D	**Opinion-Exchange (Clarification Requests)** L2: its ok H5: L2 its ok for what? L2: for you excuse *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))* L2: can you add the menu to see the room H5: see the room means what? L2: i mean the pictures room *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))* H1: i think the colour left is black and white... H2: what you mean? H1: well, i think it is better you display the picture of your hotel as the background of this homepage H2: ok *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))*

SERIOUS ACTIVITY	SAMPLES
D	**Opinion-Exchange (Clarification Requests)** M13: o yap..i think the type of font for the title is not suitable..it should different from others.. M2: MAybe we can have western food too. M11: Food.....yes,i think you are right M11: About the font.What do you mean different from others? can you explain to me? *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))*
	Opinion-Exchange (Confirmation Checks) L2: before rhis you told me to change is it correct? H5: maybe a symbol of a car and the sign boards *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))* H9: What changes do you think is suitable? M7: I think it is better if we just used all English or all Bahasa Melayu H9: So, you mean used only one language. M7: Yes. It is easier than used 2 languages. *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))* M3: yes i think you must add something about information M2: What do you mean about the menu part?Can you elebrate it more details? M2: Just now you said,we should add more information right?So can you tell me the information that you want me to add? *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))* L3: Can you describe what part that you dislike about the design prototype? M9: The appearance makes me feel that it is not interesting...As far as I am concerned,the colour of the background is too bright..that makes the user cannot read the text in a comfort condition. H10: As far as i'm concerned,the background colour is quite interesting but I think that size of the font shoud be larger so the user can full-filled the form easily.Besides that I think that we must decide either to use English language or the Malay language. L3: So, you mean you want the background color to be more heavy.If that in case, we will change it as you wish.But is the blue color ok,or you want it to change to? if that case, what types of color do you want? *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))*
	Opinion-Exchange (Comprehension Checks) H5: okay.What about the font colours.Both of u like it or not? L2: i not see the coluor H5: why? L2: because the paper white and black L2: you understand what i mean? H5: no *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))*

Apart from the above three types of negotiation of meaning, there were other forms of negotiation of meaning found in the chat transcripts. For example, there were quite a number of instances where an interactant probed the interlocutor for further information because the preceding information provided by the interlocutor was not fully understood or was incomplete. Examples of probing expressions include "can you be more specific", "can you explain further", and "can you elaborate it" (see samples in Table 6.13). These probes by the interactants "forced" the interlocutors to produce more complex or more specific responses. In other words, the probes led to "pushed output" (Swain, 1985).

Table 6.13 Samples of probing from the chat transcripts

SAMPLES
Information -> M11: Can you please describe to me about your organizational structure of Semarak Driving School ***Probe*** -> H1: can u be more spesific? as u can see, i'm only a the driving instructor, not the general manager.. ***Pushed Output*** -> M11: Beside you, is there anyone else got the same responsibility as a driving instructure? *(Serious Activity 1A, Group 13 – M11 (systems analyst) & H1 (client))*
Information -> H11: Can you tell me further about how you give their information to your customer? H11: What I mean is your informations to your customers ***Probe*** -> M12: Can you explain further? ***Pushed Output*** -> H11: I'll restart the questions.Can you explain what are the informations that you give to your customers? *(Serious Activity 1B, Group 16 – H11 (systems analyst) & M12 (client))*
Information -> M11: For me ,a part that looks very interesting is at the manu part.ithink that was an enough information that user have to know M3: yes i think you must add something about information ***Probe*** -> M2: What do you mean about the menu part?Can you elebrate it more details? M2: Just now you said,we should add more information right?So can you tell me the information that you want me to add? ***Pushed Output*** -> M11: At menu utama,there was an enought information such as activity ,course,training and test. *(Serious Activity 1D, Group 8 – M13 (systems analyst), M2 (scribe), (driving instructor) & M3 (client – clerk))*

Finally, another interesting form of negotiation of meaning found in the chat transcripts was when interactants self-clarified their preceding expressions without being asked by their interlocutors (see sample in Table 6.14) . Self-clarification occurred when the interactant perceived that the interlocutor had misunderstood, or when the interactant made an accidental mistake (a 'slip').

Table 6.14 Samples of self-clarification from the chat transcripts

SAMPLES
Self-clarification due to misunderstanding H6: You also used the combination language. I mean in your user interface design prototype,you had used two language which it is Malay and English H7: i agree with m14 H6: What about the combination language? H7: it's a good idea H6: I think you don't understand what i mean H6: <u>I mean that you used Malay word justfor Menu Utama and carian</u>. H6: If you want to uesd the multilanguage,why don't you seperate the Malay and English language.English in the top and Malay below it *(Serious Activity 1D, Group 2 – H11 (systems analyst), M8 (scribe), H4 (driving instructor) & M12 (client – clerk))*
Self-clarification due to a slip H6: Opps you have told me the wrong answer. I've ask you about you with your clerk right? H6: you answer about you with your customer H6: Want to start again? M2: <u>sorry,just now i tell you about the wokflow between me and customer</u>. M2: now i will tell you the workflow between me and clerk ok. *(Serious Activity 1B, Group 3 – H6 (systems analyst) & M2 (client))*

6.4.3.3 Strategies of Interviewing

Apart from using language related episodes and negotiating meaning, students were found to adjust their language strategically to improve the interview process and suit the purpose of the interview. For example, in Table 6.15, L2 rephrased the words "should do" to "responsibilities", to make it easier for his "client" to understand the specific information he was eliciting, and H11 rephrased his question to elicit the correct information he required from his "client".

Students broke down complex questions into smaller parts. In Table 6.15, L2 initially asked three questions but decided a little bit later to focus on only one of the three. This was done to make it easier for the "client" to understand and consequently answer the "systems analyst's" question.

Table 6.15 Samples of strategies of interviewing from the chat transcripts

SAMPLES
Rephrasing question L2: about the Human resource,what the Human Resource D mananager <u>should do</u> . L2: i mean the <u>responsibilities</u>. *(Serious Activity 1A, Group 10 – L2 (systems analyst) & L1 (client))* M12: Can you explain further? H11: I'll restart the questions.Can you explain what are the informations that you give to your customers? H11: All right.What are the actual informations that customers should give to you? *(Serious Activity 1B, Group 16 – H11 (systems analyst) & M11 (client))*
Breaking down complex question L2:Ok,can you tell me first about your organizational structure of Semarak Driving.Who's at the top (i'm ment manager) and under manager. L2: i think my question so long.ok Who at the top at organational structure *(Serious Activity 1A, Group 10 – L2 (systems analyst) & L1 (client))*

6.5 Discussion

This section will discuss the findings of the Main Study by addressing its two main research questions. The first research question aims to investigate if the CMC ESP method helps to develop the participants' interviewing skills for systems analysis and design whereas the second research question investigates whether this method of language instruction helps to develop their group discussion skills for systems analysis and design (see Section 6.2). The one group pre-test and post-test pre-experimental research design was used to answer the above research questions by testing the following null hypotheses:

For research question 1:

There would be no significant difference between the pre- and post-treatment interview test mean scores.

For research question 2:

There would be no significant difference between the pre- and post-treatment group discussion test mean scores.

The participants' pre- and post-treatment interview and group discussion tests overall mean scores were tabulated for significant differences to test the above null hypotheses. Their mean scores according to the descriptors of the rating scale for the tests (see Table 6.3) were then tabulated for significant differences to triangulate the results of the null hypotheses. Their responses to the attitude questionnaires and chat transcripts were also analyzed to triangulate the results of the oral tests.

The following sub-sections will address both of the main research questions for the Main Study concurrently.

Oral Assessment Performance

The results of the oral assessment revealed significant differences of mean for all the descriptors and the total scores in the pre- and post-treatment interview tests (see Appendix E28), and group discussion tests (see Appendix E30) (value of $p<0.05$). The participants performed significantly better in the post-treatment tests than in the pre-treatment tests in terms of task fulfillment, language, communicative ability and overall performance. These findings reject all the null hypotheses listed in Section 6.2 and suggest that the CMC ESP method helps to develop the students' interviewing and group discussion skills for systems analysis and design.

According to Levelt (1989), oral language production involves the use of three cognitive devices for language processing: 1) the conceptualizer which conceptualizes the content of the message, 2) the formulator which chooses a suitable linguistic formulation for the message and 3) the articulator which triggers articulation of the message. Payne and Whitney (2002) hypothesized that synchronous CMC helps to develop the cognitive devices required for oral language production. The findings of the interview and group discussion tests revealed that the participants attained a significantly higher score in both tests after the treatment (see Appendix E28 and Appendix E30). These results suggest that the participants benefited from exposure to the CMC ESP method. The written exchanges that text-based synchronous CMC affords through the CMC ESP method could have helped to develop the cognitive devices required to process language for oral production.

According to Anderson (1983), language acquisition requires a high level of cognitive function which involves both explicit and implicit knowledge about language as a system and wide-ranging opportunities for practice to achieve autonomy. Text-based synchronous CMC affordance to provide the participants with the opportunity for delayed response and to view and edit their written message enabled them to gradually rehearse and practice the interviewing and group discussion skills for systems analysis and design at a slower pace that may have helped them to acquire declarative and procedural knowledge of these skills (Anderson 1983). They may have experienced the three-stage cognitive process in which skills can be developed: a cognitive stage, an associative stage and an autonomous stage (Anderson, 1983, 1985). Initially, the participants may have developed declarative or factual knowledge of the target skills. With further rehearsal and practice, they were able to identify mistakes during the process of skill acquisition and reduce them in the process of acquiring procedural knowledge of the skills. Finally, the skills may have become automated. Newell and Rosenbloom's (1981:50) theory of the power of learning suggests that performance of skill improves as a function of practice as the more practice the learners have learning a particular skill, the more is "the amount of power it gets by making connection with a wide body of existing psychological work" that is related to the skill. These may be the possible reasons for the participants' significant improvement in the oral assessment. The CMC ESP method therefore seemed to have the potential to develop the specific oral communicative skills of interviewing and group discussion skills for systems analysis and design that Computer Science students needed for their studies and future profession. It supports several studies (Beauvois, 1997; Chang, 2002; Kost, 2004; Payne & Ross, 2005; Payne & Whitney, 2002) which have claimed that practice with text-based synchronous CMC improves learners' oral skills.

The students' chat transcripts resembled oral interaction rather than writing. They were found to be dialogic and involved turn-taking (see samples of chat transcripts in Table 6.10 and Table 6.12). These findings support Chun's (1994:29) suggestion that the types of sentences produced in computer assisted classroom discussion (text-based CMC) "strongly resemble what would be said in a spoken conversation". Chun (1994) hypothesized that since text-based CMC looks like spoken interaction, it could be transferred to the spoken medium. In this study, text-based CMC seemed to have the potential of being transferred to the spoken medium and consequently help to develop language learners' oral skills in the target language, as it was found to trigger messages that resemble spoken interaction and seemed to initiate the use of cognitive devices for oral production. These factors might help to account for the participants' significant improvement in the oral assessment.

Further analysis of the oral assessment results revealed that the low proficiency students benefited more from exposure to the CMC ESP method. This group had a higher increment of scores for both the interview and group discussion tests, in comparison with the high proficiency students (see Appendix E31 and Appendix E32). This is to be expected, given that improvements in language proficiency generally tend to be more noticeable at lower proficiency levels. For example, Milleret

(1991:41) found that during a foreign language summer-study programme, those of her subjects with a lower proficiency level registered a higher gain than those who were more proficient because "... students who know less can show gains more easily than can students who know more and must make more complex improvements in their skills" and because "the summer program is long enough to measure gains at the novice level but too short to measure more sophisticated improvements". Further evidence for this tendency is provided by Warren (2004) who summarized the progress of about 1 million English language learners and suggested that language learners improve more slowly as their proficiency increases.

Apart from significant improvement for their overall performance in the interview and group discussions tests, the participants also improved significantly in both types of oral assessment in terms of task fulfillment, language, and communicative ability.

Task Fulfillment

The significant improvement in task fulfillment in the oral assessment suggests that the participants had a better understanding of the tasks and managed to elicit more adequate and relevant information from the 'client' during the post-treatment interview test, and provided more satisfactory and relevant views on the discussion topic in the post-treatment group discussion test. This improvement may be due in part to the sustained-content nature of the treatment, which may have deepened their understanding of the systems analysis process. This may also be due to the fact that the participants had a positive attitude towards the use of synchronous CMC, as indicated in their questionnaire responses regarding the general use of NetMeeting Chat for conducting the CMC task-based activities. After the treatment, at least 50% of the students still remained quite positive about it being useful, relevant, interesting, motivating and fun and less than 16% thought that it was difficult, a waste of time and complicated (see Appendix E21). There was an increment in the percentage of agreement for the first two and the last items but a decrease for the rest (see Appendix E21). These differences were only significant for the fifth item, the element of "fun" (item five; see Appendix E22).

A high percentage of the students remained positive that using NetMeeting to conduct the CMC ESP tasks was useful and relevant, indicating that this method of language instruction met their ESP needs. The use of text-based synchronous CMC to perform the CMC ESP tasks aims to simulate "real-world" assignment that the students have to perform in their academic studies and in their future profession as systems analysts. Only a small percentage agreed that this method of language learning was difficult, a waste of time and complicated, probably because of the affordance of synchronous CMC to provide a low anxiety setting for language learners to rehearse and practice the target skills. In addition, as P. Robinson (2001a) suggests, the gradual sequencing of the tasks in terms of cognitive load may have helped to dispel notions of difficulty. The sustained-content approach built upon the students' understanding of content-related information that were provided in later tasks was built upon their understanding of the information introduced in earlier tasks, and they were exposed gradually to the language items required to perform the tasks. A slightly lower percentage of the students thought the use of NetMeeting to conduct the CMC tasks were interesting, motivating and fun. This was probably because of the seriousness of most of the tasks designed for the CMC ESP method, which did not seem to have a lot of the element of "fun" that is normally associated with less serious tasks such as guessing games.

Language and Communicative Ability

The language and communicative skills of the participants also improved significantly, probably because of the affordance of synchronous CMC to provide conditions for delayed response, and thus provide language learners with longer processing time to plan the structure of their message, notice their own linguistic errors, notice the feedback on problematic linguistic forms provided by their interlocutors, and make the relevant corrections or revisions (Hudson & Bruckman, 2002; Kelm, 1992; Kroonenberg, 1994/1995; Lai & Zhao, 2006). In addition, the pre- and post-task phases of the CMC ESP method may have provided the participants with repeated exposure to the language items necessary for effective interviews and JADs, and the conditions to plan and to practise these items, and try out communicative strategies. Conducting different versions of the same type of task may also have played a role in improving the participants' language and communicative ability in the oral assessment, as it offered "highly contextualised cognitive rehearsal" (Bygate, 2001:42) and enabled participants to progress from being occupied with searching for language expressions to monitoring their language formulation. Task repetition helps learners "to pay more attention to the task of matching language for concepts, and possibly to improving their knowledge and organization of the language" (Bygate, 1996:144).

The participants had an optimistic attitude to the use of NetMeeting as an effective language learning tool. At least 75% of them remained positive that it was effective to help improve their general communication skills, knowledge of English, English language skills for systems requirement elicitation, writing skills and reading skills (see Appendix E23). About 30% of the participants agreed that the use of NetMeeting to perform the CMC ESP tasks improved their listening skills and about 40% agreed that it improved their speaking skills after the treatment (see Appendix E23).

The results of the pre- and post treatment self-assessment of classroom anxiety were encouraging. As in Arnold's (2002) study, there was a decrease in the percentage of participants who agreed with all the statements in the anxiety scale after the treatment (13% to 38%; see Appendix E25), although the differences were significant for four of the seven items in the anxiety scale (see Appendix E26). These items were indicative of speech anxiety and fear of making mistakes. Several studies have reported that synchronous CMC is less stressful and less face-threatening than standard classroom interaction (Arnold, 2002; Beauvois, 1998, 1999; Freiermuth, 1998; Kern, 1995). The CMC ESP method probably helped to reduce the participants' speech anxiety and raise their confidence regarding communication in English. Task repetition via text-based synchronous CMC may also have helped the participants to become more familiar with the required language items. The gradual increment of the tasks in terms of the complexity of cognitive demands would also have helped to build participants' confidence and in turn reduce their anxiety in oral production.

Analysis of the participants' chat transcripts reveals evidence of language related episodes (see Table 6.10) and negotiation of meaning (see Table 6.12). These occurrences suggest that language learning could have taken place during the chat interaction and may have been another factor that resulted in the participants' significant improvement in language and communicative ability in the oral assessment. Evidence of language related episodes gave an indication of the affordance of text-based synchronous CMC for delayed response and thus provided conditions for participants to notice errors and produce or help their partners to produce accurate and correct messages as reported in studies by Kelm (1992), Kroonenberg (1994/1995) and Lai and Zao (2006). These may have contributed to the improvement in accuracy probably because less cognitive load was placed on the learners' limited working memory capacity so that they could focus their cognitive ability to "process the input and monitor their own language output" by "reviewing and evaluating the linguistic forms in their output" (Lai & Zao, 2006:112). Furthermore, the "relative permanency of the text" in text-based online chat could have provided the learners with the notion that it represents their language ability and therefore encourage them to monitor their language production and become more aware of its correctness (ibid).

Instances of negotiation of meaning such as clarification requests, confirmation checks and comprehension checks that can be found in the chat transcripts for all four serious activities are evidence that text-based synchronous CMC provided the participants with conditions for negotiation of meaning, as found by Smith (2003b). There was also other evidence that the participants were using communicative strategies such as probing (see Table 6.13) and self-clarification (see Table 6.14) as well as interviewing strategies (see Table 6.15) to improve their interview processes.

The CMC ESP method therefore seems to have the potential to develop some of the specific oral communicative skills that Computer Science students need for their studies and future profession.

6.6 Summary and Implications for Follow-up Study

In conclusion, the findings of the Main Study rejected all the null hypotheses in Section 6.2. The CMC ESP method was found to help to develop the Computer Science students' specific oral communicative skills, resulting in significant improvements in the oral assessment. Apart from this, the findings of the study also suggest that the CMC ESP method played a significant role in helping to reduce the participants' anxiety and increase their confidence in speaking in English. There was also evidence that language learning occurred during the chat interactions. A variety of instances of language related episodes and numerous instances of negotiation of meaning were found in the chat transcripts. These factors might have contributed to the improvement in the participants' communicative skills.

However, although these findings seem to support the view that a synchronous CMC environment can help to develop language learners' oral skills, as claimed by Beauvois (1997), Chang (2002), Kost (2004), Payne & Ross (2005), Payne & Whitney (2002) and others, the effects might be short term. In order to gather further support for the claim that the CMC ESP method improves learners' language skills in the long term, a follow-up study was conducted to see how the participants fared the following semester, when completing tasks within their subject department. An account of this study is in Chapter 7.

CHAPTER 7

FOLLOW-UP STUDY

7.0 Introduction

The results of the Main Study in Chapter 6 suggested that the CMC ESP method has the potential to develop Computer Science ESL students' interviewing and group discussion skills for systems analysis and design. However the Main Study only measured the immediate effects of the treatment. A Follow-Up Study was undertaken to further address the research questions of the Main Study by investigating the long term effects of the treatment through the students' academic performance in a content module. It intended to investigate if the treatment group had benefited in the long term from the experience, in comparison with a control group. In this chapter, I will describe the method that I used to conduct the Follow-up Study, followed by the results. Finally, I will discuss the findings of this study. In this study, the treatment group will be referred to as the English for Specific Academic Purposes (ESAP) group and the control group will be called the English for General Academic Purposes (EGAP) group.

7.1 Aim of the Study

The aim of the Follow-up Study was to investigate if there was any significant difference between the academic performance of the ESAP (treatment) group and EGAP (control) group in their Systems Analysis and Design Methods (SADM) module. In particular, I investigated their performance in the SADM module project which requires interviewing and group discussion skills for systems analysis and design.

The Follow-up Study was conducted over a period of about four months (21st June 2004 to 20th October 2004) during the first semester of UTM's 2004/2005 academic year. This was four months after the ESAP group had been subjected to six weeks (6th January 2004 – 20th February 2004) of the CMC ESP method (treatment) in their English for Academic Communication (EAC) module. During this period, the EGAP group had conducted general communicative activities face-to-face as prescribed in the EAC module, including, for example, group discussion and oral presentations on the use of electric vehicles, the implications of technology, cancer and ways to prevent it, and the causes and effects of water pollution (Department of Modern Languages, 2001). For the rest of the 14-week EAC module, both groups had received input and practice with writing and reading skills for general academic purposes. They completed the EAC module during the second semester of their first year Computer Science programme.

Assessment of the students' performance in the EAC module was conducted through coursework (70%) and final examinations (30%) (see Table 6.5 for details of the assessment). One of the pieces of coursework assessed the students' group discussion skills. However, it was not the same type of group discussion that the ESAP students performed during the treatment. It also accounted for only 10% of the overall marks for the module.

Both groups in the Follow-up Study were taking their SADM module in the first semester (21st June 2004 – 2nd October 2004) of their second academic year at UTM. This content module was chosen for the Follow-up Study because the CMC ESP tasks performed by the ESAP group via NetMeeting had taken into consideration the information content and specific communicative skills required for systems analysis and design. The specific skills of interviewing and group discussion or JAD for systems analysis and design had been identified as important skills for Computer Science students to be successful in their content module projects (see Section 1.4) and as future Computer Science professionals (see Section 1.3).

7.2 Research Questions

In the light of the above discussion, the Follow-up Study intended to further address the research questions listed in Section 6.2 by investigating the students' academic performance in the SADM module.

Both quantitative and qualitative instruments were used to address the following question:

1. Does the CMC ESP method provide opportunities for the development of Computer Science students' academic performance in their SADM module?

To answer the above research question, this study used the quasi-experimental research design with no pre-treatment assessment to test the following null hypothesis:

There will be no significant difference between the ESAP and EGAP groups' mean scores for the SADM module.

Transcripts of the students' group interviews were also analyzed to triangulate findings from the quantitative data.

7.3 Method

This section will describe the participants of the study, the data collection instruments used to answer the above research question and its procedure.

7.3.1 Participants

The participants of the Follow-up Study were two intact groups of 56 second year Computer Science students at UTM. They were all Malaysians of various ethnic backgrounds between the ages of 19 and 21. The English language proficiency of participants in the study ranged from Band 2 to Band 4 according to their MUET scores. Band 1 indicates the lowest level and Band 6 the highest level of proficiency in English.

A total of 32 ESAP students were subjected to the CMC ESP method during the Main Study but 27 registered for the SADM module and were participants in the Follow-up Study. The five other students had changed to another undergraduate programme, transferred to another university or did not sign up for the module. A total of 30 EGAP students had taken the EAC module the previous semester and 29 of these registered for the SADM module. One student had changed her undergraduate programme. Thus a total of 27 participants from the ESAP group and 29 from the EGAP group were involved in the Follow-up Study.

Overall, the EGAP group (M=79.17) had performed slightly better in the EAC module than the ESAP group (M=78.74). However, the differences of mean total score for both groups were found not to be statistically significant using the independent samples t-tests (see Table 7.1 and Appendix F1).

In the Software Engineering module taken during the Main Study, the EGAP group (M=76.69) performed better, overall, than the ESAP group (M=73.70). These differences were not statistically significant using the independent samples t-test (see Table 7.1 and Appendix F1).

In terms of their overall academic performance in all seven Computer Science (content) modules taken during their first year at UTM, the EGAP group (M=72.28) also had higher mean total scores than the ESAP group (M=70.28). However, the differences of mean total scores for both groups were not statistically significant using the independent samples t-tests (see Table 7.1 and Appendix F1).

Table 7.1 Mean scores, standard deviation and standard error for ESAP and EGAP group first year modules total marks

Modules	**Total Score (%)**	**Group**	***N***	***M***	***SD***	***SE***
English for Academic Communication Module	100	ESAP	27	78.7407	4.9427	0.9512
	100	EGAP	29	79.1724	7.8652	1.4605
The difference between the mean scores of the groups was not statistically significant (t=-0.244; p>0.05).						
Software Engineering Module	100	ESAP	27	73.7037	6.2192	1.1969
	100	EGAP	29	76.6897	7.6022	1.4117
The difference between the mean scores of the groups was not statistically significant (t=-1.602; p>0.05).						
First Year Content Modules	100	ESAP	27	70.9874	6.3302	1.2182
	100	EGAP	29	72.2755	8.5268	1.5834
The difference between the mean scores of the groups was not statistically significant (t=-0.638; p>0.05).						

The results indicated that the EGAP group were slightly more proficient in English and had more knowledge in computing skills than the ESAP group. The above results also suggest that Computer Science students with a higher level of proficiency in English might perform better in their content modules than those who are less proficient. There was significant correlation between the students' mean scores for their content modules and for their EAC module, with the value of $p<0.01$ (see Table 7.2).

Table 7.2 Correlation between Computer Science students' first year content modules and EAC module mean scores – Results of pearson correlation test

		First Year Content Modules	EAC Module
First Year Content Modules	Pearson Correlation	1.000	0.485
	Sig (2-tailed)		0.000*
	N	56	56
EAC Module	Pearson Correlation	0.485	1.000
	Sig (2-tailed)	0.000*	
	N	56	56

***p<0.01**

7.3.2 Data Collection Instruments

Both quantitative and qualitative instruments were used to answer the research question in Section 7.2. The quantitative instrument used was the students' grades for their SADM module coursework and final examinations. Group interviews were used to triangulate the findings of the quantitative data.

7.3.2.1 Systems Analysis and Design Methods Module Assessment

The quantitative measurement instruments used to examine differences in the ESAP and EGAP participants' academic performance in the SADM module were the marks for all their coursework, final examinations and total scores for the module. The coursework was 60% of the total marks (100%). It consisted of two quizzes (10%), a mid-semester test (20%) and a project (30%). The final examinations were 40%. The quizzes, mid-semester test and final examinations were all written tests which aimed to assess participants' understanding of concepts relating to systems analysis and design as well as their technical and analytical skills in systems analysis design. The SADM module project required participants to work in groups of three to five and apply systems analysis and design techniques to develop a Research Management System for the Research Management Centre (RMC) at UTM. The project was divided into two parts. The first part or "Project 1" required students to produce a Problem Definition Report (15%). The second part of the project or "Project 2" required them to produce a System Design Report (15%).

The Problem Definition Report required students to report on their investigation of how the management of research was implemented at RMC and the problems they identified with the existing manual procedure. They had to include a System Scope Document and a set of technical diagrams in the report. The System Scope Document was supposed to consist of four sections: 1) problem description, 2) anticipated business benefits, 2) system capabilities, and 4) system scope. The diagrams were supposed to include a workflow, a data flow and a context diagram which illustrated the current procedure of a research management activity at RMC. Accumulative assessment was used by the module lecturer to evaluate this report. The students were assessed on the amount and accuracy of information they provided in the System Scope Document and the technical diagrams.

The students could investigate one of the following research management activities for their project work: 1) the process of a short-term research grant application, 2) the claim procedure for research related expenses, or 3) the procedure for appointing a research assistant. When they had selected one research management activity, they had to find out how the activity was conducted, through interviews and group discussions with relevant academic and administrative staff at UTM, and illustrate it in the form of technical diagrams. They would then analyze the current manual process of the activity and identify its problems to propose improvements. Accurate illustration of the research management process through workflow, data flow and context diagrams could only be produced if the students conducted effective interviews and group discussions to elicit accurate information about the people involved in the process, their work tasks and the flow of data and tasks. Competence in the specific skills of interviewing and discussing was important for students to perform well in Project 1, in addition to the technical knowledge and analytical skills relating to systems analysis and design.

The System Design Report required students to report on the proposed Research Management System for RMC with reference to the problems they had identified in the existing manual procedure in Project 1. To this end, they were required to design the user-interface design prototype for the Research Management System and produce technical diagrams that illustrated the flow of data and work tasks for the proposed system. Success in this report relied on the students' technical ability to design an effective user-interface design prototype. Holistic assessment was used by the module lecturer to evaluate this report. For this report, the students were assessed according to the following descriptors: 1) content, 2) creativity, 3) effort, and 4) features of the user interface design prototype such as consistency of layout, aesthetics, functionality and ease of use.

Both the ESAP and EGAP groups were taught by the same subject lecturer for their SADM module throughout the Follow-up Study. All their coursework and final examinations for the module were assessed by their SADM module lecturer who was not aware which group was the ESAP (treatment) group and which the EGAP (control) group.

7.3.2.2 Group Interviews

The ESAP group participated in group interviews, with each group being interviewed twice by the researcher during the course of the SADM module (see Appendix F5 for the list of interview questions). The aim of the first group interview was to elicit the students' experience when they were preparing and conducting systems analysis interviews for Project 1 and to find out the extent in which the CMC ESP method they had experienced in the previous semester helped to prepare them to cope with the SADM project. The purpose of the second group interview was to find out what skills they needed to do well in the module and to what extent the CMC ESP method had helped them to cope with the academic demands of the SADM module in general, and particularly with the project.

7.3.3 Procedure

The Follow-up Study was conducted throughout the first semester of the ESAP and EGAP groups' second academic year at UTM (see Appendix B5 for the timeline). They were all taking their 14-week SADM module in addition to other content and non-subject specific modules (see Appendix A5 for the list of modules in Semester III of the Computer Science curriculum). The module runs from Week 1 to Week 15 of the semester. There was no class in Week 8 because it was the semester break.

The main objective of the SADM module was to train Computer Science students to be able to explain concepts in systems analysis and design, and use different techniques and methods of systems analysis and design for the development of computerized information systems. The ESAP and EGAP students met three times a week for one hour either in the classroom or in the computer laboratory throughout the SADM module. The module was taught by one of the academic staff from the Faculty of Computer Science and Information Systems. The same lecturer also assessed all their coursework and final examinations for the module (see Section 7.3.2.1 for further details about the assessment).

Quantitative data for this study was collected from the participants' scores in the quizzes (Quiz 1: Week 5, Quiz 2: Week 7), mid-semester test (Week 9), project (Project 1: Week 4-10, Project 2: Week 11-15) and final examinations (Week 18) of the SADM module. SPSS for Windows (version 10.0.1) was used to calculate the mean scores, standard deviation and standard error for each of the ESAP and EGAP groups' SADM module assessment marks. SPSS was then used to conduct an independent samples t-test that tested if the difference in the mean scores for both groups was statistically significant. This test was selected because the mean scores were parametric and from independent samples.

The students worked on Project 1 for seven weeks of their 14-week SADM module. They then proceeded with Project 2 for about five weeks. I interviewed the ESAP group twice during the SADM module. First, after they had submitted Project 1 (Week 10) and then after they had completed Project 2 (Week 15). Findings from the interviews were used to triangulate results obtained from the quantitative data.

7.4 Findings

The presentation of the findings for the Follow-up Study is divided into two sub-sections: SADM module assessment and group interviews.

7.4.1 Systems Analysis and Design Methods Module Assessment

The Software Engineering and SADM modules required students to have good interviewing and group discussion skills for systems analysis and design (see Section 1.4.2.4 on Computer Science students' academic needs and lacks). The ESAP group was trained in these specific communication skills during the EAC module the previous semester. Both the ESAP and EGAP groups took the Software Engineering module in the same semester as the EAC module and the SADM module in the following semester. There was an overall improvement in the mean total scores of both groups for SADM (ESAP group: M=77.39, EGAP group: M=77.59), in comparison with the previous semester content module, Software Engineering (ESAP group: M=73.70, EGAP group: M=76.69) (see Table 7.3). These improvements were only found to be statistically significant for the ESAP group but not the EGAP group, using the paired samples t-tests with $p<0.05$ (see Table 7.3 and Appendices F2).

Table 7.3 Mean scores, standard deviation and standard error for ESAP and EGAP group Software Engineering and SADM module total marks

Group	**Total Score (%)**	**Module**	***N***	***M***	***SD***	***SE***
ESAP	100	Software Engineering	27	73.7037	6.2192	1.1969
	100	SADM	27	77.3870	6.0844	1.1709
The difference between the mean scores for the modules was statistically significant ($t=-2.492$; ***p<0.05**).						
EGAP	100	Software Engineering	29	76.6897	7.6022	1.4117
	100	SADM	29	77.5676	7.8542	1.4585
The difference between the mean scores for the modules was not statistically significant ($t=-0.636$; $p>0.05$).						

Comparisons were also made between the ESAP and EGAP participants' mean scores for each type of SADM module assessment. Although all the mean scores for the ESAP group were slightly higher than those for the EGAP group except those for Quiz 1 and the final examinations, the differences of mean scores for each type of assessment were not statistically significant with the value of $p>0.05$ using the independent samples t-test (see Table 7.4 and Appendix F3).

However, the differences of mean scores between the ESAP and EGAP group for Project 1 and Project 2 were found to be significantly different with the value of $p<0.05$ using the independent samples t-tests (see Table 7.5 and Appendix F4). The ESAP group ($M=12.22$) obtained higher mean scores than the EGAP group ($M=10.49$) for Project 1 (which required interviewing and discussion skills) (see Table 7.5). These results were reversed for Project 2 (ESAP group: $M=12.81$, EGAP group: $M=13.60$) (see Table 7.5). In terms of the study, the most interesting part of the SADM module is Project 1 as it required students to put into practice interviewing and discussion skills for successful project work.

Table 7.4 Mean scores, standard deviation and standard error for ESAP and EGAP group SADM module assessment

Assessment	**Total Score (%)**	**Group**	***N***	***M***	***SD***	***SE***
Quiz1	5	ESAP	27	3.5926	0.6799	0.1308
	5	EGAP	29	3.7241	0.7145	0.1327
The difference between the mean scores for the groups was not statistically significant (t=-0.705; p>0.05).						
Quiz2	5	ESAP	27	3.5000	0.5718	0.1100
	5	EGAP	29	3.4828	0.8290	0.1539
The difference between the mean scores for the groups was not statistically significant (t=0.090; p>0.05).						
Mid-Semester Test	20	ESAP	27	17.3704	2.6876	0.5172
	20	EGAP	29	16.4138	2.8725	0.5334
The difference between the mean scores for the groups was not statistically significant (t=1.284; p>0.05).						
Project	30	ESAP	27	25.0211	2.0786	0.4000
	30	EGAP	29	24.0897	2.4467	0.4543
The difference between the mean scores for the groups was not statistically significant (t=1.530; p>0.05).						
Final Examinations	40	ESAP	27	27.9044	4.3358	0.8344
	40	EGAP	29	29.8579	4.0397	0.7501
The difference between the mean scores for the groups was not statistically significant (t=-1.745; p>0.05).						
Overall	100	ESAP	27	77.3885	6.0835	1.1708
	100	EGAP	29	77.5683	7.8539	1.4584
The difference between the mean scores for the groups was not statistically significant (t=-0.095; p>0.05).						

Table 7.5 Mean scores, standard deviation and standard error for ESAP and EGAP group SADM module project

Assessment	**Total Scores (%)**	**Group**	***N***	***M***	***SD***	***SE***
Project 1(P1)	15	ESAP	27	12.2163	2.2690	0.4367
	15	EGAP	29	10.4852	2.6555	0.4931
The difference between the mean scores for the groups was statistically significant (t=2.613; ***p<0.05**).						
Project 2 (P2)	15	ESAP	27	12.8063	0.4850	0.0933
	15	EGAP	29	13.6034	0.4240	0.0787
The difference between the mean scores for the groups was statistically significant (t=-6.560; ***p<0.05**).						
Project (P1+P2)	30	ESAP	27	25.0211	2.0786	0.4000
	30	EGAP	29	24.0897	2.4467	0.4543
The difference between the mean scores for the groups was not statistically significant (t=1.530; p>0.05).						

7.4.2 Group Interviews

Only the ESAP students (N=27) were interviewed during the Follow-up Study. The EGAP students were not interviewed because the aim of the group interviews was to find out to what extent the treatment received by the ESAP participants during the Main Study helped them to cope with the academic demands of the SADM module. It was also used to triangulate the findings of the quantitative data presented above.

The interview participants were grouped similarly to their SADM module project work groupings. They consisted of six groups of four or five students. All six groups were interviewed twice. The first interview was conducted in Week 10 (27th – 28th August 2004), after they had submitted Project 1. I then interviewed the same groups of students again in Week 15 (1st – 2nd October 2004), after they had submitted Project 2.

The ESAP students' responses to questions in the group interviews are identifiable by an ID code consisting of the letter "L", "M" or "H" and a number. The letter "L" indicated the student had a low level of English language proficiency or Band 2 according to the MUET score, "M" indicated medium level or Band 3 and "H" indicated high level or Band 4.

Students' responses in the group interviews will be presented in two parts. First is a summary of their comments on the SADM module project work including comments on their experience preparing and conducting the systems analysis interviews for the project and the skills they required to excel in the project. The second part consists of their comments on the value of the CMC ESP method they had experienced the previous semester in helping them to cope with the academic demands of the SADM module.

7.4.2.1 Comments on Systems Analysis and Design Methods Module Project

The students were asked to comment on their experience preparing and conducting the systems analysis interviews and the skills they thought were important for successful project work.

Experience with Systems Analysis Interviews

About half of the ESAP students (n=12) said that they had not experienced any problem preparing the systems analysis interview required for the project work. One of the reasons was highlighted by H1 when he said, "*prepare [question] don't encounter much problem based on experience from English class, our previous English class, it does help in preparing our interview*" (H1 - Week 10). H7 also agreed with H1 when she said, "*no problem, maybe we have experience prepare the interview question from the, we learn from last semester*" (H7 - Week 10). Those who experienced problems with interview preparation such as M5 and H5 revealed that it was because they did not understand what research grant applications entailed and therefore did not know what to ask. After finding out what it involved, M14 and M8 mentioned that they tried to recall what they had learned about how to create questions, and referred to last semester's EAC notes. Other students such as L5 and L6 used the strategy of consulting other groups who had already conducted their interview sessions, for advice on what type of questions to ask and how to ask them.

In Project 1, two students from each of the project groups conducted the interview sessions with their project clients. The other members of each group took notes of the sessions as scribes. Two of the 12 students (M1 and H11) stated that they had had few problems with the interview session. M1 said "*Not really cause just we prepare question and ask question based question prepared and add a little bit*" (M1 – Week 10). H11 said, "*I have the idea of probing the question, the information given by interviewee*" (H11 – Week 10). The remaining 10 students encountered three types of problems when they conducted the interviews, related to affective factors such as nervousness and lack of confidence, lack of communication skills and difficulties with data gathering.

Three students, L3, L2 and H8, said they felt nervous. L2 described his experience in the following way:

> *When I start the interview I don't know, I don't know how to ask, that word is stuck and I try to find the some word but explanation but I* ***can't find the right word****. I have a* ***correction*** *I want to find the, what I want to say, I want to, I want to find the the word but I not find nothing. The first time I tried to cool cool cool but when see the interview interviewee then start nervous. Not enough training to public speaking skill*
> (L2 – Week 10).

L2 and L3 acknowledged that they would have felt more nervous or would have had a worse experience if they had not had the interview practice in the previous semester. H8 was only a little bit nervous. One student, M12, mentioned that she lacked of confidence because she was afraid of making grammatical mistakes and was not sure if her questions were really relevant to the project topic.

In terms of communication, two students mentioned miscommunication between themselves and the interviewees. They were not given the answers they wanted for some of their interview questions. They wanted a description of specific parts of the research grant application process but were given a general explanation of the whole process. M4 said, "*Don't understand what I ask [the project client]. Maybe my question is too general*" (M4 – Week 10). Another student, M11 mentioned, "*When I ask the interviewee one of the questions, give explanation OK. When I ask again different question, she gave the same answer. ... She doesn't understand the question or she doesn't understand what I'm saying. ... We want to know further [more detailed information]*" (M11 – Week 10).

Five students (M8, M11, H4, H8 and H10) talked about problems gathering data through interviews because the interviewees were either too softly spoken or talked too fast. This caused difficulty with notetaking. One student, H10, thought that they should have recorded the interview. Two participants talked about receiving conflicting information from two interviewees with regarding the process of applying for a research grant. They sensibly conducted group discussion sessions with their clients to ask for verification and confirmation of the data collected from the interviews.

Skills Required for Successful Project Work

The participants highlighted several skills as important for producing good quality project work for the SADM module. Among them were technical, analytical and communication skills for systems analysis and design. Five students talked about the need to acquire the technical skills of drawing diagrams such as workflow and data flow diagrams and creating prototypes of user-interface for a computerized system using design software. Four of them mentioned the significance of analytical skills to analyze the current work process of systems and then propose effective improvements. Almost half of the students (n=10) stressed the importance of communication skills such as eliciting information and probing for detailed information from their project clients. For example, M14 asserted that, "... *we need communication skill. We need to know how to ask questions straight away to get more information from the client*" (M14 – Week 15). H9 added that, "... *to understand the whole process, we have to probe everything* ..." (H9 – Week 15).

7.4.2.2 Comments on the Value of the CMC ESP Method for Success in SADM Module

All the ESAP students interviewed agreed that the CMC ESP method introduced in the EAC module helped to prepare them to cope with the academic demands of the SADM module. Eight of them talked about its usefulness in providing them with basic knowledge about workflow diagrams, the job demands of systems analysts or the whole process involved in designing computerized systems. Familiarity with these things according to H9 made it "... *easier for us to catch up [follow] the lesson [SADM module]*" (H9 – Week 15). M5 said, "*At least have basic, what is workflow diagram. After this we can know a little bit about what is systems analysis and what is the whole process in the system*" (M5 – Week 15). Another student, L6, also made a similar comment. She said, "*I think it help me to more understand what, understand what he's [SADM module lecturer] talking about, to draw the diagram, to what [is] related entities and process* ..." (L6 – Week 10).

Most of the students' comments referred specifically to the value of the CMC ESP method in helping them with the project work. One example was how to conduct systems analysis interviews. They learned how to open and close an interview, how to ask their clients questions, and how to probe for further information. One student, M7 said, "***For example it was useful when*** *conducting interview, we know when we have to interview the client, first we have to introduce [ourselves], we know the procedure to do the interview*" (M7 - Week 15). Another student, L5 added that, "... *as systems analysts, we know how to make the interview, how to start the* *interview, how to make the question, we also know more about the subject [SADM module] from the last semester*" (L5 – Week 10). H10 mentioned that she used certain phrases that she learned during the treatment when she interviewed her clients for the SADM project (H10 – Week 15).

The students also thought that the CMC ESP method had provided them with background knowledge about the workflow diagrams that they had to use in project work. L5 pointed out, "*In my opinion, the lesson that you did with us last semester, we can use it to do our work this semester. From your lesson, we know how to make the workflow ...*" (L5 – Week 10). In H8's opinion, "*we have already explored this workflow diagram then it makes us more easier to 'catch-up' the lesson and when time to do the project, we have already some kind of experience*" (H8 – Week 15). One student said, "*at least we know there's a dataflow between internal entity or external entity, something like that*" (M7 – Week 15) while another said, "*it helps because for me, the workflow diagram, the dataflow, it should be, it cannot be a verb, it must be a noun kind of thing.*" (H5 – Week 15).

However, M7 claimed that the treatment did not help with the second part of the project that involved user interface design. She said that, "*... for this one [Serious Activity D], we need to comment, to give opinion, to suggest what to improve the interface but now in project we need to design*" (M7 – Week 15).

7.5 Discussion

The findings of the Follow-up Study suggest that the CMC ESP method helped to develop Computer Science students' academic performance in their SADM module. The quantitative results revealed that the overall academic performance of the EGAP group was better than the ESAP group for both the Software Engineering (see Table

7.1) and the SADM module (see Table 7.4). However, these differences were not statistically significant, with the value of $p>0.05$ (see Table 7.1 and Table 7.4). The EGAP group had already achieved better results than the ESAP group in the content module Software Engineering in the previous semester, with a mean total score difference of 2.99. After the treatment, there was only a difference of 0.18 between the mean total scores of both groups in the SADM module. There was a statistically significant improvement in the ESAP group's academic performance in SADM in comparison with Software Engineering (see Table 7.3). The EGAP group also improved but the difference was not statistically significant (see Table 7.3). These results might be due to the support the ESAP group received during the Main Study.

In Money's (1995/1996) study, Computer Science students were given the experience to conduct a real-world systems discussion using synchronous CMC tools. They commented that the experience seemed to resemble a real-world systems meeting. Money's (1995/1996) study however, did not provide any evidence of whether training these students to use synchronous CMC to "work through" a systems analysis problem using real-world data would help them to be successful in their academic studies. This study on the other hand, found that the majority of the students in the ESAP group agreed during the group interviews that the background knowledge and specific communicative training they had received during the Main Study helped to prepare them to cope with the academic demands of the SADM module.

According to Flavell, Miller and Miller (1993:250), "well-developed content knowledge can support strategies, metacognitive processes, and the processing of material at a more abstract categorical level, which in turn help recall". The students in the ESAP group may have gained metacognitive knowledge of the forms of English language used to conduct systems analysis interviews and group discussions, and also knowledge of strategies for conducting the task effectively. This "metacognitive knowledge" of "tasks" and "strategies" could have provided the students with the necessary condition for language acquisition (Flavell, 1977:207-208; Flavell et al., 1993:150-151; Flavell, Miller, & Miller, 2002:164-165), and could have been one of the factors which helped the students to develop their oral communication skills for systems analysis and design.

The quantitative results revealed that there were statistically significant differences in the mean scores for the Problem Definition Report (Project 1) and System Design Report (Project 2) (see Table 7.5). The ESAP group performed significantly better than the EGAP group for Project 1 but significantly worse for Project 2 (see Table 7.5).

These findings might be due to the following reasons. Success in Project 1 relied much more on the students' competency in the specific communicative skills of information elicitation through interviews and group discussions. The students could only produce a comprehensive System Scope Document and accurate dataflow, workflow and context diagrams for the Problem Definition Report if they were able to gather relevant and correct information from their clients through effective interviews and group discussions. The ESAP group's significantly higher mean scores might be attributed to the training in the skills of interviewing and group discussion that they had received earlier, during the Main Study. During the group interviews, the ESAP group said that the CMC ESP method provided them with knowledge about how to conduct effective systems analysis interviews and group discussions with their clients. They even used certain vocabulary and phrases that they had learned during the treatment when eliciting information from their clients for Project 1.

Success in Project 2 depended on the students' technical ability in user-interface design and development. The quantitative results of the students' first year content modules seemed to indicate that the EGAP students had better knowledge in computing skills. Their mean total scores for these modules were higher than those of the ESAP group (see Table 7.1). Most of the students in the EGAP group therefore seem to have been more technically competent and seem to have had better programming skills than the ESAP group. This factor might account for the significantly higher mean scores of the EGAP group. The ESAP students mentioned in the interviews that the CMC ESP method did not help them with Project 2 because they had only been trained to give opinions and suggestions to improve a given user-interface design prototype, not to design it.

7.6 Summary

The quantitative and qualitative results of the Follow-up Study suggest that the CMC ESP method had a positive effect on the academic performance of Computer Science students in their SADM module, in particular, project work that required competency in the specific communicative skills of interviewing and discussing for computer systems development. These results therefore further support the findings of the Main Study that the CMC ESP method has the potential to develop Computer Science students' interviewing and group discussion skills for systems analysis and design.

CHAPTER 8

CONCLUSION

8.0 Introduction

This chapter will discuss the findings and contributions of this research. It will initially present the purpose of this research and summarize briefly all the related studies and their results. It will then discuss the limitations of the research. This is followed by a discussion of its implications and suggestions for future research.

8.1 Summary and Findings of this Research

The purpose of this research was to design and investigate the effectiveness of the CMC ESP method in meeting the needs of Computer Science students. To this end, I conducted a preliminary investigation to analyze the present and target situation needs and lacks of Computer Science students at UTM (see Chapter 1). This was followed by four consecutive studies which used the concurrent triangulation mixed methods approach (see Chapter 3): 1) Feasibility Study I (see Chapter 4), 2) Feasibility Study II (see Chapter 5), 3) the Main Study (see Chapter 6) and 4) the Follow-up Study (see Chapter 7).

The results of the preliminary investigation revealed that Computer Science students at UTM need training and practice in the specific communication skills of interviewing and group discussion for systems analysis and design for their current academic needs and future careers as CSPs (see Chapter 1). In order to be successful CSPs, the students need to be competent in both face-to-face and electronic forms of communication, to elicit information or conduct group discussions such as JADs with their clients (see Section 1.3.3 and 1.4.1). The findings also indicated that Computer Science students and CSPs who graduated from local universities experienced problems articulating verbally in English due to speech anxiety, lack of confidence and lack of practice (see Section 1.3.2 and 1.4.2.3). I then decided to design a set of CMC ESP tasks and investigated to what extent the use of synchronous CMC as a modality for TBL through the CMC ESP tasks or the CMC ESP method is effective in meeting the Computer Science students' ESP needs of interviewing and group discussion skills for systems analysis and design.

The research addressed the following research questions:

a. *Does the CMC ESP method provide opportunities for the development of Computer Science students' interviewing skills for systems analysis and design?*

b. *Does the CMC ESP method provide opportunities for the development of Computer Science students' group discussion skills for systems analysis and design?*

Prior to the implementation of the CMC ESP method, I conducted two feasibility studies to find out the practicality and suitability of using CMC tools and then CMC task types with Computer Science students at UTM. Feasibility Study I (FSI) intended to answer the following question:

Which is the most practical synchronous CMC tool for investigating the effects of CMC ESP method at UTM, bearing in mind the attitudes of students and their ESP needs?

Two intact groups of second year Computer Science students (36 in each group) tested the practicality of using two different types of synchronous CMC tools: 1)

NetMeeting for computer-mediated text-based interaction and 2) Divace Duo for computer-mediated audio-based interaction, in the context of UTM. The results of FSI suggested that it was logistically possible to use both synchronous tools to investigate the effect of using synchronous CMC for conducting CMC tasks with Computer Science students at UTM. They equally enjoyed using both tools but it was more feasible to use NetMeeting because it can simulate real-time text-based discussions and meetings which are common among CSPs, especially e-JADs. NetMeeting is also easily accessible in all networked computer laboratories around UTM campus and enabled reliable data collection of students' chat interaction for feedback and analysis. NetMeeting was used in the Main Study but a small amount of time was allocated to the use of Divace Duo to provide the students with a slight variety of learning experience and some experience with online audio-based communication.

FSI was followed by Feasibility II (FSII) which aimed at answering the following research question:

> *Are the proposed CMC ESP task types suitable for investigating the effects of CMC ESP method on Computer Science students at UTM, bearing in mind the attitudes of the students and their ESP needs?*

An intact group of 27 first year Computer Science students tested the feasibility and usability of several CMC ESP task types and their potential to afford positive effects. I designed the tasks with reference to their target needs which were sustained-content in the nature, characteristics and learning opportunities they provided (see Section 5.3.3). A few changes were made to the tasks in response to feedback from the participants. The results of FSII indicated that the proposed CMC ESP task types were suitable for investigating the effects of the CMC ESP method on Computer Science students. These tasks were therefore used for the next stage of the research, the Main Study, to investigate the effects of the CMC ESP method on the development of Computer Science students' interviewing and group discussion skills.

I then conducted a longitudinal study which consisted of a Main Study and a Follow-up Study to answer the main research questions. During the Main Study, an intact group of 32 first year Computer Science undergraduates used NetMeeting to conduct CMC ESP tasks. The students were given a pre- and post-treatment oral assessment which I designed to find out the short-term effect of the CMC ESP method. The findings from these instruments were triangulated with the results of the pre- and post-treatment self-assessment attitude questionnaires and the analysis of the chat transcripts from the tasks. The results of the Main Study were encouraging. In the oral assessment, the participants achieved a significant gain in overall oral performance and in terms of task fulfillment, language and communication ability. These results support the claim of several CMC studies (Beauvois, 1997; Chang, 2002; Kost, 2004; Payne & Ross, 2005; Payne & Whitney, 2002) that practice with text-based synchronous CMC improves learners' oral skills.

The findings from the questionnaires and chat transcripts supported the results from the assessment. The participants had a positive attitude to text-based synchronous CMC as a means of developing language, reducing speech anxiety and increasing confidence. There was also evidence of language learning in the occurrence of language related episodes and negotiation of meaning in the chat transcripts. The less-stressful and less face-threatening learning environment that text-based synchronous CMC affords may have been responsible for the reduction in the participants' anxiety and their increased confidence as suggested by Arnold (2002), Beauvois (1998), Freiermuth (1998) and Kern (1995). The gradual increment of the cognitive demands of the sequence of CMC ESP tasks may have helped to reduce the learners' anxiety in language production and, as P. Robinson (2001a) suggests, may have provided them with favourable conditions for language automatization and skill development.

The sustained-content nature of the tasks may have been responsible for the improvement in their understanding of the tasks and may have helped familiarize them with the language items they would need. This would accord with several prior studies which have indicated the potential of SCLI to familiarize language learners with academic genres and language items used in their content modules (Camhi, 2000; Carson, 2000; Dhieb-Henia, 2003; Kasper, 1995; Leki & Carson, 1994; Nelson & Burns, 2000; Williams, 2000). SCLI perhaps encouraged the participants to produce "pushed output" through negotiation of meaning such as probing (see Table 6.31). This in turn would have led to "comprehensible output" (Swain, 1985:248-249). The repetition of each task probably developed their language and communicative ability in terms of fluency, confidence and communication skills, due to the "effect of highly contextualised cognitive rehearsal" (Bygate, 2001:42). Immediate task repetition may have also helped to automatize the participants' knowledge of the appropriate language to perform the tasks, thus leading to more accurate performance (Lynch & Maclean, 2001).

I conducted a Follow-up Study four months later to investigate the long-term effects of the treatment on the participants' academic performance in their SADM module. Some of the project work for the module required them to be communicatively competent in the two skills they had practised during the Main Study. The treatment (ESAP) group's performance in the project work for the SADM module was compared with a control (EGAP) group from the same cohort. The ESAP group performed significantly better than the EGAP group in the first part of the project work (Project 1) but the results were reversed for the second part (Project 2).

The ESAP group's better performance in Project 1 might be due to the support and training in the skills of interviewing and group discussion they received during the Main Study. The majority of them agreed during the group interviews that the background knowledge and specific communicative training they had received during the Main Study helped to prepare them to cope with the academic demands of the SADM module. The Main Study may have helped them gain the "metacognitive knowledge" (Flavell, 1977:207-208; Flavell et al., 1993:150-151; 2002:164-165) to conduct systems analysis interviews and group discussions and the strategies to conduct the task effectively. Success in Project 2 relied on the participants' technical ability in user-interface design and development and the EGAP group had better knowledge in computing skills than the ESAP group.

With reference to the results of the Main Study and the Follow-up Study, the answer to the main research questions of this research is that the CMC ESP method seems to provide Computer Science students with the opportunity to develop the specific oral communicative skills of interviewing and group discussion for systems analysis and design that meet their current academic needs and future needs as CSPs.

8.2 Implications of this Research

The research has implications for language learners, language practitioners, the research community in general and the body of knowledge on CMC. Language learners in tertiary educational institutions often find themselves registering for English language modules that do not match their ESP needs. This research suggests that language learners may benefit if their language learning materials are based on present and target situation analysis of their ESP needs, and are taught using the sustained-content task-based ESP approach. This method will, however, require a lot of investment in terms of time and funding to initially identify the students' ESP needs, to design the materials that address those needs and to assess their effectiveness.

Language practitioners can benefit from the procedure used to develop the learning materials for this research. The procedure raises awareness of the importance of the learners' role in the materials development process. Collaboration with language learners throughout the process of materials development (not only at the beginning or at the end of the process) adds to their relevance and usefulness for the learners. It makes the students consciously aware of what they are doing with the learning materials and makes them notice that they can make sense of their own skill development. It also raises the students' awareness of the usefulness of the learning materials for their content course and for their future career requirements. This procedure of materials development also empowers the learners to influence the end product.

This research can benefit the research community in general. It provides evidence of the advantages of conducting a longitudinal study including a short-term and long-term investigation. This form of investigation which triangulates findings within one study and between two related studies can provide validity to methods of language instruction.

Research on CMC focuses mainly on using CMC for teaching language for social purposes. The use CMC is rarely discussed in the teaching and learning of ESP. The language learning tasks set in synchronous CMC studies normally entail discussion of everyday issues (Chang, 2002; Hudson & Bruckman, 2002; L. Lee, 2002; Payne & Ross, 2005; Payne & Whitney, 2002; Tudini, 2003), or everyday decision making (Blake, 2000; Smith, 2003b, 2004). There are hardly any discussions of content that are related to the learners' area of study and with reference to their present academic and future professional needs. The aim of this research is to explore if synchronous CMC would be an effective tool to meet the specific needs of language learners. In this research, the use of synchronous CMC as a tool for TBL through sustained-content tasks seems to provide Computer Science students opportunities for the development of specific oral communicative skills of interviewing and group discussion for systems analysis and design. It also had a positive effect on their academic performance in the content module that required competency in these skills. This research therefore adds to the body of knowledge on CMC that synchronous CMC has the potential of developing languages for specific purpose.

8.3 Limitations of this Research and Recommendations for Future Research

There were several limitations to this research. Its findings are not entirely generalizable to other contexts because it was a case study, unique to its context. It will be of greatest use to other educational institutions in which the students are in similar circumstances and have similar needs.

The second limitation to this research is that although the findings of the longitudinal study were encouraging, the duration between the Main Study and the Follow-up Study was too short (four months) to see whether the CMC ESP method had really long term benefits. For future research, a longer duration between the two studies, spanning over two or more semesters, should be conducted to provide a better understanding of the phenomena under investigation. This might be possible for the new Computer Science curriculum at UTM because the EAC module is being offered in the first year of the curriculum, and the content modules, Software Engineering and Information Systems Development (similar to the SADM module) are being offered in the second year. In this case, the duration between the Main Study and the Follow-up Study would be about nine months. It would also be interesting if a further follow-up study were carried out to investigate to what extent the CMC ESP method affected the treatment students' performance during their practical training or job placement.

Finally, the EGAP students in this research were not subjected to oral assessment during the Main Study. This might be a useful addition to the design of future studies. Another form of triangulation could also be made by comparing pre- and post-treatment oral performance in the interview and group discussion tests in terms of vocabulary, accuracy, fluency and complexity, to support the findings of the oral assessment.

8.4 Conclusion

This research has shown encouraging results by combining two conceptual areas, CMC and ESP, in a context where Computer Science students need to be communicatively competent in the specific skills of interviewing and group discussion for systems analysis and design. I was able to design a set of tasks which I called CMC ESP tasks, and use synchronous CMC as a modality for TBL through these tasks to investigate its effectiveness. This method of language instruction for specific purposes seems to have the potential to reduce language learners' anxiety and increase their confidence to speak in the target language. It also has the potential to develop specific oral communicative skills.

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