Learning and Teaching Online: Structuring Computer-Mediated Communication Systems to Support Interaction at a Distance

Thesis

UNRESTRICTED

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Faculty of Mathematics and Computing
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PhD Thesis

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MSc, BA Hons

'Learning and Teaching Online: Structuring Computer-Mediated Communication Systems to Support Interaction at a Distance'

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This thesis is submitted
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PUBLICATIONS: parts of the thesis which have been published

I have published single and jointly authored papers which present earlier versions of some of the work described in the thesis, as listed and detailed below. For all of the papers, I undertook the original research involved, led the writing, and wrote the bulk of each paper. Dr. Whitelock's contribution to joint papers was to help with structuring, corrections and presentation, except where noted otherwise below.

Wilson, Tina (1995). 'So far so good? STILE (Students and Teachers Integrated Learning Environment) at The Open University, the first year'. Dept of Computer Science Technical Report No. 95/15, The Open University. [Includes some of the tutor responses which appear in chapter 8.]

Wilson, Tina (1995). 'Up and running: M205-STILE (Students and Teachers Integrated Learning Environment) at the Open University'. Dept of Computer Science Technical Report No. 95/07, The Open University. [Includes a detailed description of the conference structure for the main study. Also the Interactive Media Facilitator (IMF) is introduced. Updated versions are discussed in chapter 4.]

Wilson, Tina (2002). 'Using an interpretive approach to evaluate an online learning environment'. *In proceedings of the International Workshop on Interpretive Approaches to Information Systems and Computing Research.* Brunel University, 26 and 27 July 2002. [This paper is based on part of chapter 3.]

Wilson, Tina (2002). 'CMC and how it facilitates productive interactions for distance learners'. *Distance Learning: Where are we now?* Forum at the University of York, 3 July 2002. [This paper is based on part of chapter 8.]

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Wilson, Tina, & Whitelock, Denise (1996). 'Piloting a new approach; Making use of new technology to present a distance learning computer science course'. In Jacobs, Gabriel (ed.) *Association for Learning Technology Journal*, Vol. 4, No. 1, pp 58-68. [This paper forms an early version of part of chapter 7. Dr Whitelock contributed the theoretical framework for this paper.]

Wilson, Tina & Whitelock, Denise (1997). 'Monitoring a CMC environment created for distance learning'. In Lewis, Bob (ed.) *Journal of Computer Assisted Learning*, Vol. 13, No. 4, pp. 253-60. [This paper forms an early version of part of chapter 6.]

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Wilson, Tina & Whitelock, Denise (1998). 'Changing roles; comparing face-to-face and online teaching in the light of new technologies'. In EURODL Online Journal. [One section of this paper forms an early version of part of chapter 8. Another section of this paper forms an early version of part of chapter 5.]

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Papers which are associated with but do not from part of the thesis

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Abstract

The aim of this thesis is to investigate the effects and benefits of different ways of structuring conferences in Computer Mediated Communication (CMC) environments for learning. To this end, the thesis uses two studies of a conventional distance learning course in undergraduate computer science which was supplemented with a structured CMC environment. The research was undertaken over a period of twenty months. The first theme of the thesis is an investigation of the possibilities of using conference structures to improve navigation and organisation. The second theme of the thesis investigates the likely benefits of such structuring. Categorical analysis was used to find out the extent to which this structure was beneficial to students. The effects and benefits of various CMC structures were assessed through analysis of data collected using a variety of techniques: observation, user opinions, and interpretation of naturally occurring online interactions. Categorical analysis was undertaken with rich data on actual behaviour obtained from online conferences and compared with students' perceptions gathered through open responses in interviews and questionnaires. The categorical analysis used an approach influenced by grounded theory. The pilot study revealed the need for a new staff role to support the structured CMC. This role, called the Interactive Media Facilitator (IMF), was created during the course of the study to design the CMC structure and monitor activity within the structure. A conceptual framework consisting of a three-dimensional taxonomy was created and used to guide the IMF in the development of the broad conference structure in the main study. The framework was also used to organise the fine detail of the different discussion areas within the CMC structure. This taxonomy, developed from elements of online interaction types found in the CMC literature, is a generalisable framework, applicable in a distance learning context to any electronically supplemented course.

Dedication

To Malcolm my soulmate who always makes me laugh and indulges my whims. He continued to cook restaurant standard cuisine even though he was busy writing up his own thesis.

To my Mum, late Dad and brothers and sisters.

A special mention for my brothers Kyran and Marius for their help and encouragement all those years ago and to Gemma for being a Gem.

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Chapter 1: Introduction

The purpose of this thesis is to investigate the use of structure in CMC environments for learning. In particular, consideration is given to the types of hierarchy adopted to improve navigation and organisation in such systems. The thesis aims to understand both the effects and benefits of structure, in the context of conferences used for participant interaction, and to a lesser extent, in online access to course materials. In this research, the term 'online course-related content' refers to educational content of these kinds. This research pursues these issues by focusing on two studies that investigate the effects of introducing CMC to a distance learning computer science course. The studies analyse structures in two different CMC systems. Lessons are drawn from the investigation and subsequent findings.

1.1 Background to the research

The research took place at the Open University where, until computer conferencing became an option, undergraduate computer science courses were taught through self-study of course units (typically at home), viewing of television programmes and through a restricted number of face-to-face tutorials. Additional contact with a tutor was via the telephone or surface mail. Assignments were submitted by post and an examination was taken at the end of the course.

As there was a relatively small amount of student–tutor and student–student contact in the Open University system compared with a traditional university, considerable interest developed in many parts of the Open University in the use of CMC to enhance these aspects of teaching and learning. However, at the time that this research began, computer conferencing had not been used in any substantive form for teaching in the Computing Department.

As the first step in the research (in a phase forming part of an externally funded development project, locally led by the author) a preliminary exploration of the practicalities and issues of using CMC for computer science teaching was undertaken, as outlined below. The aim of the development project was to supplement an existing computer science course, M205 'Fundamentals of Computing', on an experimental basis, using a CMC system. This meant that students were given the new facilities but also had access to their tutor using the traditional Open University methods of a restricted number of face-to-face tutorials, the telephone and surface mail. The thesis in general focuses on situations in which distance learning students and tutors use CMC systems to supplement, rather than replace, existing courses. This category of courses (as opposed to exclusively online courses, or courses with no online component at all) will be referred to as Electronically Supplemented Courses (ESCs).

As already noted, the development of the ESC formed one strand of an externally funded development project to pilot the provision of 'online course-related content'. This wider project, known as STILE (Students' and Teachers' Integrated Learning Environment), involved four universities: Leicester, Loughborough, De Montfort and the Open University. However, the strand of work at the Open University looked exclusively at the distance learning aspects of the project, and was more or less entirely self-contained. The Open University part of the STILE development project will be referred to as OU-STILE.

The thesis grew out of the author's employment for twenty-months on OU-STILE as a research assistant (and indeed sole member of research staff) to provide technical support, to assist students and tutors in their use of an online system, and to manage its use. While OU-STILE was in place, in an independent parallel capacity as a research student, the author devised the structures to access the 'online course-related content', set them up, and ran all of the user studies reported here. The larger part of the analysis and write-up of the thesis was carried out subsequent to the completion of the development project.

1.2 Motivation for this research

As already noted, this thesis investigates the use of structure in CMC environments for learning. For any distance learning university, there are often several perceived advantages of the use of computer conferencing and 'online course-related content'.

For example, these facilities can serve:

- as a type of campus for students: enabling interaction with other students,
- as a rapid feedback mechanism from tutors to students,
- as a way for students without a library to access materials other than the printed text,
- as a way for students living in remote rural and urban areas to stay in touch with other students and their tutor,
- as substitutes for tutorials or summer schools for those who cannot attend them,
- as a discussion medium for program code which is better than the telephone or surface mail.

However, CMC and 'online course-related content' can bring their own problems. To summarise, some of the typical problems that have been documented (Hiltz and Turoff, 1985; Jones, 1994; Mason, 1995a and 1996; Naidu et al., 1995; and Soloway, 1995).

- There may not be enough message traffic to keep a conference alive.
- Conversely there may be so much message traffic that both students and tutors are overloaded with information.
- Messages of diverse relevance can be jumbled together in a single conference so that it is hard to focus on those which are important.
- Conversely there can be so many different conferences that it is hard to find the appropriate one for a given purpose.
- It can be difficult to focus dialogue on educationally valuable discussions.
- Easy access by students to tutors can result in tutors having a much higher work load. Consequently it may be necessary to find ways to limit access.

Various solutions to these problems have been proposed, for example, Hiltz and Turoff (1985) suggest an appropriate use of structural design, while Feenberg (1989) advocates an appropriate 'social architecture'. Both Feenberg and Derycke and D'Halluin (1995) suggest environments should be built using a number of different 'rooms'. Although their proposals were visionary at the time, and it was claimed that they were based on these authors' practice, they were not very explicit about how to provide or structure a CMC system. Neither did they offer any empirical evidence for the proposed benefits. This brings us to the first principal research question pursued in this thesis: *what effects do various CMC structures have on users?* Given this research question, the two studies (a pilot study and a main study) were used to explore the issue of structure, to see what effect it had on users and on their perceptions. The evaluation of these studies was based on information gained from:

- observing and monitoring users interactions,
- the participants' perceptions of the structure, as investigated by collecting users' opinions.

A related research issue that arises with the adoption of CMC systems that allow access to 'online course-related content' is the investigation of what benefits, if any, users gain from such systems. This is the essence of the second principal research question addressed in this thesis: *what benefits do students accrue from a computer conferencing environment that is structured to provide access to 'online course-related content'?*

The evaluation that addressed this question was based on a comparison of:

- behaviour within the structures, and
- perceptions of the benefits gained from using a structure in a computer conferencing environment.

In summary the two principal research questions of the thesis are:

- What effects do various CMC structures have on users?
- What benefits do students accrue from a computer conferencing environment that is structured to provide access to 'online course-related content'?

1.3 The two studies

The two studies in OU-STILE were used to investigate issues about the design and structure of a CMC environment. These studies were pursued by the author over a period of twenty-months between April 1994 and November 1995. The two studies were: a pilot study and a main study. During this period of twenty-months, the online technology evolved and the delivery system changed for each of the two studies. The pilot study used a fairly rudimentary text conferencing system and separate offline reader, (CoSy with Wigwam) which provided a Graphical User Interface (GUI). The main study used a more flexible and relatively more advanced textual conferencing environment (FirstClass), which had an integrated GUI. See table 1.1 below for a summary of these and other key characteristics of the two studies.

Table 1.1 The two studies undertaken between June 1994 and November 1995

	Pilot study (CoSy with Wigwam)	**Main study** (FirstClass)
Duration	6/94 - 1/95	2/95 - 10/95
Facilities	Email and conference areas	Email, conference areas and a bulletin board
Type of structure adopted	A limited-level hierarchy imposed by the software	An extended hierarchical structure that could be modified over time
Participants	Tutors only	Students and tutors
Evaluation techniques	Observing and monitoring users' interactions	Observing and monitoring users' interactions Collecting users' opinions Interpreting naturally-occurring interactions

The two studies used different technologies, but shared various attributes. These common attributes allowed similar issues to be identified and investigated later in the thesis. Some attributes in common between the two studies included:

- asynchronous mode of interaction,
- the use of modems by all participants to connect to the online facilities,
- student and tutor use of online facilities provided in addition to the traditional presentation of the course,
- the tutors, based in each case at a distance at locations in the UK,
- the students, all distance-learners based at locations in the UK and Europe,
- the self-selected group of students and tutors involved in these studies were typical of those taking the traditional course (see chapter 4).

Some issues which arose from the two studies are discussed briefly below.

1.3.1 The pilot study

The pilot study (CoSy with Wigwam, rudimentary text-based system) set out to investigate the effectiveness of structuring the CMC already in use at the Open University for selected courses. A secondary aim of the pilot was to test the usability of this existing software. The pilot study (which facilitated tutor-and-tutor interaction). consisted of three distinct stages. An initial structure was created. This was redesigned and finally a new structure was created in the light of the empirical findings. A practical outcome of the pilot study was the need for a new structure for course conferences (main study), intended to facilitate student and tutor interaction. Numerous issues arose from the pilot study that were concerned with technical, interface, navigational and organisational difficulties. In particular, problems were identified with: the usability and reliability of various software components; a variety of navigational issues mostly to do with the 'flat' organisational structure imposed by the software; and problems with the nature of the tutor's role. All of these issues are treated in detail in chapter 4, but at this point it is useful to comment on a finding from the pilot study related to the issue of the tutor's role.

One of the findings from the pilot study, which will be returned to in chapters 4 and 5, concerns an issue that arose with the adoption of CMC systems concerning confusion about the tutor's function in the online environment. Researchers such as Feenberg (1989) identified a number of roles for the online tutor, including acting as chairperson, host, teacher, facilitator, entertainer or other roles. Feenberg admits indirectly that this role is too big for one person because no one has time to perform all of these functions. A single tutor supporting an online environment is unlikely to succeed (Feenberg, 1989) because the roles are too varied and numerous for one individual.

As a result of the findings from the pilot study of this thesis, a distinctive solution to this problem was proposed (Wilson, 1995a). A new staff role (which will be described shortly) was adopted for the main study to divide up the roles previously allocated to the tutor, and to share these with a support person. This staff role, the Interactive Media Facilitator (IMF), was created to design the CMC structure and monitor activity within the structure. Among other things, the Interactive Media Facilitator made changes to the access permissions for areas or 'rooms' within the structure when necessary. This proposal was novel in that the support person was independent of the teaching and learning process, and the role was focused on supporting the students' and tutors' use of the technology. The IMF was required to be a facilitator with technical expertise but also a subject specialist so that they could appropriately facilitate access to the 'online course-related content'.

This solution, encompassing the structuring of access to 'online course-related content' and the IMF support role was endorsed by Mason (1996, p.4) who said that 'the conception and implementation of the role ... was definitely innovative' and 'it is easy to point to numerous examples of the need for such a role in the OU context'. Mason (1996, p.5) cited the 'lack of complaints ... from students on M205, and control of the tutors' workload ... largely attributable to the development of the IMF role by Tina Wilson'. Mason (1996, p.7) went on to say that 'the prevention of overload on tutors by ... careful structuring ... and the introduction of the IMF role, should set a precedent for subsequent uses of conferencing in the university as a whole'. The thesis offers further evidence of the effect of distinguishing between the roles of tutors and support staff in chapter 5.

Numerous other detailed issues were identified and investigated in the pilot study, as reported in chapter 4. Given an understanding of the structural, software and support issues, the research proceeded to the main study. Four outcomes from the pilot that concretely affected the conduct of the main study concerned: the use of more usable software; the adoption of the IMF support role as outlined above; the development of a handbook to aid navigation; and the adoption of conferencing software that would allow an extended hierarchical structure that could be changed over time.

1.3.2 The main study

The aim of the main study (which forms the bulk of this thesis) was to test out the effectiveness of the improved structure, the usability of new software and how the IMF support role could be extended to support the tutors and students. A new software application was adopted (FirstClass, textual conferencing with an integrated GUI) that could address most of the technical, navigational and organisational problems identified in the pilot. As the FirstClass software allowed more flexibility, it was possible to adopt an extended hierarchical conference structure. The ability to use the facilities of access permissions, read and write privileges and message approval (explained and discussed in chapter 4) added wholly new elements to the structure.

More importantly this study focused on the second research question which was investigating the educational benefits that could be gained from a structured CMC. It had become apparent from the pilot that it was not adequate to categorise the conferences simply by name of topic, chronologically, or by discussion topic order. It turned out that other considerations were important, to make the environment more beneficial. To this end, consideration was given to the types of interaction that would be expected to take place in a structured CMC. The literature had indicated elements of different types of interaction that could take place, but had not applied these in any generalisable or formal sense to the structure of online conferences. Researchers were not using a comprehensive framework to devise structured CMC systems. Therefore a taxonomy of classifications was developed from the variety of elements found in the literature. Though this comprehensive classification framework is discussed in more detail in the next chapter, a preview is given below. The three dimensions of online interaction types that take place are:

Participant pairs

learner-and-tutor

learner-and-course team member

learner-and-learner

tutor-and-tutor

Relationships

one-to-one

one-to-many

many-to-many

Domain of discussion

Knowledge

Socialisation

Motivation

This three-dimensional taxonomy of online interaction types was used to guide the development of the conference structure of the main study (FirstClass). This taxonomy is a generalisable framework that can be applied in a distance learning context to any Electronically Supplemented Course (ESC). Furthermore it can be used for the development of Virtual Learning Environments (VLEs) at the course level, either in a distance learning context or as a supplement to face-to-face teaching.

The 'domain of discussion' dimension was also used for the classification of the students' perceptions of their online activities as compared to their actual behaviour in the areas or 'rooms' in the structure in the main study. The data collection techniques adopted were:

- users' opinions, and
- interpreting naturally-occurring interactions.

The approach to categorical analysis was influenced by grounded theory. This was applied to the interactions taking place in specific areas of the conferencing structure and compared with user perceptions.

1.3.2.1 A summary of findings from the main study

Various detailed findings emerged from the main study. It is not essential for the reader to be aware of all of the details at this stage, but it is useful to have some indication of the general nature of these findings. Consequently, an outline summary is organised below under three headings: organisational, navigational, and technical findings. Interface and support findings are also mentioned. It is probably more useful at this point for the reader to sample this outline for a flavour of the findings rather than study it in detail. The principal findings are elaborated below after the outline summary and discussed further in chapter 5.

Organisational findings:

- more participants in a conference did not necessarily mean more messages,
- heated discussions were prevented with the use of message approval,
- enthusiastic participants encouraged interaction,
- some students 'lurked' and there was evidence of some students shadowing other students,
- participants were overloaded with the number of messages at first,
- participants were lost when they ventured outside the structure,
- consequently they soon learned to filter messages,

- the three-dimensional taxonomy helped to focus the development of the structure for the main study,
- students engaged in the three interaction types, which were combined in the taxonomy,
- knowledge rated the most highly as the 'domain of discussion', followed by socialisation and then motivation.

Navigational findings:

- FirstClass facilitated the use of icons, which aided navigation,
- the software was flexible:
  - allowing the design of a hierarchical structure,
  - read and write privileges were available,
  - topic access permissions were available,
- the combination of the handbook and the structure designed by the IMF appeared to scaffold the students,
- a good naming convention ensured messages only appeared in the wrong area at first, and
- tutors were not confused about where to post their messages.

Technical findings:

- the FirstClass software was more reliable than CoSy with Wigwam,
- FirstClass facilitated the presentation of visually enhanced online course materials as compared to CoSy with Wigwam,
- uploading and downloading files was more straightforward than with CoSy.

Interface findings: the FirstClass interface inspired more confidence than the dated-looking CoSy software.

Support findings: the IMF support role reduced the workload for the tutors.

The principal findings from the main study can be summarised as follows. The use of the extended hierarchical structure developed by the IMF for the main study appeared to be beneficial in terms of navigation and organisation. The handbook had also proven beneficial in terms of navigation and orientation. The results appeared to indicate that a CMC structured and controlled by an IMF promoted interactivity, allowing students to benefit from interacting with a variety of participants and engaging in a number of different types of interaction, including self-learning. More generally, the main study demonstrated that it is important to provide structures to support undergraduate students studying at a distance, to avoid information overload and a prevalence of social or technical discussion.

1.4 Summary

The research reported here investigates how CMC environments should be structured to guide the online interactions of students and tutors. Issues concerning the design of the structure and the IMF support function were investigated throughout the two studies, and are discussed in the first part of the thesis. The benefits of such structuring of online systems are discussed in chapters 6, 7 and 8 of the thesis. The dynamic organisation of the environments by the Interactive Media Facilitator (IMF), a recommendation that emerged from the present work, was found to benefit students. In the main study, there was a need for a balance between effective sign-posting to the 'online course-related content' in the structure and appropriate modification of the structure by the IMF to suit the developing needs of both students and tutors. One of the prospective benefits of using CMCs to provide 'online course-related content' to distance learners is the potential to facilitate productive interaction. The particular focus of chapters 6, 7 and 8 is on the student–student and student–tutor relationship and the types of online interactions occurring between such pairs of participants.

The facilities investigated in the main study, form part of the type of facility which has become mainstream for the majority of Open University courses at the time of writing. For example, it is planned that during 2002/3, at least 300 Open University courses will be adopting broadly similar access to FirstClass using a web browser through the Programme for the Management of Integrated Scaleable Electronic Solutions (ProMISES) project, which provides course teams with a basic online presence. Access to FirstClass is complemented by a course web page, updates and links to course resources through the Open University library, a course calendar and to university administrative functions. Hence the findings of this thesis, based on uses of technology that were educationally innovative and experimental, are now very timely in their scope for application. The findings are of practical relevance to mainstream distance education practice, both now and in the future. A similar argument applies to the timeliness and relevance of these findings to emerging practices in tertiary and higher education. The findings of the thesis offer insights into the design and implementation of Virtual Learning Environments (VLEs) to supplement face-to-face teaching at conventional universities.

Chapter 2: A review of the literature

2.1 Introduction

The main intention of this thesis is to investigate the use of structure in CMC environments for learning. The thesis aims to understand both the effects and benefits of using hierarchical structures to improve navigation and organisation in such systems. In this research, the term 'online course-related content' refers to electronically mediated participant interaction and online access to course materials. Before plunging into the detail of how researchers have provided 'online course-related content', it is useful to briefly note that CMC has been in use in the educational context since the mid 1970s (Harasim, 1996; Harasim, 2001). Researchers have documented the adoption of email and computer conferencing in a variety of countries and for different types of courses (Rohfeld and Hiemstra, 1995; Hiltz, 1995; Turoff, 1995; Velayo, 1994; Steeples et al., 1993; Collis et al., 1994; Paulsen, 1997; Mason, 1989a and 1995a; Alexander and Mason, 1994; Collins and Berge, 1996; Collins, 1996). Although this growing body of CMC research existed, the World Wide Web (WWW) was not used substantially by the general public until 1993 (Woolnough, 2000) and was still in the very early stages of adoption for the educational environment in 1994. This meant that the time that this research started, there was little discourse about the use of the Web in education.

Although the CMC literature is informative, little consideration has been given to exploiting the effectiveness of using hierarchical structures in CMC systems. Another area of research that has been relatively neglected is the necessity to support conferencing structures to improve interaction. Hartley (2000, p.1) refers to these two elements of research as 'discourse schemes that emphasize structure and moderation of interactions in building up communities of practice', and it is in this spirit of providing structure and appropriate support that the current research was started.

However, before undertaking this research, it was important to find out what types of issues had been encountered by other researchers. Indeed the adoption of CMC for educational purposes had not been straightforward, and it was reported that participants encountered a variety of barriers to successful usage. The author has defined four key categories of issues that can impede successful usage.

- Technical issues
- Navigational issues
- Organisational issues
- Online support issues.

As one would expect in the early phases of adoption, the research literature concentrated on the technology being used rather than on how the technology can be used to facilitate learning (McConnell, 1999). However researchers have tried to redress this imbalance, advocating that the use of the latest technology should be secondary to the usability of the online environment. Technology should only be playing a supporting role (Goodrum et al., 1993; Schwen et al., 1993) to the implementation of a sound pedagogical environment. Online systems will only be used if they fulfil the purpose for which they were designed (English and Yazdani, 1999; Berge, 1995; Goodrum et al., 1993), that is supporting and enhancing the work and learning activities of users (Goodrum et al., 1993). Furthermore, Goodrum et al. (1993, p.12) suggest that 'the technology must provide tools and strategies in the learning environment to enact authentic relationships between peers, whereby they can readily communicate with each other and tap the relevant individual skills, experiences, and perspectives of others'. The strategies that researchers have adopted to develop their online environments will be discussed in this chapter. Let's now consider the four key areas one by one.

2.2 Technical issues

A good structure is of little benefit if technical issues impede or altogether prevent access to that structure. It is useful to investigate the literature on technical issues to be able to take these into account and factor them out, where possible, when investigating possible effects and benefits of structure. Reported problems about the main obstacles, and ways of overcoming them, are considered below. Technical problems have been organised into three categories as shown below.

- Some participants had difficulty gaining reliable access.
- Those who were able to get online encountered problems using the software itself.
- Often one application did not supply all of the necessary features and users experienced a steep learning curve as a result of this lack of integrated software.

2.2.1 Gaining reliable access to a CMC environment

One of the main hurdles participants had to overcome was being able to log into the CMC system regularly (Mason, 1989a and 1989b; Collins and Berge, 1996; Steeples et al., 1993). Indeed, one researcher claimed that if students did not get online quickly, they would tend not participate in online activities at all. Goodrum et al. (1993, p.19) state that 'it's no secret that if people do not have easy access to technology, they will not want to use it, will not have the time or energy to seek it out'.

Although reliable access was a problem reported in these early days of CMC usage, severe network and software failure were still reported as a problem more recently when using the Web environment (Gurwitz, 1998; Sumner and Taylor 1998; Alexander, 2001). It appears that although the technology has moved forward, gaining access to an online environment is still as complicated as reported in 1993.

2.2.2 The choice of CMC software can affect usability

The ease with which the software including the interface can be mastered affects the adoption of CMC systems (Kaye, 1994; Davie, 1989; Turoff, 1995). The usability is affected by the number of different features available within a single software package (Kaye, 1989; Feenberg 1989; Hiltz and Turoff, 1985). For example the interface to the Co-learn CMC system was not simple enough to be used easily (Derycke and D'Halluin, 1995). Not surprisingly, CMC software was described as 'primitive' (Steeples et al., 1993). In the case of the CoSy software (which was used in the pilot study, chapter 4), Mason (1989a) noted a lack of features available to help the infrequent participant find the information they needed. However Feenberg (1989) was emphatic that software that offered too many features was too complex for users and not suitable as a social environment. He was particularly concerned that too many tools would cause confusion to the user and discourage them from using the online system.

2.2.3 A lack of integrated software packages

The learning curve associated with becoming accustomed to a CMC environment is affected by the number of applications adopted (Collins and Berge, 1996; Goodrum et al., 1993). More than one application is used if there is a lack of suitable features in any one package (Davie, 1989; Turoff, 1995; Naidu et al., 1995). Indeed the number of tools available in the conferencing systems for organising and managing group activities and information sharing, were limited (Harasim, 1989; Hiltz and Turoff, 1985; Feenberg, 1989). Feenberg (1989) concludes that technology was based on using a variety of applications, rather than one integrated package. Indeed, Derycke and D'Halluin (1995) found that the design of their overall user interface was a problem as it did not hide the underlying complexities of the different software applications. Also Kaye (1994) stated that the combination of offline and online tools associated with the use of CoSy could be bewildering for naive users.

At the time of writing, new applications continue to be developed independently and there are still few if any integrated software packages. For example:

- the Virtual Campus software application is not integrated software: it uses a Web browser, a Telnet connection and a separate WebCT environment (Maher, 1999),
- a CMC system for undergraduate study reported by Sloane (1997) uses a combination of Netscape, email and file transfer software.

Such ad hoc mixtures of CMC tools typify environments that generally present a steep learning curve for users.

Given these three identifiable problems in the literature, the next section deals with some improvements mentioned by researchers and some issues that were overlooked.

2.2.4 Suggestions from the literature to overcome these problems

Researchers have suggested a number of ways to deal with technical issues and maximise the usability of the software.

- Students and tutors need initial training and technical support with new communications software (Steeples et al., 1993; Naidu et al., 1995, Berge, 1995 and 1996; Mason, 1989b and 1995; Collins and Berge, 1994; Riedl, 1989).
- Students and tutors need ongoing training and support as they attempt to learn new software features, especially as there are wide variations in usability between different packages (Rohfeld and Hiemstra, 1995; Naidu et al., 1995).
- A variety of training materials should be supplied to participants (Mason, 1989b; Berge, 1996).
- Students should be given time to learn to use the software before they have to participate (Berge, 1996).
- An introductory period should be used to acclimatise the students to the online environment (Alexander and Mason, 1994; Wegerif, 1998; and Collins and Berge, 1994 and 1996; Rohfeld and Hiemstra, 1995; Berge, 1995).
- Participants need to have enough technical expertise and confidence to be able to participate (Steeples et al., 1993).
- Computer conferencing systems should be easy to learn so as to minimise the learning curve (Velayo, 1994; Selinger, 1998; Collis et al., 1994; Collis and Verwijs, 1995; Goodrum et al., 1993; Schwen et al., 1993).
- Users should be involved in improvements to CMC systems (Goodrum et al., 1993).
- Simple technological solutions should be adopted which take into account the applications advantages and limitations (Collins and Berge, 1994).
- The best features of the software should be exploited (Collins and Berge, 1994).
- An integrated CMC system should be used to reduce some of the software usability problems, an example of which is discussed below (Alexander and Lincoln, 1989; Alexander and Mason, 1994; Collis and Verwijs, 1995; Goodrum et al., 1993; Schwen et al., 1993). One example of an apparently integrated package was NetAcademy (Seufert, 2000). It used a 'toolbox' which adopted different templates for different learning communities, but in an integrated environment which would appear to solve some of the problems reported by earlier researchers. However no evaluation of this environment appears to have been reported.

Researchers have identified the above problems but have perhaps failed to emphasise enough the importance of software reliability and usability when planning or implementing a CMC system. Reliability and usability are not marginal issues but essential prerequisites to allow access to a structured CMC. Chapter 4 details how some of the techniques recommended above were used to avoid problems, and also gives indications of the issues which could not be resolved. This completes the discussion of the first category of issues that can impede successful usage of educational CMCs, and the discussion can now move on to the next category, which deals with issues of navigation.

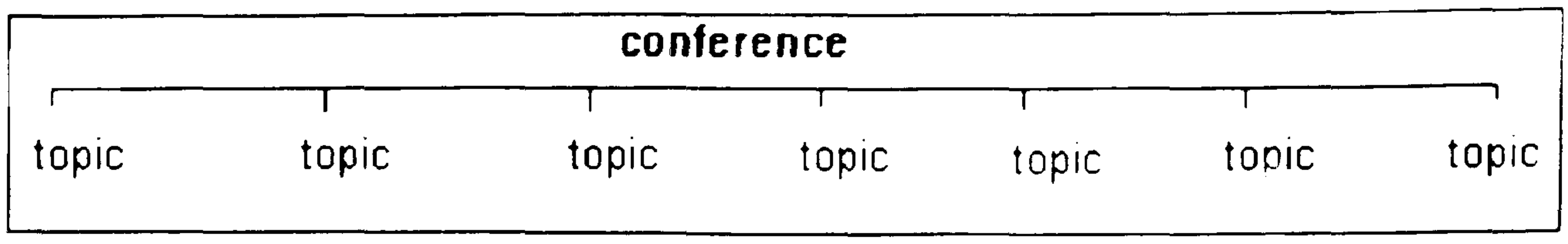
2.3 Navigational issues

Researchers noted in general that once participants gained reliable access and became familiar with the software features, navigation of conference structures tended to become an issue. Participants did not always have a clear view of the structure. In many cases they found it difficult to move around the conference levels. They typically found it difficult to know where to post messages. This resulted in messages being posted in the wrong conferences and therefore irrelevant to the participants in that conference. These problems are partly related to the limited structural hierarchy imposed by many of the software packages typically used.

2.3.1 A limited structure imposed by the software

Some CMC applications limit the type of hierarchical structure available. In turn, such limitations affect the ease with which users may be able to navigate the resulting structures. In the case of software such as CoSy developed by Guelph University and DIALOG (as discussed by Zuboff, 1988, Ch.10) only a limited hierarchical structure could be adopted. A conference may contain a number of sub-topics which appear at the same level, see figure 2.1. However, these sub-topics may not contain sub-topics themselves. Similarly, although conferences may have access conditions, sub-topics may not have any independent access conditions of their own, which limits the flexibility with which they may be used. These restrictions on hierarchical structure and on the flexibility of access permissions limit the dynamism of the structure that can be provided.

Figure 2.1 An example of the limited structure available with the CoSy software



As a result, researchers reported a number of navigational issues related to conference structures.

2.3.2 Difficulty moving around the conference levels

Participants typically found it difficult to navigate even around restricted conference structures of the type reported above (Tonnesen et al., 1995). When it was possible to have more complex conference structures, these often caused conceptualisation problems for students, where they found it difficult to move around levels from conference to conference (Davie, 1989). For example, students had difficulties knowing where they were in such structures. Mason (1989a) found in interviews that some very infrequent users of the CoSy system had an unclear idea of the structure of conferences and topics. The participants found it difficult to orientate themselves and to find out where the interesting discussions were taking place (Alexander and Lincoln, 1989). Consequently students found it difficult to know where to post their messages (Grint, 1989; Owen, 2000; Okamura et al., 1994; Thomas, 1989; Mason, 1989a; Rohfeld and Hiemstra, 1995). Messages which appeared in the wrong place appeared irrelevant (Alexander and Lincoln, 1989).

2.3.3 How practitioners have solved these problems

It is useful to look at what practitioners have done to date to solve these problems.

- They have adopted a simple but easy to learn structure. A minimal approach to organisation is recommended (Davies, 1989). Otherwise learners will rebel if they find the conference structure too complex (Berge, 1996).
- Conferences should be structured in advance of the course start date (Velayo, 1994; Harrison and Bergen, 2000).
- Students should be given an impression of what the conference structure will look like, how it will function and its purpose (Velayo, 1994).

- Tools to aid navigation and searching should be provided, as the ability to organise and re-organise information was limited (Harasim, 1989).
- An extremely simple interface with a common set of features should be adopted which has add-on options for specific needs (Feenberg, 1989).
- Metaphors should be used to indicate the type of discussion that should be taking place in various areas (Davie, 1989; Alexander and Lincoln, 1989; Turoff, 1995; Schwen et al., 1993; Harasim, 1996; Kaye, 1994; Seufert, 2000), for example, keeping jokes in the students union and out of the tutorial conferences (Kaye, 1994).

It is useful to consider briefly one example from the literature that illustrates the first suggested method above: namely the adoption of a simple, easy-to-learn structure to facilitate navigation. This example influenced the approach to structure used in the main study of the thesis (chapter 4).

Alexander and Mason (1994) used a single discussion conference, 'The Meeting Room'. Using the FirstClass software, the conference could contain sub-conferences at different levels. The conferences were used to separate the course discussion from other activities. They state (p.16) that 'the structure and organisation of the meeting room was important to enable students to find relevant messages and input their own in appropriate places'. This solution to structure made use of an extended hierarchy which was facilitated by the FirstClass software.

All of the above approaches need to be used with care: incautious application can lead to problems. For example, uses of metaphors must be properly thought out to ensure that they illuminate rather than obscure conference structure. One frequently used metaphor is that of 'rooms' or 'spaces'. 'Rooms' are identified within Seufert's (2000) NetAcademy environment to assist users to identify the right space for information and interaction. However, Davie (1989) urges caution, indicating that over-use of metaphors could hide the conference structure. The terms 'rooms' or 'spaces' in which students could make different types of contributions were emphasised by a number of researchers (Feenberg, 1989; Alexander and Mason, 1994; Maher, 1999; Selinger, 1998; Hiltz and Turoff, 1985; Hiltz, 1995; Derycke and D'Halluin, 1995; Kaye 1994, Harasim, 1996; Seufert 2000; Owen, 2000). As would be expected, practitioners used different 'rooms' for different courses, see appendix A. In general, the use of metaphors such as 'rooms' as organising elements for structuring CMCs has at times been counterproductive. In the next section, which deals with the third category of issues that can impede successful usage, namely organisational issues, a general framework is proposed for organising, describing and guiding the design of structured CMCs.

2.4 Organisational issues

Navigational issues, discussed in the previous section, dealt with ways of helping participants to find their way around a given structure. Organisational issues deal, among other things, with arranging the structures in the most appropriate way, for the task in hand, in the first place. It was very unclear from the literature how CMC systems should be organised. For example, the number, naming and division of discussion areas within a conference structure can vary greatly among different attempts to teach ostensibly the same topic. To some extent, the organisation of discussion areas relates to the way in which particular subjects are conventionally taught: for example, provision of a lab room, a tutorial group or a seminar room. However, in general, differences in the structuring of discussion conferences (compared between competing attempts to teach the same topic) appear essentially arbitrary. Since course organisers may reasonably differ on what structure is appropriate for a given course, students cannot be expected automatically to have the mental model corresponding to the structure that their course organiser happens to have adopted. As a result, participants were often unclear about where to post or find messages of a particular kind, and experienced overload with the number of messages posted.

However, even if, hypothetically, students were entirely clear about the structure and purpose of the various conferences, there are other organisational issues which tend to result in conferences being used for purposes other than those for which the course organisers intend them. Two related variants of this problem concern, firstly, conferences of any sort. These include conferences focused on particular educational topics, where there can be a tendency for social and technical conversations to become too prevalent. The second variant is that it is hard to keep students focused on educational discussions.

Organisational problems have been organised under four headings as follows.

- Participant overloaded with messages.
- Dominant discussion topics.
- The difficulty of involving participants in educational discussion.
- Inappropriate transfer of traditional working practices online.

2.4.1 Overloaded with the number of messages and message content

Participants were overloaded with the quantity of messages they were expected to read (Mason 1989a and b; Turoff, 1995; Grint, 1989). Information overload was caused by too many messages in a short space of time (Alexander and Lincoln, 1989; Hiltz, 1985). Students experienced message overload in this form when they had not logged on for some time (Wegerif, 1998). Discussions could also permeate all conferences (Alexander and Lincoln, 1989). In the case of one course run over a period of several years, structural changes had been made year-on-year; however students still reported that there were too many messages (Mason, 1990) 'unstructured conferences, alienated students and overloaded tutors' (Mason, 1995, p.1). It was also reported that formal topics, in the CSCW environment, were overloaded with messages (Okamura et al., 1994). This was in contrast with Zuboff (1988, Ch. 10), who reported that formally organised conferences were used ineffectively.

2.4.2 Dominant discussion topics

Researchers have noted the dominance of social, administrative and technical discussions in educational CMC environments (Steeples et al., 1993; Mason, 1989a; Kaye, 1994). As a consequence of these dominant topics, it was difficult to involve students in educational discussions. For example, contrary to expectations, but fairly typical in practice, Mason (1989a) had found that the chat topic within the tutorial conferences was the most heavily used. Also, in one workplace CSCW environment it was not possible to discourage workers from using the recreational conference during working hours (Okamura et al., 1994). The issue appears to be related to where the social area is placed, how interaction should be encouraged and yet how it can be contained.

2.4.2.1 The difficulty of involving participants in educational discussion

Researchers monitoring these environments have reported the difficulty in reproducing the types of discussion that occurred at face-to-face tutorials. The primary problem with CMC from the teaching and learning perspectives was stated as the difficulty of establishing 'educationally valuable discussions ... partly because the use of the system is not driven by the course content' (Mason, 1995a and 1996). Indeed Thomas (1989) agrees with Mason (1989a) that messages were not all related to academic matters and the irrelevance of many messages to the course material was mentioned by students. Email worked well for tutoring but the 'quality and quantity of interactions on matters of course content' did not meet initial expectations (Goodyear et al., 1991). Owen (2000) also reports on the difficulty in establishing and maintaining meaningful educational dialogue in Computer Supported Collaborative Learning and Computer Mediated Conferencing environments. He identifies the key problems in his study as a lack of participation except by a few individuals which contributed to a lack of any real debate. In another case, the online system was not used for ongoing intellectual debate (Steeples et al., 1993). There was a lack of opportunity for dialogue, debate, conversational learning and collaborative work (Kaye, 1994). Wegerif (1998) reports on the lack of critical debate and academic argument but reflects that, on the whole, students were learning from an accumulation of different perspectives. This suggests that there is value in lurking. Indeed Berge (1995) advocates accepting that students will lurk. Students learn from watching the activities of others and it should not be assumed that learning is not taking place, (Berge, 1996). However, Davie (1989) is of the opinion that too many students lurk.

In the case of CSCW, Rogers (1994) recommended that consideration be given to how the CSCW is to be used rather than transferring traditional working practices online. This could equally be applied to the use of CMC. Indeed researchers have suggested considerations which should be taken into account.

2.4.3 Suggested solutions to these problems

Practitioners, have suggested a number of ways for overcoming the incidence of overload.

- Structure the CMC environment to combat information overload (Hiltz and Turoff, 1985; Mason, 1995).
- Use message approval to reduce overload. A moderator can screen all messages before releasing them (Okamura et al., 1994).
- Provide tools to help users make organisational decisions which facilitate the clarity of online interaction (Hiltz and Turoff, 1985).
- Plan the CMC environment 'to save time and effort for the instructor' (Naidu et al., 1995, p.70).
- Create a critical mass of individuals but manage the group size (Steeples et al., 1993).
- Limit the number of rooms to enhance the usability of a structure. For example, match the social interactions with a limited number of conferences (Feenberg, 1989).
- Consider organisation, activities and human factors (Naidu et al., 1995).
- Consider who needs to talk to whom about what (Feenberg, 1989).
- Consider how many conference rooms would be required (Feenberg, 1989).
- Consider what size would rooms need to be (Feenberg, 1989).

Various methods have been suggested by researchers to encourage educational discussion.

- Organise activities or structure learning opportunities within conferences (Hiltz, 1995).
- Focus on students' 'working and thinking patterns' to 'design well organised services' (Collis and Verwijs, 1995, p.20).
- Examine the human, social and organisational consequences. The focus must be on 'the people, the task they must do and the relationships' (Goodrum et al., 1993, p.19).
- Use the interface level to look at how to structure the way in which the 'student interacts with the places, materials and other people' (Maher, 1999, P.3).

- Provide participants with guidance on appropriate behaviour in conferencing areas (Harasim, 1996; Seufert, 2000; Okamura et al., 1994; Steeples et al., 1993; Berge, 2000; Rohfeld and Hiemstra, 1995), for example, confining personal socialising to conferences or spaces set up specifically for that (Kaye, 1994).
- Include areas for technical queries and for social interaction (Steeples et al., 1993).
- Separate technical issues from course discussions (Mason, 1989b).
- Provide places to 'play' and socialise online as well as areas for course-related activities, (Harasim, 1996).
- Ensure the environment encourages facilitation (Collis et al., 1994).
- Configure access to conferences which facilitate appropriate discussion in different areas (Harasim, 1989). She states that the design of the online environment is critical to ensure that productive interactions are taking place.
- Use a 'topic-orientated discussion space' which encourages online groups to form and enhances discussion (Hiltz and Turoff, 1985; Hiltz, 1995; Rohfeld and Hiemstra, 1995). Participants should move from topic to topic (Feenberg, 1989). Make ongoing changes to suit the needs of the group. Change and restructure the discussion areas, create new topics and close old ones, during the lifetime of the conference (Okamura et al., 1994; Alexander and Mason, 1994).
- Alternatively use a 'group-centred' approach where the group of participants stays the same but the topics of conversation change from time to time (Derycke and D'Halluin, 1995; Feenberg, 1989). In this case the structure of the conference should not change throughout the course as this causes confusion for users, Feenberg (1989). Instead make year-on-year changes to the 'group-centred' structure for each new batch of students (Mason, 1989b).
- Adopt a hierarchical structure by making use of the available features of the software (Naidu et al., 1995; Steeples et al., 1993; Turoff, 1995), for example, use one conference with sub-conferences and sub-sub-conferences (Alexander and Mason, 1994). Create a university campus environment which contains more focused classroom environments (Seufert, 2000).

The use of structure had not been widely adopted for the World Wide Web (WWW) at first. Soloway (1995) stated that the Internet was like 'stumbling around a library with thousands of large bookshelves all marked "miscellaneous"', until a 'digital intermediary' was introduced to provide guidance. More recently Horton (2001) affirmed this statement saying that the content of the Web only became structured when intermediaries were introduced in the mid 1990s. For example, web search engines were provided to help users find the information and news they were looking for, using a more structured approach. The use of structure was also lacking at first in the Web as an educational CMC. For example, Sloane (1997) directed undergraduate and postgraduate computing students with an open-ended approach whereby he checked that enough information would be available and students were to make their own searches for relevant information for their module. However one solution to the provision of general course information on the Web was the use of a compiled bibliography of online resources (Gurwitz, 1998). This could be said to have provided a type of structure.

These solutions to the problems of overload and a lack of educational discussion appear useful. However researchers have not suggested a generalisable solution that all types of course could use. Such a conceptual framework, generalisable for any course, will be proposed in the next section.

2.4.4 A proposed framework for structuring access to 'online course-related content'

As argued above, there is currently no comprehensive framework for educational CMCs for classifying online interactions. However elements of a framework do exist in the literature. Any such framework needs to take into account the different types of interaction that can take place within discussion areas and should be applicable to courses irrespective of their subject matter and approach. Such a framework, in addition to providing an organising principle for the interactions themselves, should be of value in structuring discussions of issues and attributes of all kinds arising in educational CMCs of any sort.

2.4.4.1 Participant pairs

The first issue to consider is the type of participants, and more accurately the *types of pairs of participants* involved in any given online communication. Two possible examples of participant pairs include: learners and tutors, and learners and learners. Note that an interaction in one of these categories could involve more than two individual participants (for example, one teacher might interact with an entire tutor group of learners) but it is useful nevertheless to identify the two key participant types in any given interaction. (In principle, interactions could involve more than two types, but in practical terms it has proved sufficient, and most useful, to focus on pairs of participant type.) In a quest for a generic solution it is valuable to consider the variety of participant pair types identified (however tentatively) in the literature, and then to focus on those types of generic importance in educational CMC. Researchers have identified many different elements of participant pair types. These are listed in the table below, starting with the most popular pair type and ending with the least popular pair type.

Table 2.1 Participant pairs within the CMC environments

learner(s) and learner(s)	(Derycke and D'Halluin, 1995; Riedl, 1989; Kaye, 1989 and 1994; Feenberg, 1989; Davie, 1989; Alexander and Lincoln, 1989; Mason, 1989a; Harasim, 1989; Hiltz, 1995; Thomas, 1989; Harasim, 1996; Seufert, 2000; Owen, 2000; Velayo, 1994; Tonnesen et al., 1995; Maher, 1999; Steeples et al., 1993; Selinger, 1998; Naidu et al., 1995; English and Yazdani, 1999; Alexander and Mason, 1994; Collins and Berge, 1994 and 1996; Mason, 1995; Goodrum et al., 1993; Schwen et al., 1993; Alexander, 2001; Berge, 2000; McConnell, 1999; McConnell et al., 2000; Rohfeld and Hiemstra, 1995; Berge, 1995)
learner(s)-and-tutor(s)	(Derycke and D'Halluin, 1995; Riedl, 1989; Feenberg, 1989; Davie, 1989; Alexander and Lincoln, 1989; Mason, 1989a; Harasim, 1989; Kaye, 1994; Hiltz, 1995; Turoff, 1995; Thomas, 1989; Harasim, 1996; Seufert, 2000, Owen, 2000; Velayo, 1994; Tonnesen, et al., 1995; Maher, 1999; Steeples et al., 1993; Selinger, 1998; Naidu et al., 1995; Collins and Berge, 1994 and 1996; Mason, 1995; Schwen et al., 1993; Alexander, 2001; Berge, 2000; McConnell, 1999; McConnell, et al., 2000; Rohfeld and Hiemstra, 1995; Berge, 1995)
learner-and-expert (or information specialist)	(Harasim, 1989 and 1996; Thomas, 1989; Steeples et al., 1993; Selinger, 1998; Naidu et al., 1995; Collins and Berge, 1996; Mason, 1995; Mason, 1990; Rohfeld and Hiemstra, 1995; Berge, 1995; Seufert, 2000; Alexander and Mason, 1994)
self –learning	(Derycke and D'Halluin, 1995; Paulsen, 1997; Harasim, 1989 and 1996; Collins and Berge, 1994 and 1996; McConnell et al., 2000; Alexander and Mason, 1994; Schwen, 1993)
learner-and-learning system resources	(Seufert, 2000; Harasim, 1996; Alexander and Lincoln, 1989; Collins and Berge, 1994 and 1996; Berge, 1995)
learner-and-course team	(Mason, 1989a)
learner-and-alumni	(Seufert, 2000; Kaye, 1994; Mason, 1989b; Mason, 1990)
learner-and-academic community	(Hiltz, 1995)
learner-and-non-academic community	(Hiltz, 1995)
learner-and-the institution	(Collins and Berge, 1994)

tutor-and-tutor	(Mason, 1989a; Kaye, 1994; Hiltz, 1995; Thomas, 1989; Mason, 1989b; Collins, 1996; McConnell et al., 2000)
tutor-and-course team	(Mason, 1989b and 1995)
tutor-and-staff tutor	(Mason, 1995)

The following participant pair types are those that appear to be most useful in educational CMCs in general, and could be one useful dimension of the types of interaction which take place.

Participant pairs

learner-and-tutor

learner-and-course team member

learner-and-learner

tutor-and-tutor

These researchers have mentioned many participant types in passing, as noted above. However, they have not mentioned the number of participants they expect to interact together.

2.4.4.2 Relationships

A second important dimension is needed to define the numbers of participants involved in given relationship groupings. Elements have been identified in the literature which the author has combined into this second useful way to classify types of interaction.

Relationships

one-to-one

one-to-many

many-to-many

The term 'relationship' may seem a little non-intuitive as a name for this dimension however this technical term has been borrowed from the database literature, where it is used as an important distinction in relationships between entities.

The one-to-one relationship generally takes place via email (Harasim, 1989; Mason, 1989a; Davies, 1989; Paulsen, 1997; Collins and Berge, 1996; Tonnesen et al., 1995;

Naidu et al., 1995). The one-to-one relationships most commonly considered are learner-and-learner or tutor-and-learner (Harasim, 1989; Collins and Berge, 1996).

The one-to-many interactions most commonly identified take place between a tutor and many learners, taking the form of a lecture, broadcast or symposium (Harasim, 1989; Naidu et al., 1995). Such interactions are typically conducted via Web, bulletin boards or distribution lists for email (Paulsen, 1997). An alternative method is the use of list server-managed groups (Collins and Berge, 1996).

The many-to-many relationship was also referred to briefly in the literature (Harasim, 1989; Kaye, 1989; Paulsen, 1997; Naidu et al., 1995; Collins and Berge, 1996). Many-to-many interactions typically take the form of group learning or a seminar (Harasim, 1989). Paulsen (1997) notes that the many-to-many relationship can be conducted within computer conferencing systems, bulletin boards or distribution lists for email. Debates and role plays could also form many-to-many interaction, Naidu et al. (1995).

Two dimensions have now been identified. These are participants and relationships. However the area of discussion has not been highlighted and will be discussed in the next section.

2.4.4.3 Domain of discussion

Other researchers discuss elements of a third way to identify types of interaction, which have been categorised by the author as follows.

Domain of discussion

- Knowledge
- Socialisation
- Motivation

The author (Wilson, 1995a) identified the need to separate course-related dialogue from social chat in CMC systems. Whitelock promoted these two strands and added a third strand to propose a theoretical three-dimensional framework. Whitelock's framework consists of a knowledge dimension, a social dimension and a motivation dimension, see Wilson and Whitelock (1996).

2.4.4.3.1 Knowledge

Knowledge as an element in a classification system for investigating interactions in educational CMCs has not been defined clearly by a large number of researchers in the CMC area (Derycke and D'Halluin, 1995; Kaye, 1994; Kaye, 1989; Alexander and Lincoln, 1989; Mason, 1989a; Harasim, 1989 and 1996; Turoff, 1995; Velayo, 1994; Seufert, 2000; Owen, 2000; Steeples et al., 1993; Selinger, 1998; Naidu et al., 1995; English and Yazdani, 1999; Schwen et al., 1993; Wegerif, 1998; Rohfeld and Hiemstra, 1995; Berge, 1995).

In this thesis, the author has focused on computer mediated *interactions,* rather than on solitary learning, therefore solitary reading of 'online course-related content' is outside the scope of this study. However, in any educational CMC many of the interactions between participants have, or are intended to have, course content as their main focus. Interactions that can be identified as relating to the knowledge domain (as opposed to the motivation and social domains) include questions about concepts, attempts to clarify concepts, problem solving, discussions of case studies and examples, group discussions, tutorials, and many diverse kinds of interactions, although as noted earlier, interactions that begin with a knowledge focus may have a tendency to drift into other areas such as the technical or social. Different views exist about the nature of knowledge and how it is constructed or acquired: many educationalists share a broadly constructivist view. Indeed social construction of knowledge is mentioned, but only by a few CMC researchers (Selinger 1998; Collins and Berge, 1996). Examples of what is typically highlighted as knowledge in the context of educational CMCs is included in the following observations.

- Knowledge is educational, academic or intellectual interaction (Kaye, 1989; Mason, 1989a; Harasim, 1996; Harasim, 1989).
- It is constructed through a process of discussion and interaction (Harasim, 1989; Alexander and Lincoln, 1989). 'Learners shift from being passive receptacles to

being active participants in the search for knowledge. Moreover, they learn how to acquire and use knowledge' (Naidu et al., 1995 p.72).

- Knowledge building was considered important for problem solving which was a coordination among the knowledge actions performed by learners and tutors (Derycke and D'Halluin, 1995).

According to this view, knowledge cannot be thought of as simply passively residing in the course texts. It tends to emerge from the active interactions of the participants. This view in some respects expands the range of interactions that could be considered as falling in the 'domain of discussion' of knowledge. In practical terms, irrespective of the theory of learning adopted, the knowledge domain is one useful element in the 'domain of discussion' as part of the classification system that is proposed in this thesis.

2.4.4.3.2 Socialisation

Socialisation has merited more discussion than knowledge or motivation by CMC researchers (Derycke and D'Halluin, 1995; Feenberg, 1989; Hiltz and Turoff, 1985; Kaye 1989 and 1994; Mason, 1989a; Harasim, 1996; Owen, 2000; Davies, 1989; Tonnesen, et al., 1995; Selinger, 1998; Schwen et al., 1993; Wegerif, 1998; Collins and Berge, 1994; McConnell, 1999). The literature focused on how to make online environments more socially acceptable (Feenberg, 1989; Hiltz and Turoff, 1985; English and Yazdani 1999; McConnell 2000). Indeed the design of the social environment in which interactions took place impacted on the success of the CMC (Kaye, 1994). Some researchers argued that in order to encourage social interaction, structural design needed to be adopted in CMC systems (Hiltz and Turoff, 1985; Rohfeld and Hiemstra, 1995), as explained in more detail below. By structural design, these researchers meant that CMC systems needed to be designed to encourage small groups to interact together, rather than one large mass of people interacting in the same space. Feenberg (1989) argues for a 'social architecture' in the design of computer conferences. The 'social architecture' he proposes determines the success of the interacting group just as the layout of a room can affect what takes place within it.

Socialisation has been argued to be the key issue to the success of computer conferencing (Hiltz and Turoff, 1985; Feenberg, 1989). Feenberg (1989) suggests concentrating on the variety of social situations which could occur between different groups. Indeed, given theories about the social construction of knowledge (mentioned earlier in the section on knowledge as a category for classifying online interactions), it can be hard at times to distinguish between two kinds of social interaction: social construction of knowledge as discussed by Selinger (1998) and Collins and Berge (1996) and individuals simply socialising online. Indeed, interactions can easily move from one kind to the other, and elements of both may be present simultaneously. Socialisation has been described as a social relationship within a learning context (McConnell, 1999). Also the learner population needs to have a social appreciation or membership of a group as otherwise collaborative learning can be rejected (Derycke and D'Halluin, 1995).

2.4.4.3.3 Motivation

Motivation has been mentioned in passing by a number of researchers (Kaye, 1989; Hasasim, 1989; Hiltz, 1995; Velayo, 1994; Paulsen, 1997; Okamura et al., 1994; Naidu et al., 1995, English and Yazdani, 1999; Alexander and Mason, 1994). Velayo (1994) suggests incorporating motivation features into the structure of the conference. For example, students need to have easy access to help related to use of the system. Although motivation appears to be a neglected area, English and Yazdani (1999) were of the opinion that the use of online facilities in themselves tended to increase motivation, even taking into account the Hawthorn effect. Indeed, the effect of online facilities on students' motivation will be discussed later in the thesis.

2.4.4.3.4 Summary

Only three of the researchers cited in this section (Kaye, 1989; Harasim, 1989; Wilson and Whitelock, 1996) mention all three of the strands that have been proposed as the basis of the 'domain of discussion' dimension. Researchers generally seemed to expect discussion of knowledge (including social construction of knowledge) to be the main focus of online interactions: the expectation was that pure socialisation, despite its importance, would be a secondary focus and was expected to take up less time and account for fewer messages than discussion of knowledge (Mason, 1989a; Okamura et al., 1994). It appears that some researchers have neglected the social aspects of the online environment while others have overlooked the motivation factors. This research proposes the systematic use of these three strands to investigate and clarify the types of domain interaction which take place in any online educational CMC environment.

2.4.4.4 The conceptual framework

As noted earlier, there is currently no comprehensive classification framework available to identify interaction types in online systems. This thesis proposes three dimensions of interaction types for this purpose to exploit the educational potential of computer conferencing. The three interaction types are: participant (understood to mean participant pairs), relationships and domain of discussion. The three dimensions of online interaction types decompose into:

Participant pairs

- learner-and-tutor
- learner-and-course team member
- learner-and-learner
- tutor-and-tutor

Relationships

- one-to-one
- one-to-many
- many-to-many

Domain of discussion

- Knowledge
- Socialisation
- Motivation

It should be noted that this taxonomy is intended to apply to interactions or communications in CMCs in the educational setting, as opposed to classifying self-learning experiences. The author has not concentrated on solitary learning. As mentioned above, it is evident that there is a lack of a generalisable framework from which to devise the discussion areas for a CMC structure. These classifications can be used to organise the different discussion areas within a CMC structure. In chapter 4, a computer conference structure which draws on all of these dimensions will be presented. This completes this part of the review dealing with organisational issues.

2.5 Online support issues

The structure of conferences can be used to guide interaction, but the adopted framework needs to be supported in some way if the integrity of the structure is to be preserved. Indeed, to a large extent, the structure and its components need to be understood before support and online communities can be established (Seufert, 2000). Owen (2000) links the moderator role and structure as key to sustain online learning. Both human and artificial agents have been used for supporting electronic environments, as discussed by Klark and Udi (1995), though Collis and Verwijs (1995) argue that artificial intelligence applications are not very useful in electronic support environments. In any event, the aim in the present thesis is to concentrate on human roles in CMC systems rather than artificial roles.

In the traditional classroom setting, the tutor concentrates on teaching students. If the classes are large in size or involve some type of laboratory work, the tutor often has support from a teaching assistant, allowing the teacher to remain focused purely on the teaching role. By contrast, in online systems, researchers have identified a number of roles for the online tutor, in addition to their teaching function, all of which are typically expected to be performed by a single person. Various researchers identify different roles and there appears to be little consensus on what the roles are. It is implicitly assumed that all tutors are capable of carrying out these additional roles, though not all of the roles may be natural or congenial for them to adopt. As a result of the widespread expectation that a single tutor should perform all of the varied roles online, there is a tendency for tutors to suffer from an inflated workload (Naidu et al., 1995; Jones, 1994; Mason, 1995). For example, students expect tutors to answer their technical queries (Mason, 1989a; Naidu et al., 1995) and tutors are often also expected to moderate purely social conferences. A single tutor supporting an online environment is unlikely to succeed (Feenberg, 1989) because the roles are too varied and numerous for one individual. In general, the time investment in online participation is typically high for the tutor (Collins and Berge, 1996). Overloading of the tutor is not only a problem for the tutor: it can also be a problem for the students. One example of the way in which overloading of the tutor can affect students' experiences adversely is when tutors have a high workload and do not have the time to monitor all interactions. As a result, 'flaming' sessions can become more prevalent, causing bad feeling and alienation among students (Davie, 1989).

2.5.1 Confusion about the role of the online tutor

The tutor's role in online environments is essential for a valuable and successful learning experience for all students (English and Yazdani, 1999). However tutors can be confused about what to do in an online environment. Their role is not always clear and as a result, students may appear to be expected to work together without any support (English and Yazdani, 1999). Students may miss tutor-led guidance (Mason, 1996). The lack of support in English and Yazdani's (1999) environment may have contributed to the majority of students not using the bulletin board or email. Indeed, Alexander (2001) also reported how tutors without guidance did not know how to support their students' use of conferencing. It appears that the transition from being a distance learning tutor to an online tutor is more straightforward than the teacher in the classroom becoming an online tutor. For example, Kaye (1989) believes that the traditional tutoring role at a distance is facilitative, whether it is face-to-face or online. This view is in line with Collins and Berge, 1994 and 1996, and Berge, 1995. By contrast, in the case of online teaching developed to supplement traditional classroom teaching, Naidu et al. (1995) argue that typically too much of the traditional teaching and learning role is transferred online rather than consideration being given to the new medium of CMC and what sort of support would be required. To overcome this they suggest (p.70) that 'a CMC-based teaching-learning environment prescribes a different set of tasks for the instructor'.

It is useful to review briefly what roles have been identified for online tutors in the literature. Many of these roles are mentioned in the literature in name only, but the table below orders the roles from the most mentioned to the least mentioned, as a rough and ready metric of the perceived importance researchers place on the various roles.

Table 2.2 The role of the tutor in conferencing

Facilitator	(Berge, 1995; McConnell, 1999; Kaye, 1989; Davie, 1989; Harasim, 1996; Velayo, 1994; Naidu et al., 1995; Collins and Berge 1996; Mason, 1990; Riedl, 1989; Hiltz and Turoff., 1985; Hiltz, 1995; Rohfeld and Hiemstra, 1995; Seufert, 2000; Collins and Berge, 1994)
Skilled moderator	(Berge, 1995; Collins and Berge, 1996; Mason, 1989a; Hiltz and Turoff, 1985; Rohfeld and Hiemstra, 1995; Feenberg, 1989; Seufert, 2000)
Creator of online environment	(Berge, 1995; Harasim, 1996; Velayo, 1994; Naidu et al., 1995; Harrison and Bergen, 2000; Hiltz, 1995; Feenberg, 1989)
Managing interactions, including restructure of the environment	(Berge, 1995; Velayo, 1994; Owen, 2000; Seufert, 2000)
Educationally skilled	(Berge, 1995; Hiltz and Turoff, 1985; Feenberg, 1989; Seufert, 2000)
Technically skilled	(Berge, 1995; Collins and Berge, 1996; Hiltz and Turoff, 1985)
An administrator	(Davie, 1989; Hiltz and Turoff, 1985; Feenberg, 1989)
A guide to the discussion areas at the beginning	(Collins and Berge, 1996; Mason, 1995; Feenberg, 1989)
A trainer	(Davie, 1989)
A group coordinator	(Seufert, 2000)
A mentor	(Schwen et al., 1993)

Of these roles, the only ones that have been discussed in any great detail in the literature are the facilitator and moderator roles: these are the roles which will now be considered. The role of the facilitator or moderator is discussed by many researchers, see table 2.2. Kaye (1989) and McConnell et al. (2000) discuss the role of the tutor in online conferencing as a facilitator in the educational setting. Kaye (1989) does not allude to the tutor being a moderator or carrying out any administrative tasks. The facilitator or moderator are what makes a conference successful or unsuccessful and this role usually falls to the teacher (Rohfeld and Hiemstra, 1995; Berge, 1995). The facilitator must enhance the discussion and make summaries (Rohfeld and Hiemstra, 1995). They need to strike the balance between when to interject and when to be silent (Rohfeld and Hiemstra, 1995). Four categories of moderation are described by Berge (1995 and 1996) and Collins and Berge (1996):

- *pedagogical:* refers to an educational facilitator,
- *social:* creates a social environment to promote learning, as noted in Mason (1997),
- *managerial:* organising and managing interactions,
- *technical:* making the technology transparent to the users.

Feenberg (1989) sees the moderator acting as chairperson, host, teacher, facilitator, entertainer or in other roles. Paulsen (1995) also sees the moderator carrying out several different roles throughout the presentation of the course. However, Feenberg (1989) also admits indirectly that the role of moderator, as interpreted in this way, is too big a role and that no one person has the time to perform all of these functions. He suggests that members of the student group share the functions with the moderator. However, an informal arrangement of shared roles appears to be fragile. The balance of workload would vary, so that some members would be likely to be more overloaded than others.

2.5.2 The tutors' high workload

As explained above, one effect of confusion about the role of the online tutor is overload of the tutor. However, there are other aspects of online tutoring that also tend to give tutors a high workload. The question of workload for the tutor is such an important one that this problem will now be discussed in its own right, despite some overlap with the previous discussion.

Moderating can be a big workload for a part-time tutor. The tutor's workload is affected by two general factors: firstly the number of students in the tutorial group and secondly the number of messages, typically related to the number of separate conferences, a tutor is expected to monitor. One key problem is having to read all of the messages, particularly social messages, even if they are not relevant to the course (Jones, 1994; Mason, 1995). Derycke and D'Halluin (1995) raise the issue of whether the tutor should have an obligation to monitor social messages within the online setting. Work overload may occur because traditional practices have been transferred into the online environment without thought of the consequences (Rogers, 1994). Mason (1989a) reported that when students had technical problems they felt more comfortable contacting their tutor rather than the help desk. Therefore, rather than just queries about the course, tutors also received queries about technical issues. The tutors were expected to carry out the following tasks.

- Create the online environment and be responsible for providing 'educational structures' (Harasim, 1996; Velayo, 1994; Owen, 2000).

- Manage interactions, working as an 'active agent' restructuring the environment to improve its usefulness for learning (Velayo, 1994).
- Guide the discussion areas, setting up user accounts, welcoming students on first arrival, and responding to their early messages (Davie, 1989; Harrison and Bergen, 2000).
- Take responsibility for training (Davie, 1989).
- Manage dominant personalities carefully, (Naidu et al., 1995).
- Use acceptable online conversation protocols, (Naidu et al., 1995).
- Manage information, (Hiltz and Turoff, 1985).
- Help participants to orientate themselves (Feenberg, 1989).
- Administer (Feenberg, 1989; Hiltz and Turoff, 1985).
- Reflect on online interaction, reconceptualise events and make a synthesis for the online participants (Feenberg, 1989; Seufert, 2000).
- Moderate discussion formats (Seufert, 2000).
- Control access to closed discussion groups (Seufert, 2000).
- Implement and supervise rules for interaction (Seufert, 2000).
- Initiate topics, send news, update discussion information (Seufert, 2000).
- Facilitate ease of access to needed technologies; create a sense of engagement; foster the sharing of information; promote individual gratification (Tonneson et al., 1995).

Researchers made the following suggestions to overcome some of these issues.

- Tutors need to be proficient in the use of the online medium for teaching, and be enthusiastic about its use (Alexander and Mason, 1994; Collins and Berge, 1996; Rohfeld and Hiemstra, 1995; Berge, 1995).
- Tutors need to be trained to design and construct online educational approaches (Harasim, 1996).

The multitude of roles and tasks which the tutor is expected to undertake in the online environment is a principal contributor to higher workloads online. Tutors are often unable to cope with the extra load that the roles demand. In general, additional support is needed, which is the topic of the next section.

2.5.3 The tutor needs support

Although the role of the online tutor is discussed by many researchers, as indicated above, there is comparatively little mention of additional support for the online tutor, nor consideration of how the role could be split formally between a number of people. Berge (1996) and Collins and Berge (1996) suggest that while there is a variety of roles for a single tutor to perform, the tutor need not perform all of the roles with the same degree of thoroughness. Alexander and Mason (1994) and Derycke and D'Halluin (1995) are aware of the need for good staff support but do not define the support role clearly. Derycke and D'Halluin (1995) allude to the term 'educational agents' which in different parts of their paper is taken to cover mediators, tutors, learners, teachers, advisors and academics. Following a similar pattern to that used in the previous section, the various support roles identified in the literature are shown in table 2.3 and then discussed in turn, starting with the role of social network designer.

Table 2.3 Support roles to assist the online tutor

Social network designer	see section 2.5.3.1	(Feenberg 1989; Goodrum et al., 1993)
Assistant moderator/ supporting facilitator	see section 2.5.3.2	(Berge, 1996; English and Yazdani, 1999)
Mediator	see section 2.5.3.3	(Rogers, 1994; Okamura et al., 1994)
Host	see section 2.5.3.4	(Seufert, 2000)
System manager	see section 2.5.3.4	(Naidu et al., 1995)
Educational agents	which includes mediators tutors, learners, teachers advisors and academics	(Derycke and D'Halluin, 1995)
Technical support	to deal with problems related to the CMC software	(Alexander and Mason, 1994; Mason, 1989a)
Respondent to student queries	to deal with general queries	(Mason, 1989a)
Respondent to help queries	who is well versed in the course content	(Mason, 1989a)
Course team member	to input up-to-date course information	(Mason 1989a)

Of these support roles, the only ones which have been discussed in any great detail in the literature are the social network designer, assistant moderator/supporting facilitator and mediator. These are the roles that will now be considered.

2.5.3.1 The social network designer

Feenberg (1989) concluded that the CMC needs to be organised and supported by both the 'social network designer' and a moderator. The social network designer role involves various aspects of the design of the 'social architecture' prior to the groups coming online. These aspects can be itemised as follows.

1. The selection of systems, training techniques and materials adjusted to the proficiency of the group.
2. The selection of software and systems with the features best adapted to the needs of the group.
3. The construction of the conference architecture by breaking down the various concerns of the group into separate discussion forums.
4. The provision of leadership, and development of moderating skills among members.
5. The starting of conferencing activities with all the members of the group clear on the agenda and procedures.

The social network designer needs to understand how groups interact and have the technical understanding of how to build software structures out of the available packages. Provision of technical support is not a role for the social network designer. It is not clear how the social network designer relates to Feenberg's moderator role and indeed there seems to be a slight overlap. This role does not involve administrative skills and there is no suggestion that the social network designer is involved when the CMC goes live with participants (unlike the IMF (Wilson, 1995a)). Goodrum et al. (1993) advocate a role which is similar to the social network designer. Several practitioners, appear to be adopting Feenberg's (1989) social network designer role (Harasim, 1996; Velayo, 1994; Owen, 2000). However, unlike Feenberg (1989), they appear to expect the tutor to undertake this role. Another difference from Feenberg is that these practitioners suggest that the role should continue during the presentation of the course and involve restructuring the environment rather than just setting up the structure before the course started.

2.5.3.2 Assistant moderator/ supporting facilitator

Berge (1996) suggests the use of assistant moderators who are students. A suggestion from other authors (Kaye, 1994; Mason, 1995) was that one tutor should be in overall charge of moderation and guide the activity of the other tutors, to reduce the workload on regular tutors. Sayce (2001) discussed the role of a lead tutor to support the regular tutors and the importance of tutor–tutor support. English and Yazdani (1999) have identified the need for the support of a facilitator who would be a 'motivator, mentor and mediator' (p.13).

2.5.3.3 Mediator

The mediator has a variety of roles which are discussed below. This support function was identified by Okamura et al. (1994) for the CSCW context but could equally be applied to the CMC context. Okamura et al. (1994) see these mediators as important to the success of CSCW applications. The tasks which the mediator is expected to undertake are as follows.

- To continually adapt the online technology and guide users' interactions (Okamura et al., 1994).
- To 'intervene deliberately and with organisational authorisation' (Okamura et al., 1994, p.56).
- To look after the technical issues but also the issues of context and use (Okamura et al., 1994).
- To respond to users' feedback and change the organisational environment (Okamura et al., 1994).
- To be credible with the users' and 'sensitive to' their needs (Okamura et al., 1994, p.63/64).
- To 'directly influence users' interactions with their technology, and have a profound effect on how usable, appropriate and relevant the technology is (and remains) in particular contexts of use' (Okamura et al., 1994, p.63).

In order to carry out the forgoing tasks effectively, Okamura et al. (1994) recommend that mediators have a number of characteristics.

- They should be users themselves (Okamura et al., 1994; Steeples et al., 1993).
- They need to be technically adept and understand the context of use (Okamura et al., 1994).

2.5.3.4 Other roles

Two roles that were discussed briefly in the literature were the Host and the System Manager. These are included for completeness.

Host: Seufert (2000) discusses the role of a host in the 'campus community' who designs the learning environment, provides technical support and controls access to the various areas of the environment. This support role is at the campus level and differs from other researchers who focus on one or more course implementations. This combination of a host at the campus level supporting the tutor at the course level allows the tutor to concentrate on the teaching function.

System Manager: Naidu et al. (1995) see the system manager taking on an administrative and technical role, ensuring that the CMC is working and available.

2.5.4 Other issues in the support of tutors

One key determinant of the kinds and amount of support required by tutors is the number of students assigned to each tutor. In the Open University context, there has usually been a ratio of one tutor to about 25 students for both face-to-face and online tutorial groups (Mason, 1989a; Kaye, 1994). However tutor-to-student ratios between 1:6 and 1:14 are often found when tutoring online (Alexander and Mason, 1994; Selinger, 1998; Davie, 1989). (Note that the author has adopted the convention of calling a tutor-to-student ratio of 1:14 lower or more generous than a ratio of 25:1 - beware that some authors use the opposite convention!) Similarly generous ratios of mediators to users can be found in more general CSCW contexts (Okamura et al., 1994). For example, though groups can contain between six and ten members for workshops, the whole cohort of students can be involved in discussions, seminars and shared readings (McConnell, 2000). This suggests that the use of both small and large groups should be considered depending on the role or function of the group. An important factor is the population of the course and how to divide this up into larger and smaller groupings and yet provide adequate support.

Either the tutor-to-student ratio needs to be low to allow the tutor to carry out other duties or the tutor needs an assistant. Another factor is how much scaffolding the students need. On the one hand this appears to be related to the level at which they are studying and how much support they need from their tutor. However when discussing the sub-level 'classroom community' of the environment, Seufert (2000) envisaged the instructor's role varying according to the level at which students were studying. It appeared that the tutor would be autonomous at the first level guiding learning, a facilitator at the second-level, and a group co-ordinator at the third level. In the 'Online Discussions' which is a team-centred learning method, Seufert refers to a moderator role. She also discusses a lecturer role in the 'classroom community', which is a learner-centred method. The lecturer has a passive role, generates assignments, gives individual feedback and grades assignments. On the other hand, it depends on whether the students and/or tutors are new to the medium, and how much scaffolding they need from a mediator. From his findings, Wegerif (1998) suggested using maximum structure and support at the beginning of the course and gradually taking this away to move towards greater freedom and student-centred learning. This is in line with Seufert (2000) and Sloane (1997), who suggest that a more structured and supported approach is better for students in the early stages of undergraduate study but at the higher levels and at postgraduate level, less structure is needed. Seufert (2000) holds the view that more advanced learners can adapt more easily to open-ended courses. For example the extent to which students are involved in the design of the conference structure depends on their level of study. At level two they are starting to have more autonomy whereas in their first use of conferencing they would be supported with more guidance.

The use of access permissions within the conference structure is a form of scaffolding. For example, the 'Virtual Classroom' devised by Turoff (1995) included both private and public conferences. The private conferences consisted of areas related to the course content, while the public conferences consisted of tutor and student lounges. This suggests that the use of access permissions can be used to improve the structure of online environments. To make dynamic ongoing changes to these access permissions would require additional support from a mediator.

2.5.5 Summary

Feenberg (1989) raises the question, how should computer conferences be organised, by whom and in what sort of setting? The conference structure needs to be planned, structured, supported and changed over time. Who should support the structure and ongoing interaction? Since the tutor's role, as discussed in the literature, is too big for one person and a support role is not well enough defined, the author suggests that it is better to split the role into the functions of the tutor and the functions of a support person. It would appear to be a good idea to adopt a combination of Naidu et al.'s (1995) system manager, Okamura et al.'s (1994) mediator and Feenberg's 'social network designer' role. The educational facilitation aspects of Feenberg's moderator would be adopted by the online tutor.

The combined support role (an Interactive Media Facilitator, IMF) would take away the complexities of the technology from both the students and tutors, allowing them to concentrate on the teaching and learning taking place. Some of the actions of the tutors would overlap with those of the mediator, but while the tutor was looking after a small group, the IMF would be guiding the whole cohort of students (a precursor to Seufert's (2000) host). The IMF would monitor ongoing activity, make dynamic changes to the structure when necessary and give reassurance, guidance and help.

2.6 Conclusions

The literature suggests that careful structuring and adequate support is needed to ensure effective participation in computer conferences. This chapter has considered four areas which will inform the aim of this thesis, which is to investigate the effects and benefits of structure in the context of conferences used for participant interaction and online access to course materials.

Technical issues

There appears to be an assumption that the technology would be stable and available. However researchers reported that participants had difficulties with access to online facilities. The usability of software and the learning curve associated with using a number of different packages are also relevant issues. A good structure is of little benefit if technical issues prevent access to that structure.

Navigational issues

Navigation in conference structures was problematic for participants. The software imposed rigid structures. This led to participants getting lost in the structure and posting messages in the wrong place. The author proposed the use of a hierarchical structure which could be dynamically changed.

Organisational issues

In the literature, there appeared to be a lack of any generalisable approach to organising discussion areas within a conference structure. Researchers did not have a common way of classifying interactions using different criteria. As a result, participants were overloaded with the number of messages posted. Also educational discussion was taking a back seat to social and technical discussions.

Using the previous research, the author developed a generic framework to guide the design of the conference structure. The framework has resulted from the author's classification of the elements found in the literature. The types of 'room' or 'space' could then be selected for a given domain, in this case, computer science. This research is focusing down on just one course and the environment needed to support it. Chapter 4 will discuss the comprehensive system devised by the author, which uses an underlying 'group-centred' approach.

Online support issues

Tutors were overloaded with work because they were expected to adopt a number of different roles in addition to their teaching load. The author suggests that the tutor should only be expected to concentrate on teaching. A support person should undertake all the other activities from designing the online environment through to providing ongoing support for the environment and the participants.

Having defined four key areas of interest which require further investigation, it is now appropriate to consider what evaluation techniques should be adopted. These are discussed in the next chapter.

Chapter 3: Research methods

3.1 Introduction

This thesis set out to investigate the use of structure in CMC environments for learning. The thesis aims to understand both the effects and the benefits of structure in the context of conferences used for participant interaction and online access to course materials. In particular, consideration is given to the types of hierarchy adopted to improve navigation and organisation in such systems. This chapter reports on the range of methods used to collect and analyse data in the two separate studies undertaken in this research (a pilot and a main study). Within these studies, two different strands of investigation were pursued over time. In the first strand, data were collected from both studies to address the first research question, namely, an investigation of the effects of various CMC structures on interaction. The second strand considered what benefits students gain from structured CMC systems. For this second strand the author was looking for evidence that would provide new interpretations of the student perspective. Data were collected about how students interacted in reality as compared to their perceptions of their interactions in these structured CMC environments.

The first strand of the research employed various CMC structures to improve usability during a period when technologies were changing rapidly. It was considered appropriate to include a formative evaluation in this first strand. The intention was that this approach would provide feedback from each study, which would inform the design of the structure to be adopted for the subsequent study. This incorporation of iterative improvements during the course of the research reflects a position argued for by Rowntree (1991) and Zand (1994).

When the studies were being planned, a number of research methods were considered. In the case of quantitative research methods, the sample set in M205 Fundamentals of Computing (3%), would have been too small to be representative of the population for the purposes of statistical analysis. The M205 course normally attracted a population of more than 3,000 students, the majority of whom were male. Structured methods of data collection were also considered but it was judged that these methods, often undertaken in an artificial setting, as discussed by Wilson (1998), would miss the type of rich data from user opinions, perceptions and attitudes required to inform the goal of this thesis. Indeed, experimental research is not always appropriate in educational settings, because of ethical considerations and the difficulty of getting subjects to cooperate (Hammersley et al., 1994). Also a key element of the research was that it should take place in its natural setting, as advocated by many researchers (Maruyama and Deno, 1992; Hammersley et al., 1994; Preece et al., 1994). Therefore qualitative research was undertaken in the field setting in order to:

- collect data in natural circumstances,
- interfere as little as possible with student learning,
- gain student and tutor participants cooperation, and
- gather information on users' opinions, attitudes and perceptions.

Qualitative research methods were adopted for both strands of research so that the researcher could analyse a rich data set. In the first strand, the data included observation of usage from both studies and user opinions which were collected for the main study. Indeed, in the educational setting, qualitative research methods are particularly appropriate, as data cannot be collected by controlled methods. In such complex circumstances, users' opinions, attitudes and perceptions become important indicators of what is happening. Data of this kind, when taken from a number of different perspectives, is very useful for highlighting similarities and differences in participants' perceptions, attitudes and opinions (Maruyama and Deno, 1992). The data analysis in the second strand of research used an approach influenced by grounded theory as developed by Glaser and Strauss (1967). This involved the development of analytical categories, during the process of data analysis. The data, analysed in this way, comprised of user opinions as expressed through open responses in questionnaires and interviews as compared to interpretations of online interactions. Applying an approach influenced by grounded theory to all of the different data instruments allowed categories to emerge that were related to the research on various benefits to student learning. Indeed, qualitative research is widely used for generating theory from such data (Hammersley et al., 1994). Grounded theory, as described by Glaser and Strauss (1967) is a general method of comparative analysis used for the discovery of theory from data – systematically obtained and analysed in social research. It is often considered to be a specific type of qualitative research; however some researchers characterise it as the interweaving of data collection, theory construction and testing (Foster, 1998; Strauss and Corbin, 1998). Grounded theorising (based on Glaser and Strauss, 1967) is probably the most common approach in use today for qualitative data analysis (Boulton and Hammersley, 1998). Interpretation of action and interaction are an important part of grounded theorising and this method allows theory to have some practical application (Strauss and Corbin, 1998). For example, grounded theory is an appropriate method for analysing changes in behaviour in the field of education (Strauss and Corbin, 1998).

3.2 The role of the researcher

The researcher was a participant observer (Foster, 1998; Wilson 1998) in the two studies. She devised CMC structures, set them up and then evaluated them. The researcher was an accepted member of the online culture, and perceived to be a valued participant (according to tutor feedback) by those being studied. The use of a pre-project questionnaire had enabled the students to become familiar with the researcher, in advance of the main study.

In undertaking this research in the natural setting it was important for the researcher to have as few preconceived ideas as possible about what the outcomes might be, so that the data could speak for themselves (Hammersley et al., 1994; Maruyama and Deno, 1992). To this end, she tried to uncover as many meanings as possible over time, which is in keeping with an approach influenced by grounded theory as proposed by Hammersley et al. (1994). The researcher used a variety of instruments and continually refined the design of the research with the content of future data collection being informed by analysis of earlier data. As a participant observer, the researcher could construct appropriate questions for the collection of user opinions and find conference areas of interest, which would merit further investigation.

3.3 Selection of participants

The pilot study (using CoSy with Wigwam, essentially a rudimentary text-based system) consisted of five tutors and a number of invited guests, but there were no students at this stage as involvement would have interrupted their study mid way through a course and was thought to be inappropriate. By contrast the main study involved 110 students at the outset (3% of the target population) and nine tutors. The complementary study started off with 75 students and nine tutors.

The researcher was aware that a random sample of participants would have been the best method of selection. However as this was an early phase of studies for an ongoing course, student-to-tutor allocation had to be undertaken in the Open University administrative regions in the normal way. The allocation process matched the student to their nearest study centre. These constraints with the administration and regulations meant that it was not possible to have a random sample of students spread across the UK and Europe. Students had to be contacted to see whether they were willing to participate, and whether they had a computer capable of supporting the CMC software and a telephone line available. In most cases the students who were excluded from the main study either did not have a computer able to run the software, or were concerned about the cost of their telephone access, or the extra course work involved, or did not have access to a telephone line. A detailed analysis of the facilities available to students can be found in Wilson, (1995b). The students were self-selected volunteers and, as such, were a non-random sample. However measures were taken to make this group as representative of the target population as possible. For example remote, rural- and urban-based participants were included. Tutorial groups were geographically widespread in both the UK and in Europe, which allowed exhaustive data collection in a few well-chosen areas.

3.4 Data collection methods

In general, it is rare that one data collection instrument alone will produce good results (Shackel, 1994; Hammersley et al., 1994). Researchers who adopt qualitative analysis often combine observational studies with interviews. This combination of techniques is referred to as 'unstructured data' (Boulton and Hammersley, 1998). Given that the research was taking place within a CMC environment, it would have been inadequate to use only observation and interviews. It was therefore considered appropriate to adopt these two techniques, complemented by questionnaires and the interpretation of naturally-occurring online interactions. This latter technique is particularly appropriate for use in natural or online settings, as opposed to artificial settings in laboratories. Indeed, Strauss and Corbin (1998, p.160) insist that grounded theory is interpretive work, which 'must include the perspectives and voices of the people' under study. Furthermore, they state that 'interpretations are sought for understanding the actions of individual or collective actors'. The four techniques adopted were:

- observation,
- interviews,
- questionnaires,
- interpretation of naturally-occurring interactions.

It is interesting to note that the first three evaluation techniques mentioned above, are used for both the HCI evaluation methodology (Preece et al., 1994) and correspond with the most common evaluation techniques advocated by educational researchers. For example, the three most common data collection techniques used in the research reviewed in chapter 2 were interviews, questionnaires and observation. Also, in a general social science context, Fowler (1993) describes what is essentially the same as the third of the four techniques above as 'the survey research method'. Maruyama and Deno (1992) and Hammersley et al., (1994) would describe the fourth of the four types of evaluation as a form of measuring the natural process taking place. Similarly, in the general social science context, Foster (1998) would describe interpretations of naturally-occurring interactions as 'less structured observation'. Indeed, the term 'observation' is used in different ways by different researchers. Some refer to structured observation as a quantitative research method and less structured or unstructured observation as a qualitative technique. Preece et al. (1994) also suggest that observation can be used both formally and informally, which adds to the confusion. The author prefers to adopt the terminology 'observing and monitoring usage' for data related to users' interactions with the CMC software and adopt the expression 'interpreting naturally-occurring interactions' to discuss interactions between individuals within the CMC. The author also prefers to use Preece et al.'s (1994) description of questionnaires and interviews as collecting user opinions.

Therefore the three techniques used can be described as:

- observing and monitoring usage,
- collecting users' opinions by interviews and by questionnaires,
- interpreting naturally-occurring interactions in the online environment.

These techniques are three of the five types of evaluation described by Preece et al., (1994) within the field of Human Computer Interaction (HCI). A division of this type is most appropriate for this research, given the need to collect data on users' perceptions for comparison with their online interactions to address the second research question. These approaches are discussed further in the sections below.

The three techniques discussed above were chosen because they are advocated for qualitative analysis, which aims to understand what people do and think. Data were collected that allow multiple perspectives of the participant's opinions, attitudes, perceptions and behaviour to emerge. One of the known problems with research studies is that subjects' early impressions can be tainted with 'novelty value'. A contrasting danger is where the researcher waits until early impressions have faded and collects post hoc rationalisations. A third issue is the Hawthorn effect, where subjects perform better as a result of the additional attention they are receiving. In order to overcome these three problems, the researcher undertook substantial temporal impressions using a variety of data collection instruments during the two studies (Maruyama and Deno, 1992; Hammersley et al., 1994).

3.4.1 The two studies

The two studies were used to investigate issues about the design and structure of CMC environments. (For the reader's convenience in putting the details of this section into context, the table showing the two studies in chapter 1 is reproduced below. Table 3.1 summarises the key characteristics of the three studies.)

As noted earlier, the first research question was to establish the effectiveness of the structures adopted. For this purpose, the observing and monitoring usage technique was used in the two studies. User opinions gathered from participants in the main study were also used to address this first research question.

Table 3.1 The two studies undertaken between June 1994 and November 1995.

	Pilot study (CoSy with Wigwam)	Main study (FirstClass)
Duration	6/94 - 1/95	2/95 - 10/95
Facilities	Email and conference areas	Email, conference areas and a bulletin board
Type of structure adopted	A limited-level hierarchy imposed by the software	An extended hierarchical structure which could be modified over time
Participants	Tutors only	Students and tutors
Evaluation techniques	Observing and monitoring users' interactions	Observing and monitoring users' interactions Collecting users' opinions Interpreting naturally-occurring interactions.

The second research question focused on what educational benefits students could gain from a structured CMC. An approach influenced by grounded theory was used on the data related to the main study, which additionally included the third of the three techniques identified in the previous section, namely the interpretation of naturally-occurring interactions.

As might be expected with research carried out in a natural setting, practical constraints and changes in relevant technologies as the studies progressed, and details of the ways in which the techniques were applied, varied during the two studies in a complicated way. For example, the duration, facilities, types of structure adopted, participants and evaluation techniques all varied (table 3.1). In many respects, these differences are of no great significance for the research. However in order to follow the way in which the various techniques were actually applied in each study, the reader may find it helpful to form a picture, at least in outline, of these differences between the studies. The aim of this section is to give an overview of the relationship between these differences and the evaluation techniques used.

The relationship between the data collection methods and the different studies is shown in figure 3.1. (There is no need at this point for the reader to understand all of the details of the diagram, though it will be referred to later where this helps with clarity.) At the top of the diagram, a timeline indicates the duration of the three studies. As noted in chapter 1, three alternative technologies were adopted. Only tutors were involved in the pilot study, whereas both tutors and students were involved in the main study. Below the timeline, the four different data collection activities are shown. The rectangular boxes represent the questionnaires against the timeline throughout the study. The tape recording icons roughly show the timings of interviews. The timings when questionnaires were administered and interviews took place are shown in table 3.2.

Figure 3.1 An overview of the data collection methods for the two studies

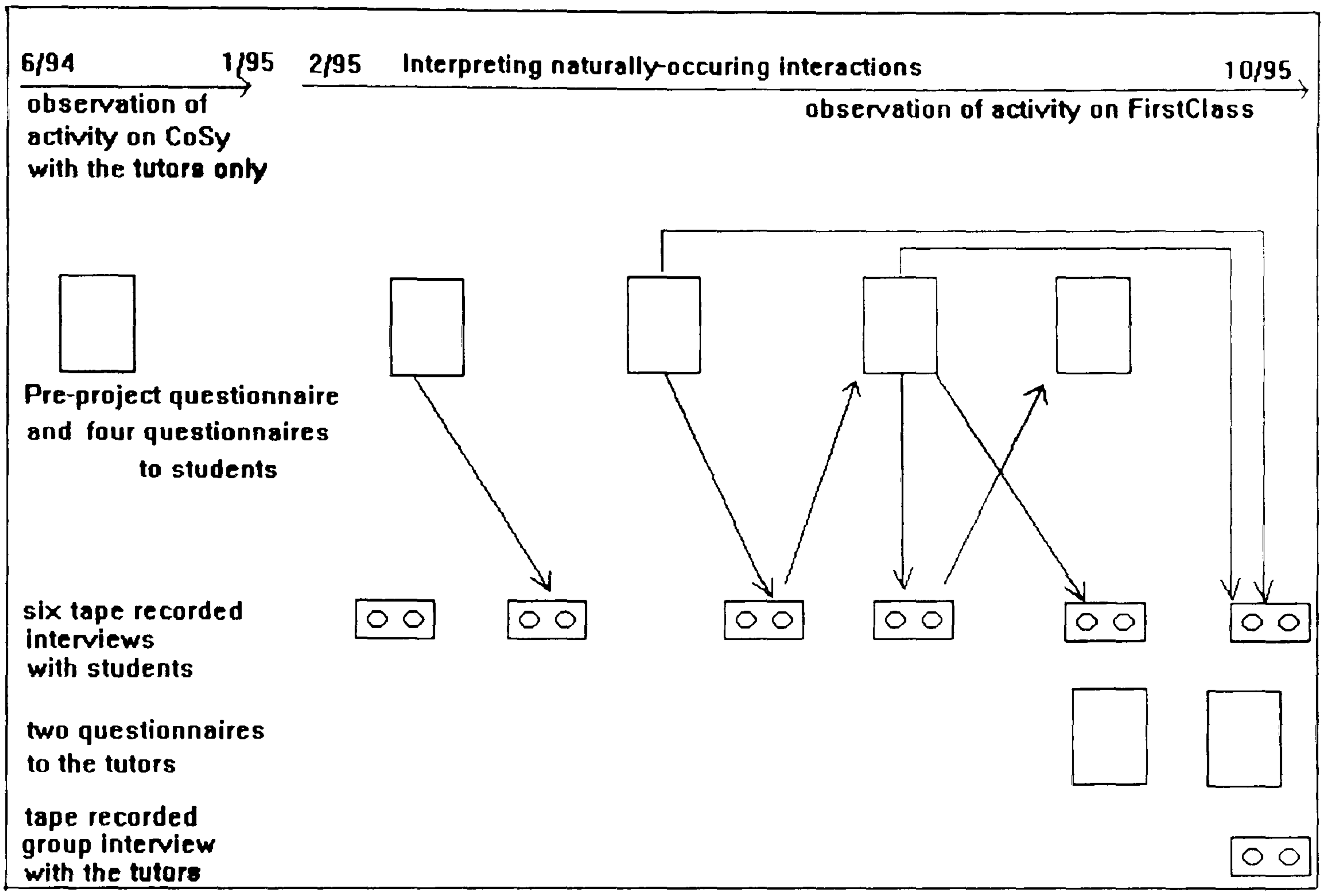


Table 3.2 Timetable for administration of questionnaires and interviews to students

Questionnaires	Sept 94		mid Mar		early Aug		early Sep	late Sep	
Interviews		early Mar		early May		mid Aug	early Sep	late Sep	late Oct

The tutors were sent questionnaires in late September and late October. The group interview with the tutors took place in late October. Although this description matches the research undertaken in the thesis, the variety of data collection techniques used demand that these are discussed individually. Therefore the three types of evaluation selected from Preece et al. (1994) that were mentioned above will now be discussed in more detail.

3.4.2 Observing and monitoring usage of the CMCs

To understand how much use the participants were making of the CMC systems, observing and monitoring usage was undertaken during the two studies (the pilot employing CoSy with Wigwam; and the main study using FirstClass). As mentioned earlier, researchers in related fields use the term 'observation' to mean a number of different activities. In the case of the two studies, the author uses the term 'observation' to refer not to data about interactions between users, but to data gathered about individual user activity in the CMC, for example:

- access logs which showed when users were online,
- the number of messages posted,
- dates when areas of the structures were in use.

As automatic procedures for monitoring these kinds of activity were not built into these two systems, these data were collected semi-manually at intervals to record changes over time. In the case of the pilot study (CoSy with Wigwam) only, traditional observational data were also collected. These data was related to conference messages posted by the tutors to the conference topics.

3.4.3 Collecting users' opinions

For the first strand of research, users' opinions were collected to understand their perceptions and attitudes related to the effectiveness of the structure and usability of the software. In the second strand of the research the users' opinions were employed to gauge the benefits of the structured CMC. The data were collected through a combination of questionnaires and semi-structured interviews (Preece et al., 1994; Zand, 1994; Fowler, 1993). These techniques were used in the main study (FirstClass, textual conferencing with an integrated GUI). These data collection methods were used in the main study to allow a direct assessment of the students' attitudes and perceptions of their behaviour online and that of their peers and their tutor. This involved probing the students for their own evaluations of various aspects of the structural organisation, the usability of the software and the benefits they received from structured CMC environments. Questionnaires and a group interview were also used to collect data from the tutors.

To validate the data collection instruments, they were reviewed with competent researchers before they were used. An advance letter (which was an invitation to participate), the pre-project questionnaire, online questionnaires and semi-structured interviews were scrutinised and changed after advice from three independent experts. The pre-project questionnaire was used as a pilot to test out this data collection method. The advance letter enclosed with the pre-project questionnaire informed the individuals that their participation was totally voluntary, optional and supplementary to the traditional version of the course. They were also told that all information would be confidential. Copies of the letters, questionnaires and interview schedules can be found in appendix B.

Although all respondents were asked the same questions, the wording and format of the questionnaires and interviews changed with time reflecting the findings from earlier student responses. In general, each method of data collection was used to illuminate the data collected by another: for example, samples of the early questionnaires and interviews influenced further research (Foster, 1998; Fowler, 1993). This process helped to enrich the picture of events and provided a means of triangulating data from different sources. For example, the researcher formed impressions of useful question categories to follow-up lines of enquiry. The content of the instruments used, therefore, evolved to some extent over time. The author found that results from one instrument could be usefully followed up using another technique. For example, a number of related and follow-up questions were asked in both the questionnaires and semi-structured interviews. The latter is indicated in figure 3.1 by the arrows between the questionnaires and interviews. In some cases a question was asked in an interview before it was asked on a questionnaire, and vice versa. In many cases the interviewer could sense that a question was not fully understood and could quickly follow this up by asking the question differently. When an interview question was used on a subsequent questionnaire, there was therefore a better chance that the student would understand the question being asked and respond with understanding. The use of two different techniques while asking the same question gave comparable answers and captured more of the complexity of the situation.

3.4.3.1 Questionnaires to students

Five questionnaires in all were sent to the students, including a pre-project questionnaire. Four of the five questionnaires were sent during the course of the main study. Questionnaires were used mainly to gather qualitative data. As response rates to questionnaires can often be disappointing, each questionnaire was made as concise as possible in the student case, with the length limited to one single-sided page. Questions that required some reflection were put into the middle of the questionnaire rather than at the beginning. Every effort was made to make the questions unambiguous and non-technical, to ensure as little interference with student study as possible. In fact, these were tested on members of the course team and competent research staff.

Student involvement was dependent on students having access to a computer capable of running the CMC software and access to a telephone line. Therefore a pre-project questionnaire was designed to collect this information to aid the selection of participants. Additionally the questionnaire was used to ascertain students' previous experience of modems, email and conferencing. The questionnaire was accompanied by a letter (Fowler, 1993; Frey and Oishi, 1995) that informed the students about the intended project. This pre-project questionnaire was used in part to explore any problems in using the questionnaire data collection method with these subjects. As student responses needed to be curtailed in the pre-project questionnaire, closed questions were adopted. This questionnaire allowed early identification of the typical types of response to this type of question. Based on the responses to the questionnaires, the researcher was able to select individuals. Those who fitted the selection criteria were sent a follow-up letter to secure their help with the project and the evaluation, see appendix B.

The students were sent the pre-project questionnaire by ordinary mail in September 1994. There was a disappointing postal response of 52% (the Open University courses survey uses a postal questionnaire which usually achieves a response rate of 55-60%, however more specific surveys such as the one reported here normally receive a response rate of 70%). As the response rate was not good, the author decided that it would be better to evaluate the main study using online questionnaires at timed intervals, as detailed in table 3.2. The researcher was then in a position to remind the non-respondents to return their questionnaires on several occasions (Fowler, 1993). The use of email facilitated these reminders and achieved a better response rate than the pre-project questionnaire, as summarised in table 3.3. The use of online questionnaires was a relatively novel collection instrument in the evaluation of CMC environments at the time the study was undertaken. The online questionnaire responses formed a temporal study. The first online questionnaire was sent out to students in the main study (FirstClass) after one-month, to allow them to have undertaken all of the training activities. Indeed, to answer the questionnaire they needed to understand how to download a file, open it in Windows Write, fill it in, upload it and send it back.

Table 3.3 Questionnaires sent to and returned by students

	Number of questionnaires sent out	**Number of questionnaires returned**	**Response rate**
Pre-project questionnaire - Sept 94	324	168	52%
1st questionnaire - mid Mar 95	106	62	58%
2nd questionnaire - early Aug 95	67	49	73%
3rd questionnaire - early Sept 95	58	47	81%
4th questionnaire - late Sept 95	58	48	83%

To enhance students' responses for the evaluation of the actual studies, a combination of question types was adopted. These are described as open-ended and 'closed' questions (Zand, 1994; Preece et al., 1994; Wilson, 1998; Fowler, 1993; Mason, 1995b). The open-ended questions were geared to ascertain the students' opinions. A variety of 'closed' questions were adopted which included simple checklists and a five-point rating scale question (as described by Preece et al., 1994). In this thesis, these 'closed' questions are termed 'simple answer category' questions. These were provided to give the participants a variety of question types and also to elicit qualitative and quantitative data. Therefore the four online questionnaires contained both simple category questions and open or free response questions. Table 3.4 shows the numbers of both type of question in each of the four questionnaires. The students were asked forty questions in all. Each questionnaire also included a section for extra comments.

Table 3.4 Types of question posed to students in each questionnaire

	1st questionnaire	2nd questionnaire	3rd questionnaire	4th questionnaire
Simple answer categories	9	8	4	7
Open questions	1	2	3	3

In the first questionnaire, three questions from Issroff (1994) were repeated and an additional two questions were modified. See appendix B for examples of open and closed questions (some of the questions in the appendix are investigating issues not in the thesis, which were the subject of papers or will be the subject of a future paper).

The online questionnaires were intended to collect information about how student perceptions and attitudes were changing with time. For example, a question was asked in the first questionnaire and again in the fourth questionnaire, in order to compare students' views early in the course with their views towards the end of the course. Students were also asked retrospective questions. This summarises the key points related to the questionnaires issued to students. In the next section the questionnaires issued to tutors are considered.

3.4.3.2 Questionnaires to tutors

The tutors were secondary to the evaluation but received two questionnaires towards the end of the course, see table 3.5. Although not as important as the student responses, their feedback was primarily to give indirect measures of what they as tutor experts had observed of their students' involvement in the main study (FirstClass, textual conferencing with an integrated GUI). Indeed Bosworth (1991) suggests that opinions other than those of the students should be collected in evaluation studies.

Table 3.5 Questionnaires sent to and returned by tutors

	Number of questionnaires sent out	Number of questionnaires returned	Response rate
1st questionnaire - late Sept 95	9	8	89%
2nd questionnaire - late Oct 95	9	8	89%

To undertake a direct comparison of the tutors' views with those of their students, the tutors were asked some of the same questions as the students. They were asked about their own use of the environment and asked what they had observed their students doing. In the first questionnaire the questions were open, closed (or simple answer category), and retrospective, see appendix B. In the second questionnaire the questions were all open-ended, in order to ascertain the tutor's singular views about the M205-STILE conference and to focus their minds prior to the group interview

Table 3.6 Types of question posed to the tutors in each questionnaire

	1st questionnaire	2nd questionnaire
Simple answer categories	5	0
Open questions	6	19

These questionnaires were not restricted to one page as it was essential to gather as much information as possible from the tutors in the time that was left. This completes this section on the questionnaires sent to tutors. The next section discusses the second data collection instrument for user opinions, which involved interviews.

3.4.3.3 Semi-structured personal interviews with students

Interviews were used to gather more detailed information about each student's individual experience, which could not be captured in questionnaires (Zand, 1994). These interviews were undertaken with a smaller number of students, at six points during the course, to provide qualitative comparative data over time. The style of interview was semi-structured as described by Preece et al. (1994). One of the interview questions was adapted from Hiltz and Turoff (1985). Students were contacted in advance of the interviews by email to enlist their cooperation.

Although recommended for quantitative analysis, Fowler's (1993) suggestions were adopted, where possible, for the qualitative research discussed in this thesis. For example, individual personal interviews were conducted by telephone and recorded. The subjects were contacted in their own homes during the evening and at weekends. These interviews formed another temporal study with a uniformity of approach, using one interviewer who was a good listener. The tape recordings were transcribed which assisted with completeness and accuracy. Interviews were held initially with 12 students, six of each gender (group one in table 3.7).

Table 3.7 Timetable for personal student interviews and the number of students interviewed from each group

	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5	Interview 6
	Early March	Early May	Mid August	Early Sept	Late Sept	Late Oct
	Group one	Group one	Group two	Group three	Group three	Group three
Student A	yes	yes	yes	yes	yes	yes
Student B	yes	yes	yes	yes	yes	yes
Student C	yes	yes	yes	yes	yes	yes
Student D	yes	yes	yes	yes	yes	yes
Student E	yes	yes	yes			
Student F	yes	yes				
Student G	yes	yes				
Student H	yes	yes				
Student I	yes	yes				
Student J	yes	yes				
Student K	yes	yes				
Student L	yes	yes				

The students were selected as three groups of four students and where possible the students had the same tutor to ensure conditions were similar. One group was based in England, one in Scotland and one in Wales. Each group of four students contained two male students and two female students. In each gender pair, one student had experience of the technology and one did not. The expectation was that some of these students would not be available (for personal reasons) for a full six interviews throughout the year. The dates when the interviews were held, and the number of students interviewed from each group, is shown in table 3.7. The aim was to carry out a minimum of six interviews with four students, which was achieved. The final four students (group four) were determined by their availability to take part in all six interviews; three were female. Two of the students were experienced with online working while two were not. Unfortunately each student had a different tutor.

The interviews were aimed at eliciting personal experiences that would be expressed in greater detail. These data would provide corroborating information to complement and enhance the group information gathered through the questionnaires. The semi-structured interviews contained questions, which were all of an open type, but sub-questions were often adopted to overcome misunderstandings. The students' perspective was captured through successive interviews throughout the year. Responses in early interviews were pursued in more detail in later interviews. The interviews were also aimed at non-contributors to assess the value of passive participation, Kaye (1994). These instruments gave the participants perceptions of their interactions and this could be used in contrast with their actual behaviour as noted through interpreting naturally-occurring interactions, see section 3.4.4.

3.4.3.4 Group interview with the tutors

The tutors had a group meeting at the end of the course. The intention was that the group interview would gather their consensus of opinions. Eight tutors were able to attend this group interview. The discussion was tape recorded and later transcribed. The question types were mostly open to encourage discussion. The main aim of this group interview was to collect data from the tutors on their opinions of students' online activities, various aspects of the structural organisation, and the benefits that their students gained from structured CMC environments. The tutors' perceptions of their online teaching experience were also elicited to see if it matched the picture presented by the students.

3.4.4 Interpreting naturally-occurring interactions

Data related to interactions, which occurred naturally, was collected to understand the participants' behaviour in the online environment and to use it in comparison with their perceptions and attitudes collected in questionnaires and interviews. As the thesis is based on CMC environments where aural and visual cues were not available, the focus of interpreting naturally-occurring interactions was based on what was being said in conference messages and whether students or tutors were speaking. To facilitate the analysis, all conference messages in the main study (FirstClass, textual conferencing with an integrated GUI) were archived. This provided a continuous record of the conference interactions throughout this study and a record of how these changed and developed over time. As a participant observer, it was possible for the researcher to discreetly observe all activity, in order to understand:

- what was happening,
- at what times it occurred,
- the number of times it occurred, and
- who was involved in the interaction.

As an observer, the researcher could identify the most active areas and analyse the naturally-occurring interactions taking place there. Four sub-conferences were scrutinised to investigate whom the interactions were between and the types of interactions, which took place. Data about the quantity of interactions between tutors and students, and between students themselves, was also collected. The message history feature (also used by Owen, 2000) assisted with the latter as it was possible to:

- count the number of message readers of a FirstClass message,
- see if students were responding to other students or to their tutor.

Participants were able to interact together unaware that they were being observed. This helped to ensure more natural interaction, especially as time progressed. The researcher's intention was that this interpretation of naturally-occurring interactions would provide a comparison of what students were actually doing, as contrasted with the self-reported perceptions of students and tutors. Incidents that occurred were followed up by questioning the students and tutors through questionnaires and interviews. These data were valuable for triangulation purposes to increase reliability and build up an understanding of student behaviour over a period of time. Email reports of software installation and students' enthusiasm were recorded. Unsolicited comments made in questionnaires were collected (Mason, 1995). The interpretation of naturally-occurring interactions is particularly valuable (according to Preece et al., 1994) to understand the types of complex exchanges taking place within online systems. This completes the section on data collection methods. In the next section the discussion moves on to how the data were analysed.

3.5 Preparing data for both types of analysis

The two main research questions, concerning respectively the detailed effects of structure in CMCs on users' interactions, and the perceived benefits of structure, required the data to be analysed in two different ways. However, the data needed to be prepared before analysis. The method of preparation was essentially the same for the two kinds of data. For example, open-ended responses to the online questionnaires were cut and pasted into a file so that they could be sorted and resorted. The interview transcriptions were broken down into separate responses. These were cut and pasted into a file so that they could be manipulated. The conference messages were archived to assist with analysis. To minimise the possibility of investigator errors and produce credible results, all analysis was undertaken manually by hand (Maruyama and Deno, 1992). The next sub-section looks in more detail at the analysis undertaken to answer the first research question.

3.5.1 Analysis of the data related to the first research question

Recall that the first research question concerns the effects of structure on CMCs. As discussed in the preceding section, two principal methods were used for collecting data to address this question, namely:

- observing and monitoring usage,
- collecting users' opinions.

Both kinds of data were collected for both studies (except that users' opinions were not collected for the pilot study) but the data were collected and analysed in different ways for the different studies, which will now be described.

3.5.1.1 Analysis of data collected by observing and monitoring usage

Data related to observation and monitoring of usage were collected and analysed in two different ways at different points during the studies as follows.

3.5.1.1.1 Analysis of observation data in the pilot study and the main study

Access logs were analysed by the researcher to establish:

- when and for how long students and tutors were online,
- the number of messages posted in each principal conference,
- the dates when areas of the structures were in use.

This information was then used to help guide the interpretation of naturally-occurring interactions (see 3.5.2).

3.5.1.1.2 Analysis of observation data in the pilot study alone

The analysis of the observation data in the pilot study alone involved the analysis of conference messages in two different ways.

- For all messages it was determined whether the subject of the message was relevant or irrelevant to the intended discussion. The number of messages in each of these two categories was counted within each conference topic.

- All messages were analysed for any comments that concerned the usability of both the conference structure and the software.

Comments relating to the usability of both the structure and the software were collated together under different headings that emerged during the analysis, e.g. navigation, organisation and support.

3.5.1.2 Analysis of data obtained by collection of users' opinions

The data collected on users' opinions (interviews and questionnaires) for the main study were collated into separate files.

1. They were printed out to aid analysis.
2. The researcher looked for repeating patterns in the use of comments and interesting suggestions. These were counted up and allocated to separate categories.

Each message was read several times on more than one occasion to check that the category was appropriate. This type of analysis is discussed further in section 3.5.2. The data obtained from 'closed ended' questions were analysed by counting up the number of responses to each option offered. Qualitative analysis was used on the 'open questions', which is discussed also in chapter 5. This completes the discussion of the analysis of data used to address the first research question. The analysis used to address the second research question is the subject of the next sub-section.

3.5.2 Analysis of the data related to the second research question, using an approach influenced by grounded theory

The more detailed categorical analyses of the data collected for the main study addressed the second research question: recall that this question concerns the benefits which students may gain from structured conferencing in CMC environments. The approach to analysis was influenced by grounded theory (Hammersley et al., 1994; Swift, 1998; Boulton and Hammersley, 1998; who all refer to the originators Glaser and Strauss, 1967). Indeed a number of CMC researchers have used interpretative techniques to analyse their data (English and Yazdani, 1999; Wegerif, 1998) though it is not clear how these techniques were used. The main study was used to undertake the detailed analysis of the students' perceptions of the structure adopted as compared with an interpretation of their behaviour (interactions) within the structure which had been devised using the comprehensive framework proposed in chapters 1 and 2. The forms of data analysed were:

- users' opinions, and
- interpretations of naturally-occurring interactions.

This data analysis included open-ended responses in questionnaires, semi-structured interviews and comments in conference messages. The data from these three sources were analysed by categorising similar responses into groups and counting the frequencies in each. Comparisons were made across the different techniques. In line with the influence of grounded theory on the methodology, various important categories emerged during the analysis and collection of the data. For practical reasons, an *a priori* category was used in addition to the emergent categories for purposes of classifying the emergent categories. This additional category is in fact one of the dimensions from the three-dimensional taxonomy introduced in the introduction and literature review, namely the 'domain of discussion'. The additional category was introduced for purposes of organisational clarity and to facilitate analysis of the data by others working from alternative perspectives; however not all of the data have been forced to conform to this pattern.

Data analysis was undertaken during the data collection phase. As an integral part of this preliminary analysis using an approach influenced by grounded theory, analytically meaningful categories were established in advance of writing the thesis and peer reviewers of the published papers critiqued these. These early established categories, have undergone further refinement in the work described in this thesis. This thesis has involved reanalysis of all the data collected, which includes both published material and interview, and other data that are unpublished. In line with an approach influenced by grounded theory, the researcher became familiar with all of the relevant data and continually assessed them to identify emerging categories by reading and rereading open-ended responses in questionnaires, semi-structured interviews and conference messages. Sections of the data were analysed separately. This was followed by comparative analysis across similar aspects of data, which were collected over a period of time, using different instruments. Boulton and Hammersley (1998) suggest that the sources of data that can be analysed using grounded theory, include observation and user opinions. Note though that the author has used the term 'interpreting naturally-occurring interactions' in line with Preece et al's. (1994) terminology rather than the term observation. They further suggest that grounded theorising can be applied to all appropriately collected data, and categories developed can be applied to different cases. In this research, this involved thinking about what the categories should include, their boundaries and what similarities and differences appeared across the interviews, questionnaires and conference messages. In one case, where data had been analysed previously for some other purpose (Wilson and Whitelock, 1997c) a number of steps were taken to reanalyse the data for the thesis:

1. An initial sample of the data was analysed. This sample related to how the students expected to use FirstClass to help with their study. The data, which had been collated in a file, were printed out to aid annotation. The researcher looked for comments that were interesting, or repeated and made comments in the margins of the printout. An initial set of nine categories was developed, as discussed in chapter 6.
2. This initial set of categories was used for the reanalysis of all of the data. Data related to each category were gathered together.
3. The data assigned to each of the nine categories were then compared (Glaser and Strauss call this the 'constant comparative method').
4. It became obvious that some of the categorisation was too fine. There were too many categories with too few entries. An iterative process of examining the categories repeatedly and the interpretation of the data in these categories was used to reformulate the data. This reformulation led to the development of some new categories.
5. After these modifications were made to the categories, the researcher looked back to the previous analysis to check if the category that was assigned was still appropriate and if not to change it to the new category if that was appropriate.
6. The data were reexamined to see if any data not already assigned to a category fitted better.

After checking and rechecking, a taxonomy of categories was then developed by the researcher. This taxonomy was given to two independent researchers who attempted to use it on the same data (Preece, 1994; Fowler, 1993; Foster, 1998). The taxonomy was modified in the light of their feedback. Steps 4 to 6 were undertaken again across the data collected from open-ended responses in questionnaires, semi-structured interviews and conference messages.

Data were grouped together behind well-developed categories. These were mutually exclusive and were used to count up instances as suggested by Boulton and Hammersley (1998). However, because the number involved in the main study was small, this would be more viable for future work with larger numbers and using more structured methods. This process of analysis is considered in chapters 6, 7 and 8.

In this thesis, it is argued that the classification of categories which emerged from the process description above, was established with considerable care. It is argued that these categories give important indications to help in understanding what benefits students gain from the structuring of CMC systems. This process is a central contribution of the thesis, intended to provide a baseline for the future development of theory. One useful outcome of such a process is to enable suitable hypotheses to be framed and to enable future testing with larger numbers and using more structured methods. The next chapter discusses how the hierarchical structures employed in the CMCs were developed for the three different technologies.

Chapter 4: First steps towards investigating the use of structured CMCs

4.1 Introduction

This section of the thesis (chapters 4 and 5) investigates the effects that limited-level (flat) and hierarchical structures have on CMC users. This will address the first of the research questions. To this end, the two empirical studies originally outlined in the chapter on methodology (chapter 3) are discussed in more detail, focusing on technical, navigational, organisational and online support issues. The present chapter focuses in particular on the findings and iterative changes made to the online structure which was used with the tutors in the pilot study (CoSy with Wigwam). The findings from the pilot study influenced the design of the CMC structure for the main study. The proposed structure for the main study (FirstClass), which was designed to support both tutors and students, is then discussed. The findings from the main study are considered in the next chapter.

4.2 The course selected

Two pragmatic, practical considerations influenced the selection of the course (M205) which was to be the focus of the two studies. Firstly, the course had pre-existing teaching difficulties (itemised below) which it was thought might be addressed by the introduction of a CMC system. Secondly, the course was near the end of its life cycle and due for rewriting. Consequently, if convincing empirical evidence could be found for benefits to students learning, a plausible argument might be made within the university for introducing a CMC system as part of the replacement course, with possible benefits for thousands of students. These pragmatic considerations influenced the choice of course for the study. The key elements of the chosen course will now be briefly outlined. The course, Fundamentals of Computing (M205), was an established post-foundation computer science course that had been running since 1988. The usual presentation of this course ran from February to October and it contained six blocks of study. The students submitted eight tutor-marked assignments and sat an exam at the end of the course. The format for the course was similar to many other undergraduate Open University courses. The main focus of the course was Pascal Programming and students made extensive use of a home-based personal computer to write their program code. Yearly recruitment to the course was in excess of 3,000 students.

The adoption of a CMC system was intended to remedy specific teaching problems associated with teaching a computer science course at a distance. For example, in the case of the traditional M205 course, when students experienced programming problems and needed help, they contacted their tutor by telephone. It proved difficult for students to explain their programming problems over the telephone and tutors found it difficult to visualise the program without seeing the code either on paper or in an electronic form. Although ordinary mail and face-to-face tutorials made the program code more visible to both parties, the delay of a week or more for such an opportunity was frustrating for the student, especially if the problem was simply a syntactical error, such as a missing semi-colon, or a misplaced program statement. Access to tutors and peers was further restricted since M205 did not have a summer school. Given this background, the use of a CMC system to support learning and teaching online was intended to overcome the problems of:

- describing program code over the telephone,
- having to wait for an ordinary mail response to a program listing or a piece of code sent on a floppy disk,
- the infrequent opportunities to discuss program code at face-to-face tutorials.

4.3 The pilot study (CoSy with Wigwam)

The pilot study used a rudimentary text-based conferencing system called 'CoSy with Wigwam'. This conferencing system was already in use at the Open University for students on selected courses, and was the only conferencing system supported by the central IT computing services at the time. Consequently, CoSy was the de facto choice for conferencing software for the study. The Open University had adopted the CoSy software, developed by Guelph University, in 1989. At the time of the study, the version in use was CoSy 2.

The user interface was command line driven, and involved users making a Telnet connection to a VAX computer. The user was required to be online at all times when reading conference messages. This led to expensive connection charges for students.

As a result, the Open University commissioned Ashmount Research to produce an offline reader for CoSy 2, which had a graphical user interface. Once the student had connected briefly to the online system, messages could then be read offline, at the student's convenience. The offline reader was called Wigwam 1 and ran in the Windows environment. This was the system that was available for the M205 course which is discussed below. In summary, the pilot study used a fairly rudimentary text conferencing system and separate offline reader, which provided a graphical user interface (CoSy with Wigwam).

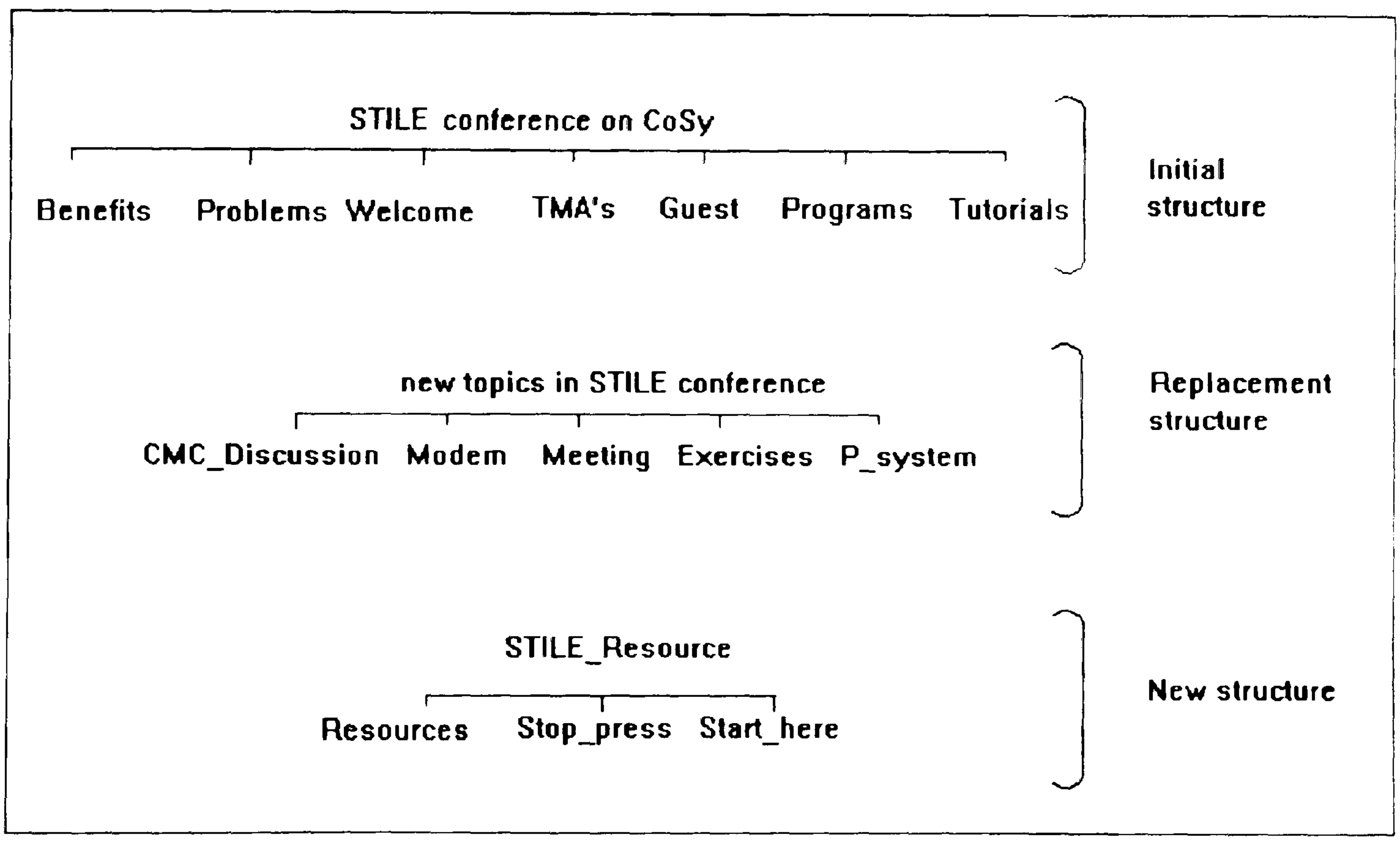
The pilot study, which facilitated tutor–tutor interaction, involved three distinct conferencing structures. An 'initial structure' was created. This was redesigned during the study, producing a 'replacement structure'. Finally, towards the end of the pilot study, a 'new structure' was developed in the light of the empirical findings to complement the 'replacement structure'. The main components of the organisational structures in the pilot study were formed of: conferences (common repositories for messages) and email. This study set out to investigate both the technical and navigational issues associated with the use of the software itself.

The five tutors involved in the pilot all had experience of teaching M205 at a distance. Two of the tutors were female and three were male. One tutor from each gender group had experience with modems and CMC software. Two tutors had experience in the use of email via a network. An additional aim of the pilot study was to help the tutors to become familiar with the conferencing system, to investigate how to teach with it, and how to use teaching materials online (Soloway, 1995; Rohfeld and Hiemstra, 1995). To endeavour to fulfil this additional aim it was important to recruit a variety of individuals who had experience of tutoring online with educational CMCs. Four experts, making nine participants in all, joined the five tutors. Two of the experts were a tutor and a student who had used CMC in subject domains other than computer science. The other two experts were a tutor and staff tutor who had monitored conferences in the computer science context.

4.3.1 The 'initial structure' and the 'replacement structure' for the STILE conference in the pilot study

The pilot study set out to define the role that the structured CMC would play in the main study. The CoSy software had rudimentary structuring capabilities, which meant that conferences could not contain sub-conferences. Instead, topics were forced to be all at the same level within a conference, which meant that an extended hierarchical structure could not be adopted. As already noted, an 'initial structure' was established for the pilot study. A conference called STILE, which contained seven topics was set up for the period of early June to end July 1994, see 'initial structure' in figure 4.1. The 'replacement structure' in the STILE conference was set up for the period mid July to end November 1994, see 'replacement structure' in figure 4.1. (It is not yet necessary for the reader to consider the part of the diagram labelled 'new structure', as this conference structure is discussed later.)

Figure 4.1 The structures adopted for the pilot study (CoSy with Wigwam) with tutor-only involvement



Under CoSy, all conferences had three access-related attributes, which could be set for a given participant: visible/hidden, open/closed, and read-only/read-write, as now explained. The STILE conference was *visible* to STILE participants and hidden from all others: i.e. its existence was invisible to other users. If a conference was *visible but* *not open*, then the existence and name of the conference would be visible, but not the names of individual topics or the messages they contained. The STILE conference was *open* to STILE participants and closed to all others. Finally, topics could be *read-only* or read-write to participants. The 'initial structure' and 'replacement structure' in the STILE conference allowed both read and write access to all topics. Unfortunately, a key restriction of CoSy was that none of these attributes could be applied to individual topics, but only to the entire STILE conference. So, for example, it was not possible to make individual topics read-only as the access privileges feature was restricted to the conference as a whole. When the tutors accessed the conference they were automatically joined to all topics in the 'initial structure'. The topic naming convention for the 'initial structure' was influenced by that used by Tony Hasemer for his teaching on Lisp programming (DM863) on CoSy in 1993. It is not necessary for the reader to understand the fine detail of exchanges in the various topics as this is superfluous to the discussion.

4.3.1.1 Findings from the adoption of the 'initial structure' and the 'replacement structure' for the STILE conference in the pilot study

The issues, which the conference topics in the 'initial structure' and 'replacement structure' were set up to address, did not materialise. Discussion did not revolve around the purpose of the STILE conference. Although each topic had a topic name descriptor attached (a brief description of the intended purpose of the topic), these descriptors were not automatically displayed, and therefore it appeared to be more important that the title of the topic conveyed the type of discussion, which was supposed to take place within it. Indeed, the lack of a good naming convention may have contributed in part to discussions going off-topic. However a reduction in the number of topics and a better naming convention for the 'replacement structure', as shown in figure 4.1, did not help to focus discussion.

The cohort of nine participants (five tutors and four experts) involved in the STILE conference appeared to be too small to sustain involvement across the number of topic areas. In the STILE conference as a whole, the input from the tutors had been disappointing. Indeed one of the invited guests contributed many of the messages.

Although access logs indicated that all tutors logged in, one of the tutors who could gain reliable access did not post any messages.

Communication problems became evident, particularly in the first part of the pilot study. Individuals tried to bring a halt to off-topic discussion, then after a few messages the off-topic discussions would again ensue. Also it appeared easy for dominant personalities to take over. Curt remarks sometimes made participants angry. For example, one tutor observed that conferencing made her very defensive. Another issue was how the software restricted:

- the creation of sub-conferences at different levels, by imposing a limited-level hierarchy,
- read and write privileges,
- topic access permissions.

These software limitations affected navigation through the structure. Tutors found it difficult to know where to post and find messages in the STILE conference structure.

- *I'm finding it difficult to know where to put messages on STILE.*
- *I don't find it very obvious at present to know where to put comments.*
- *I am trying to remember where things were said.*

With all topics at the same level, it was difficult for participants to navigate to the topic where they wanted to post their message. This suggested that the number and types of topic available needed to be more controlled.

Encouraging the subjects to participate was not such a problem but the set up of the structure raised the following issues.

Support: support for online discussion was missing:

- one of the tutors did not post any messages,
- heated discussions were taking place,
- dominant personalities could take the lead.

Navigation: discussion strayed away from the intended subject matter; messages appeared in the wrong topic area.

Organisation: there were too many topics for the nine participants.

Interface: the appearance of the software did not inspire confidence.

These findings suggested that a new, complementary conference structure would need to be adopted. The support issues indicated that a facilitator would be needed to steer activity along in the new structure. The independent person would take overall responsibility for designing the online structure. This person was to be called the Interactive Media Facilitator or IMF (Wilson, 1995a). The IMF would monitor online activity, guide discussion, contain heated discussions and include all participants. The IMF would also help to overcome navigational problems by focusing discussion and assisting the tutors to realise their ideas in terms of the extra resources they were providing for the M205 course material bulletin boards. The IMF was to help them put their teaching materials into an electronic downloadable format.

The necessity to create a new conference structure confirmed the findings of other researchers. For example, Wegerif (1998) discussed similar changes to the Teaching and Learning Online (TLO) course where discussion was running out of control in one area and a new conference had to be created. Also Okamura et al. (1994) reported on CSCW usage in one company, where the number of topics in the news system changed with some topics being made redundant and some new topics being formed. The finding suggesting that a better naming convention should be adopted was also reported by Okamura et al. (1994). They found that the topic naming convention was too vague and caused confusion about which newsgroup was appropriate for which message. They also changed the names of the discussion topics.

4.3.2 A 'new structure' for the pilot study

In the third stage of the pilot study, the IMF decided to develop a separate complementary structure (figure 4.1 'new structure') to focus the discussion on the online course materials that the tutors were to devise. The intention with this 'new structure', summarised in figure 4.1, was to separate out the course-related discussions from the technical issues being discussed in the STILE conference. This 'new structure' was set up from the end of September 1994 to the start of January 1995. It was necessary to create a new conference because the software would not allow the creation of topics where access could be restricted. This conference was to be closed and membership was to be limited to the tutors and staff tutors to ensure that the discussion did not go off-topic. The number of conference topics was reduced from five to three to help guide the discussion and a good naming convention was used. The STILE conference, which included the four CMC experts, was still available for other types of discussion.

4.3.2.1 Findings from the 'new structure' adopted for the pilot

The discussion in the 'new structure' did stay on topic. The topic names appeared to be a good descriptor for the intended discussion meant to take place within them. Messages did not appear in the wrong topic. Indeed all of the tutors became involved in this new conference structure and started to engage in dialogue about the online materials they were going to present. Heated discussions did not occur.

The conference structure and the use of the IMF to direct activities within the new structure appeared to provide a promising way forward. However the use of just three topics was too restrictive. Also the lack of both access permissions and access privileges, provided by the CoSy software (that is the ability to make topics read-only or to restrict access), necessitated the need for separate conferences. The CoSy software was not dynamic enough to allow an extended hierarchical structure. This meant that more flexible software, which would allow the structure to be modified, was required. This use of more flexible software suggested that the role of the IMF would need to expand to encompass the control of the online structure so that changes could be made as and when required.

4.3.3 Technical issues associated with the use of the CoSy with Wigwam software

A number of technical issues arose for the tutors in the pilot study:

- access to the CoSy server was unreliable, and
- the software did not allow presentation of course materials online.

4.3.3.1 Access to the online facilities

CoSy 2 with Wigwam 1 did not always prove to be a robust system. A tutor who encountered the most technical difficulties did take part but was frustrated by the lack of reliable software. For example, the upload and download of messages using the offline reader was not straightforward. The connection to the server could often be broken. Telephone line noise could sometimes cause messages to loose their pointers.

As a result, messages could be misinterpreted, causing the loss of message transfer. In these cases, a full download of all conference messages was required to rectify the situation. The tutors also lacked confidence in CoSy with Wigwam to support their online teaching. The comments noted above pointed at the need for more robust software for the main study.

4.3.3.2 Difficulties presenting course materials online with the CoSy and Wigwam combination

The ability to attach files to conference messages was important for the presentation of course material. However, this facility of file attachments was not easily available with the CoSy and Wigwam combination. The tutors were limited to the use of ASCII text and terminal emulation, which limited the design of their teaching materials. They wanted to use more flexible software to present their course materials.

4.3.4 Outcomes from the pilot study which influenced the main study

The 'initial structure' and the intermediate 'replacement structure' of the STILE conference that developed during the pilot study were unsuccessful in focusing discussion. The discussion topics were not fully explored. Questions were not raised and answered explicitly as anticipated. However the introduction of the 'new structure' supported by the IMF, with restricted numbers of both topics and participants, did focus discussion. The 'new structure' was not without its problems, though, and was considered too minimal to be used for the main study. The pilot study highlighted the fact that the conferencing system used (CoSy with Wigwam) had technically restricted the type of structure that could be adopted. That is, it only allowed the adoption of a flat conference structure. The CoSy software allowed only one level within a hierarchy. Discussion areas or 'rooms' all appeared on the same level, and sub-levels of 'rooms' were not accommodated. The flat structure made it difficult to find and navigate between topics.

The findings taken as a whole suggested that many of the technical and interface issues could be addressed with the adoption of more capable and robust software. For example, the use of extended hierarchies to structure the conferences could help address navigational issues, and would allow students to be organised conveniently into discussion groups. A better granularity of access permissions and read and write privileges would then allow students to be able to benefit from reading discussions in other areas, while avoiding overloading of tutors and sub-conferences. The support issues would be improved by the extension of the IMF's role. Indeed, one unexpected outcome of the pilot study was the identification of the need for a person to support the structure who was not a tutor and not solely a moderator. This person was named the Interactive Media Facilitator (IMF) and became responsible for the following activities in the latter part of the pilot study:

- the design of the online environment,
- monitoring all online activity,
- focusing discussion in conference areas,
- assisting the tutors to develop their online teaching materials for presentation and download.

The pilot study had indicated that the IMF should design an appropriate structure for the main study. Also the IMF should prepare a handbook to guide the students' through the use of the software. Given an understanding of the structural, software and support issues, the research was able to proceed to the main study.

4.4 The proposed structure for the main study (FirstClass)

The main study is the focus of the bulk of the thesis. The first aim of the main study was to test out the effectiveness of the improved structure, the usability of new software, and how the IMF support role could be extended to support the tutors and students. More importantly the second aim of this study was to investigate the educational benefits that could be gained from a structured CMC.

In line with the findings of the pilot study, new conferencing software was adopted which could address most of the problems identified in the pilot. This software was called *FirstClass*, which is a textual conferencing system with an integrated graphical user interface. FirstClass allowed more flexibility, including extended hierarchical conference structures. In addition, access permissions, access privileges and message approval could be altered to a fine granularity as needs arose, giving rise to a structure that could be adapted flexibly and quickly to the changing needs of participants. In these senses, by contrast with the pilot study, the conference structure in the main study could be described as 'dynamic'.

4.4.1 The FirstClass software

As it was essential to disrupt student learning as little as possible, it was important to deliver conferencing software which would be stable, easy to use and supported, so as to minimise technical difficulties, frustration and demotivation. The IMF looked at the features provided with the FirstClass software because there was a possibility that it would be supported by the Open University on a trial basis. The IMF found that it provided facilities to develop a more dynamic structure. The different levels of access permissions, access privileges and use of message approval with FirstClass made it a much more flexible system than CoSy. For example the access permissions feature could be used to limit what a student could see on their desktop or reveal conferences but restrict student and/or tutor access. Also lower-level conferences could be made read-only without affecting higher-level conferences. Navigation was through icons that were clickable. The upload and download of files which was to be a necessary mechanism for the students to download course material and both send and receive program listings, was more straightforward with FirstClass than with the CoSy with Wigwam combination.

The FirstClass software appeared to provide the necessary features and facilities to undertake the main study. Researchers used the features, facilities and interface of the FirstClass software to organise their conference structure (Owen, 2000; Alexander and Mason, 1994). Indeed the FirstClass facilities had proved successful on the XT001 Renewable Energy course, providing 'many of the positive and significant outcomes of the course' (Alexander and Mason, 1994, p.2). The attractive appearance of the FirstClass software was reported as an important factor in supporting online collaboration (Wegerif, 1998). Also 'all of the students without exception praised FirstClass for its ease of use' (Wegerif, 1995, p.12). FirstClass was reported as 'easy to use or very easy to use' by '89% of students' in Mason's (1997, p.3) study. FirstClass was one of the most popular systems for educational purposes (Jones, 1998).

The central IT computing services agreed late in 1994 to trial the FirstClass conferencing and email system (version 2.6, copyright 1994, Softarc Inc.) for the Personal Computer, running the Windows 3.1 operating system. The M205 course and a PGCE course using the Macintosh were to be supported, to check the software's viability during 1995. Therefore the main study used a more flexible and relatively more advanced textual conferencing environment (FirstClass), which had an integrated graphical user interface. The flexibility provided by FirstClass for the main study is discussed in more detail in section 4.4.3.4.

4.4.2 The subjects involved for the main and complementary studies

To inform the decisions for the proposed new course mentioned earlier, it was considered important to recruit a cross-section of tutors and students from the established M205 course to participate in the main study.

The participants were to:

- be based in different geographical regions (including Europe) and located in urban, rural or remote locations,
- include subjects with either technical or non-technical expertise.

4.4.2.1 The student subjects

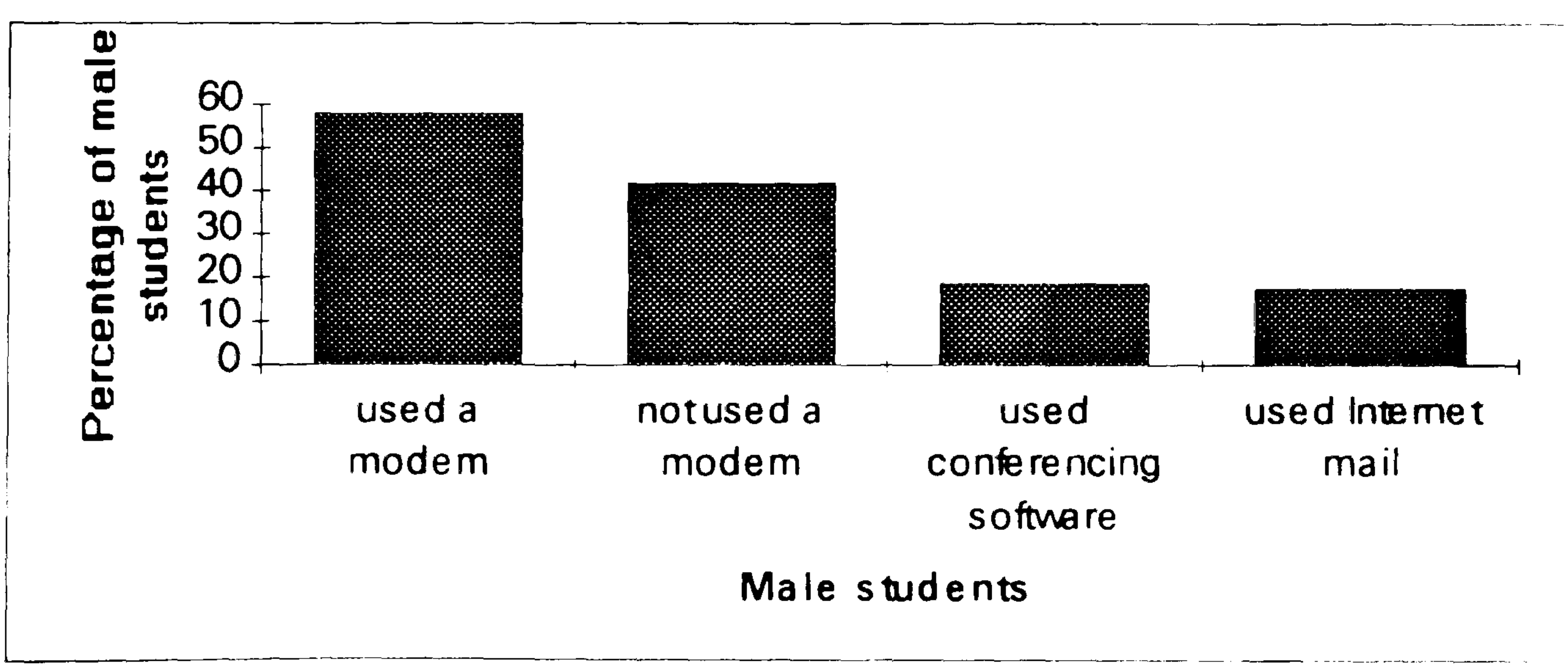
One hundred and ten students joined the project. They were based in England, Scotland, Wales and mainland Europe. Those in England were located in Newcastle (19 students), Cumbria (10 students), Dorset (two students) and Somerset (five students). These later two groups were joined by a house-bound student in London. The Welsh students were located in Cardiff (16 students) and Clwyd (seven students). In Scotland, nine students lived in the Highlands and islands of Scotland, seventeen in the Aberdeen area and fifteen in the Edinburgh area. The nine European students were located in France (three students), Austria (two students) and Germany (four students).

Seventeen per cent of the students were based remotely or house bound, and did not have the advantage of being able to attend face-to-face tutorials. Twenty-two per cent of students were located in rural areas but had to travel distances to attend two-hour face-to-face tutorials. Sixty-one per cent were based in urban areas where attendance at face-to-face tutorials would have been more straightforward than for the rural students. However the latter two groups contained students who worked away from home or who travelled with their work.

In 1995, 3,781 students registered at the start of the year to take the M205 course. The sample discussed here consisted of 110 students, 3% of the full course population. Students studying with the Open University tend to be mature and a higher proportions are in the age range 35 plus when compared to other universities. The age range of the students involved in the main study varied from under twenty-five to over fifty-five for the eldest. The majority of students were in the age group twenty-six to thirty-five. Eighty-six of the student participants were male and twenty-four were female. This reflects the course norm, since the students who followed this Open University computing course were predominantly male.

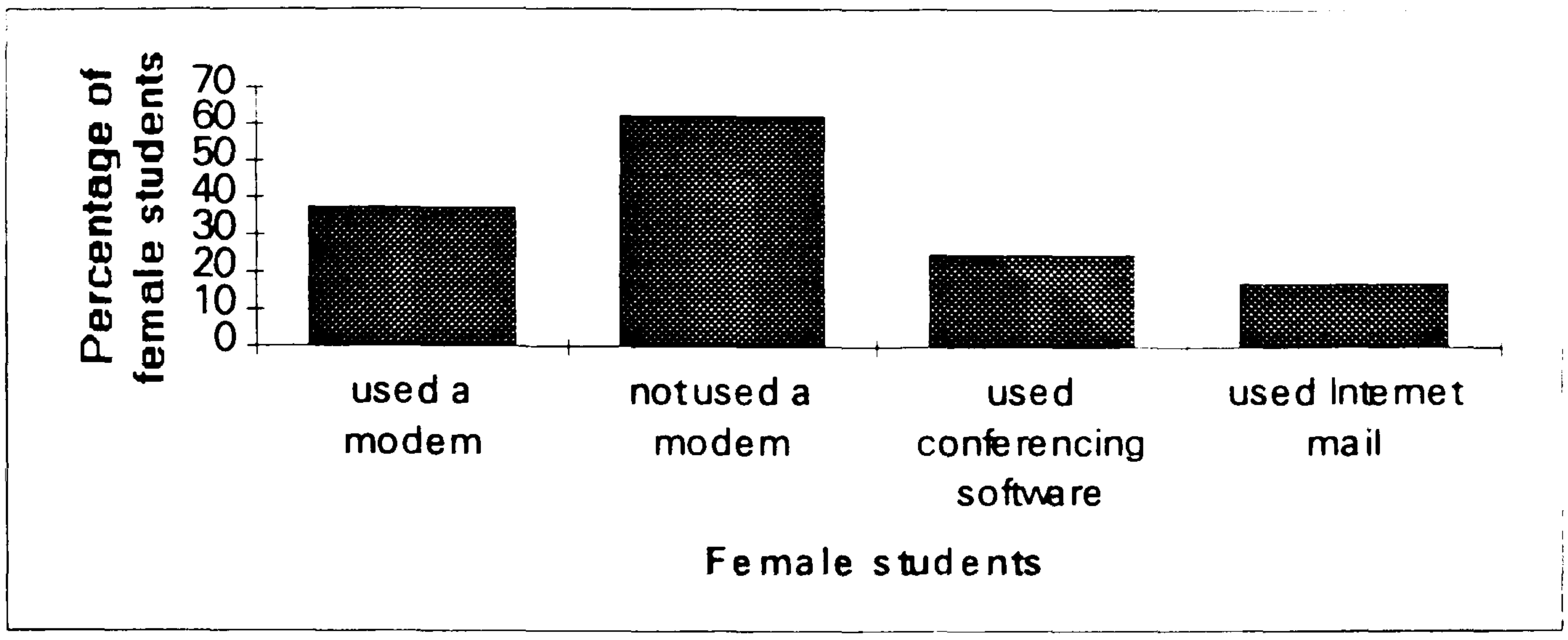
The pre-project questionnaire (discussed in chapter 3) revealed that the subjects in this study, though following a computer science course, held a broad range of experience and were not all technical experts in communications hardware and software, which is summarised in figures 4.2 and 4.3. Only 17% of the male students had experience with conferencing software and Internet mail, but 58% of the male student population had used a modem before starting this course.

Figure 4.2 Male student experiences with the technology



However, a different pattern emerged for the female volunteers in the project, as detailed in figure 4.3. A higher percentage of the female participants had used conferencing software (that is 25%) but only 4% had used Internet mail prior to starting the course. Overall a lower percentage of the female students had used a modem before taking part in the project 37.5%.

Figure 4.3 Female student experiences with the technology



It was surprising that more female students had used conferencing software than the male students and yet fewer female students had used a modem than their male counterparts. This suggested that the females' use of conferencing software may have been via a network rather than a modem.

4.4.2.2 The tutor subjects

Nine tutors were involved in the main study. Four of the five tutors from the pilot study were joined by five new tutors. The nine tutors were all experienced in teaching the M205 course face-to-face. Six of the tutors were male and three were female. Their experience with new technology varied quite considerably. Six of the tutors had used email to varying degrees; two of these with modems but only one had previous experience with conferencing software. All of the tutors had used computers as part of tutoring M205 and they all used computers for their occupation. The adoption of the IMF together with the nine tutors corresponded to a ratio of 1:11 students. This is in line with the ratio of between 1:6 and 1:14 adopted by other researchers (Alexander and Mason, 1994; Selinger, 1998; Davie, 1989; Okamura et al., 1994).

4.4.3 The structure and support for the main study

It was the IMF's responsibility to design and construct the online environment for the main study (FirstClass). To do this the IMF needed to consider a number of issues.

1. The tutors' workload.
2. The three dimensions of online interaction types discussed in chapters 1 and 2.
3. The design of the interaction spaces.
4. The construction of the levels within the hierarchy to aid navigation.
5. The type of access permissions, read and write privileges, and message approval.
6. Technical and navigational problems.
7. The support role that the IMF would play in the main study.

4.4.3.1 The tutors' workload

Online participation was a supplementary activity to the traditional version of the course and as such the tutors were already taking on extra work over and above their normal tutorial workload. It was therefore very understandable that they expressed anxiety about how the work would be shared and how much extra work this would involve. The IMF would have liked to have adapted the shared teaching aspects of Tony Hasemer's (1994) learning environment. However, one of the tutors had voiced his opinion in the pilot study *that two tutors sharing a group would not work all that well - I am not saying that there shouldn't be any joint conferences but there should be a 'home' group within which one tutor administers his tutor group.* Indeed, it has been reported that instructors' control of students was reduced in the online environment as compared to the face-to-face situation (Harasim, 1996). In order to alleviate the tutors' concerns, it was decided that each tutor would have their individual tutorial conference. In addition, a shared teaching conference would be created. This shared conference would be a forum where students could seek general help with course work. Some members of the course team would monitor it while the tutors were invited to answer queries on an optional basis.

4.4.3.2 The three dimensions of online interaction types

The primary interest in the work in the main study (FirstClass) was to develop and test out the effectiveness of a structure that could be adapted flexibly and quickly to the changing needs of the participants. To do this the IMF needed to take into account the participants' social and motivation needs as well as the need to focus on the course content (knowledge) when designing the environment in FirstClass.

It became apparent from the pilot that it was not sufficient to categorise the conferences simply by name of topic, chronologically, or by discussion topic order. In order to support better navigation and organisation, it transpired that other considerations were important. To this end, consideration was given to the types of interaction, which would be expected to take place in a structured CMC. The literature had indicated elements of different types of interaction that could take place, but had not applied these in any generalisable sense to the structure of online conferences. Furthermore, no comprehensive framework for classifying these types of interaction had been proposed. Therefore a taxonomy of classifications was developed from the variety of elements found in the CMC literature. The three broad dimensions identified and proposed for classifying interaction types are: participants (understood to mean participant pairs), relationships and 'domain of discussion'.

The three dimensions of online interaction can be decomposed as follows:

Participant pairs

learner-and-tutor

learner-and-course team member

learner-and-learner

tutor-and-tutor

Relationships

one-to-one

one-to-many

many-to-many

Domain of discussion

Knowledge

Socialisation

Motivation

This three-dimensional taxonomy of online interactions could be applied to a wide variety of practical and theoretical purposes. It has been put to two practical purposes in the main study. Firstly, it was used to guide the IMF in the development of the broad conference structure in the main study (FirstClass). Secondly, it was used to organise the fine detail of the different discussion areas within the CMC structure. The taxonomy is a generalisable framework, which could be applied in a distance learning context for the organisation or analysis of interactions in any Electronically Supplemented Course (ESC). Furthermore it could be used for the development of Virtual Learning Environments (VLE's) at the course level (as opposed to the campus level), either in a distance learning context or as a supplement to face-to-face teaching.

As a first step in planning the broad conference structure for the main study, the taxonomy was used to analyse the types of online interaction, which were expected to take place between participants and the 'online course-related content'. Note, for the purposes of this analysis, that every interaction is a posting or email addressed to some recipient or conference, each interaction is never solitary: it can always be classified using the participant pair dimension. Note that the one-to-many and many-to-many relationships are needed for classifying conferences and sub-conferences, even though it is less frequently applicable to individual interactions in the context of ESCs. Note also that all interactions studied in the thesis are remote and asynchronous. Given these provisos, it is possible to categorise online access to course materials using the three dimensions of online interactions (participant pairs, relationships and domain of discussion). The classification that emerged from this analysis is summarised in table 4.1. (Note: the relationship dimension is not shown independently in this diagram, but is shown by appropriate annotations.)

Table 4.1 The online interaction types which were expected to take place with the 'online course-related content'

One-to-many or many-to-many	Knowledge	Motivation	Socialisation
Learner(s) and learner(s)	Interactions that enabled students to learn about the computer science course Engage in dialogue about any aspect of the course	Interactions that enabled students to access and then discuss extra online course materials that tackled known problems on the course Interactions that allowed the iterative exchange of documents (in practice program code) and experience the use of modern media	Interactions that enabled students to communicate with each other to create a sense of community and find possible 'help mates'
Learner(s) and course team member(s)	As above	Interactions related to queries on any aspect of the course	
Learner(s) and tutor(s)	As above	As above	
Tutor(s) and tutor(s)	Interactions that allowed tutors to prepare online course material, to enable students to learn about the computer science course	Interactions to explore how to present the online course material Interactions to exchange ideas	Interactions to support each other

The next stage in planning the broad conference structure for the main study was to consider where these online interactions with 'online course-related content' would take place.

4.4.3.3 The design of the interaction spaces

One design decision when planning a conference structure for any educational CMC is typically whether to organise a particular level of the structure by a group-centred or topic-centred approach. In planning the main study, it turned out that different approaches were appropriate for different parts of the structure. In particular, one part of the structure, the course material bulletin board (see section 4.4.3.4) would, by its nature, deal with topics of interest to different students at different times as they progressed at their own pace (within a flexible timetable) through different blocks of the course. For this sub-conference, a 'topic-centred' approach was adopted (Feenberg, 1989; Hiltz and Turoff, 1985) where participants would move individually from topic to topic. By contrast, for many activities, students were either allotted to tutor groups or to areas common to the whole cohort of students. Hence for many parts of the structure in the main study, a 'group-centred' approach (Feenberg, 1989) was adopted, where the group would stay the same, but the topics of conversation would change from time to time.

To facilitate access to the 'online course-related content' detailed in table 4.1 above, it was necessary to consider the 'rooms' or 'spaces' in which these interactions would take place, which are summarised in table 4.2. A conference called M205-STILE was to contain the interaction spaces for the main study. The knowledge element of the online environment was to be supported in the organisational structure by a daily help sub-conference where potentially all participants could answer a query. This area was to provide a repository for the collected knowledge of the participants and provide flexible access to the wider body of participant knowledge. Separate tutorial sub-conferences were to be created for a tutor and their students to provide domain-specific help. A resource development conference (a new version of that provided in the pilot study) was an area to be used by the tutors to discuss the development of the online course materials.

Motivation was to be facilitated by the online course materials bulletin board on FirstClass. The online course materials were intended to create a motivation problem-oriented context to encourage interaction and support student understanding through the use of the tutorial areas for discussion. The tutors' motivational area was provided by the staff room.

Socialisation was to be catered for by a global social area and student- and tutor-only areas, see table 4.2 below. Recall further that the particular focus of this work is on situations in which 'online course-related content' is provided to supplement the existing course that is electronically supplemented courses (ESCs). This research is not focusing on solitary learning.

Table 4.2 The 'rooms' or 'spaces' in which interactions would take place in the structure

One-to-many or many-to-many	Knowledge	Socialisation	Motivation
Learner(s) and learner(s)	Tutorial conference and M205 Help conference	Meeting Place and Students common room conferences	Discussion about course materials in tutorial conference
Learner(s) and tutor(s)	Tutorial conference. M205 Help conference sometimes	Meeting Place	Discussion about course materials in tutorial conference (their own tutor + the tutor who developed the online material
Learner(s) and course team member(s)	M205 Help conference		
Tutor(s) and tutor(s)	Resource development conference	Staff room	Staff room

The one-to-one relationship between the different participants was expected to be exploited through email. In terms of the conference areas, the one-to-many relationship (tutor-and-learners) was expected to take place in the tutorial sub-conferences. The one-to-many or many-to-many relationship between learners was expected to take place in the tutorial conferences, the M205 Help conference, the Meeting Place, and the Students' common room. The one-to-many and many-to-many relationship between the tutors was expected to take place in the Staff room and the Resources development conference. Having established what online interactions would take place with the 'online course-related content' and where these would take place, the next stage was to consider how participants would navigate to these areas.

4.4.3.4 The construction of the levels within the hierarchy to aid navigation

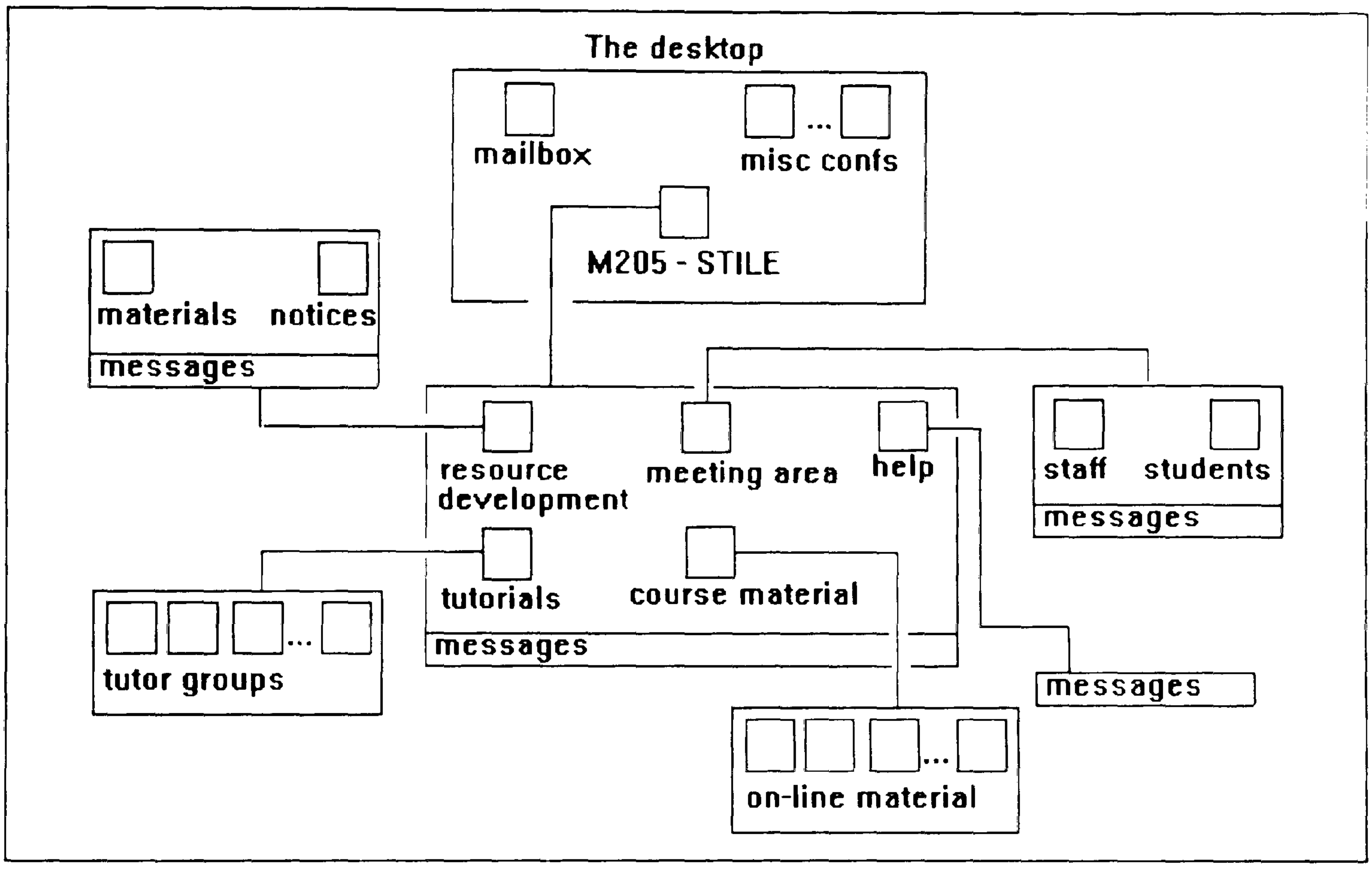
To aid navigation, an extended hierarchical structure was adopted. This choice of structure for the main study was influenced by the work of Alexander and Mason (1994). A secondary influence came from the author's use of a hierarchical structure to access static content on a CD-ROM (Wilson, 1993). The conference supporting the M205 course was to be called M205-STILE.

The main components of the organisational structure for the M205-STILE conference for the main study (FirstClass) were as follows:

- conferences (common repositories for messages),
- email and
- a bulletin board for online course materials.

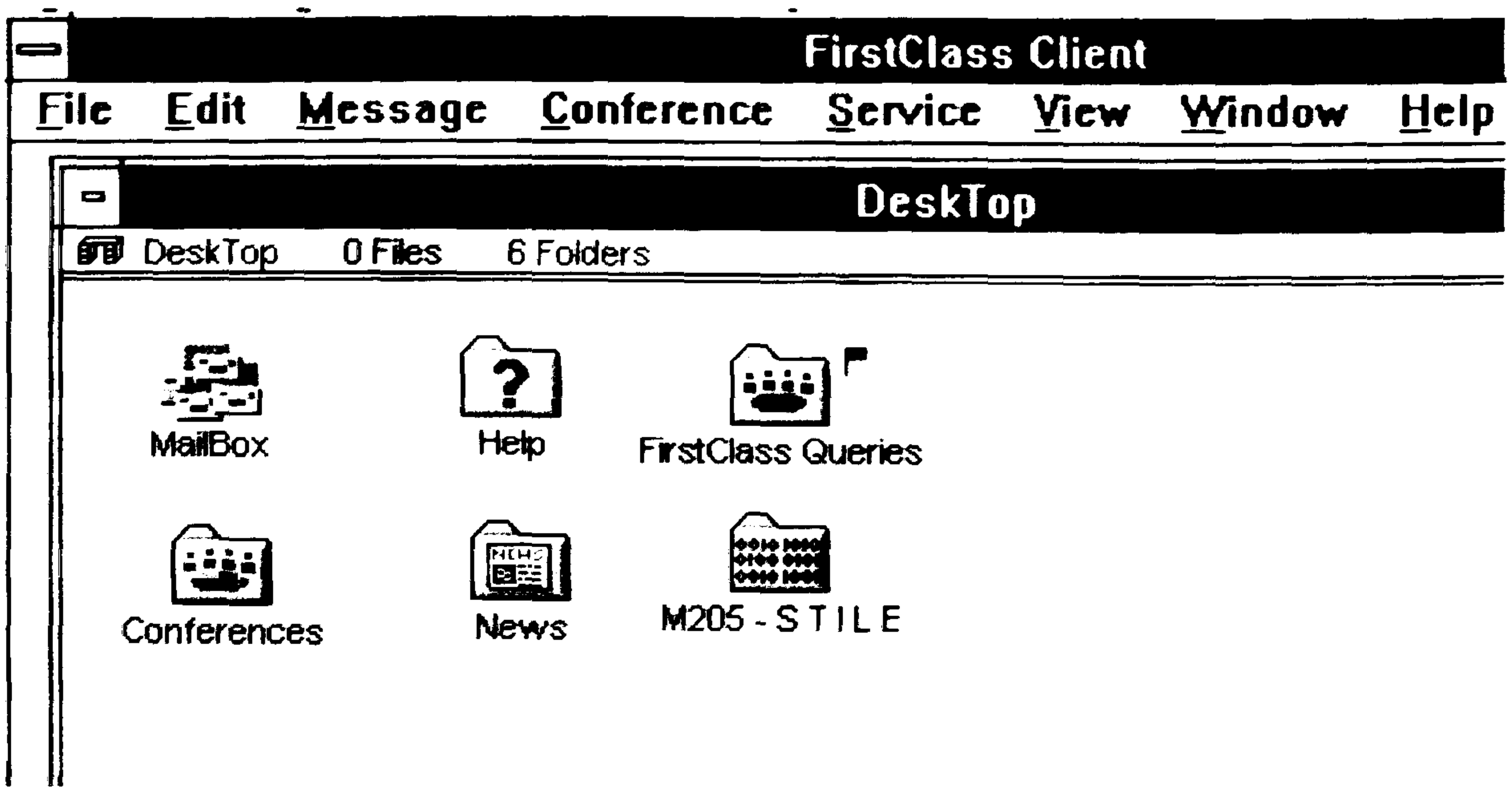
M205-STILE was to contain all the sub-conferences relevant to the M205 students and to reside on the top-level desktop with the students' personal mailbox and a few conferences designated by the system administrator, see figures 4.4 and 4.5.

Figure 4.4 The structure adopted for the M205-STILE conference for the main study



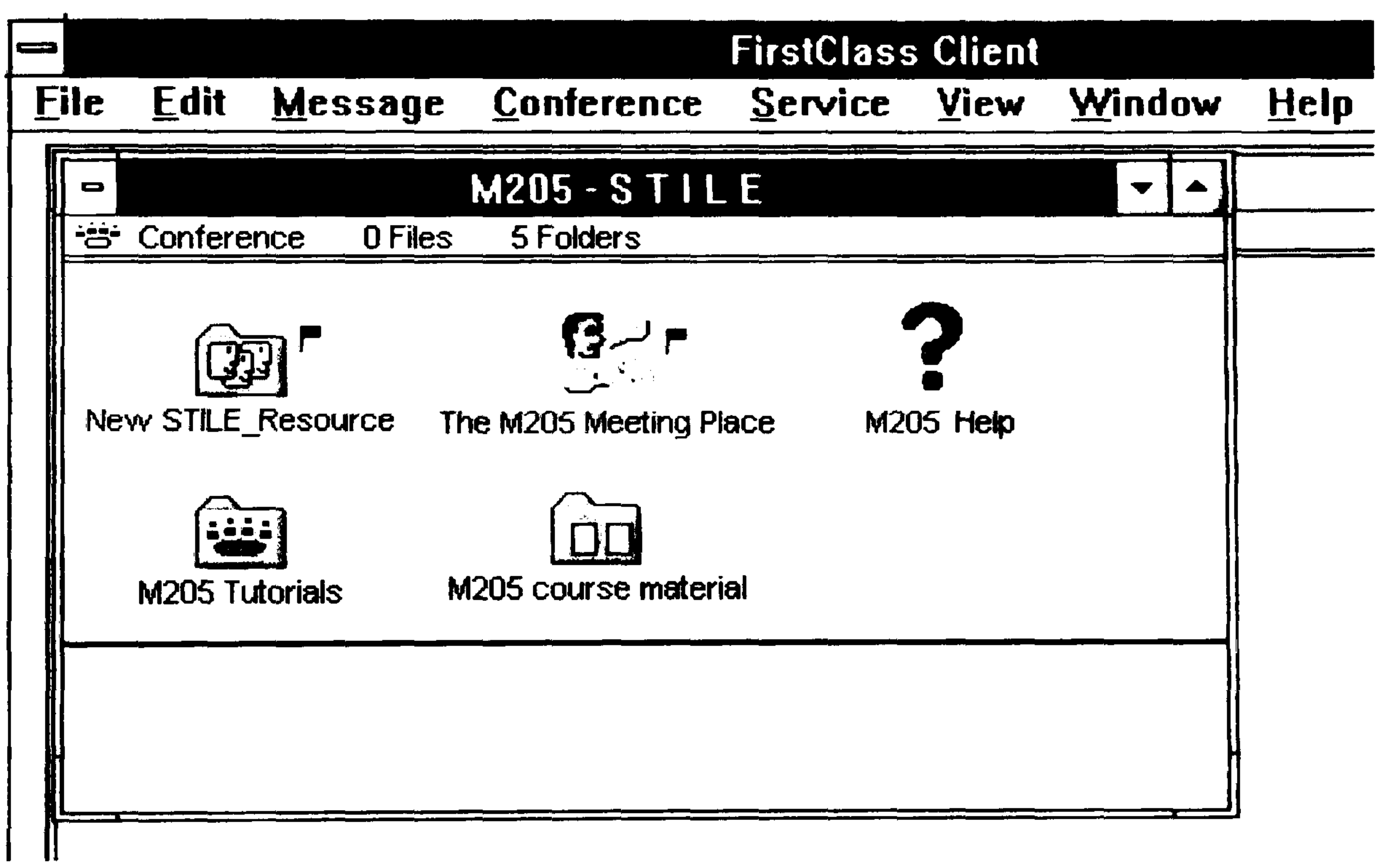
Careful choices of the available clickable icons were made by the IMF to aid navigation and to indicate the type of intended discussion within the main conference or sub-conferences. Also the naming convention was thought through carefully to reinforce the intention of each conference.

Figure 4.5 The M205-STILE desktop on First Class.



The sub-conferences within M205-STILE were structured into five main areas: New STILE_Resource, The M205 Meeting Place, M205 Help, M205 Tutorials and M205 course material (see figure 4.6).

Figure 4.6 The sub-conferences one level down from the desktop

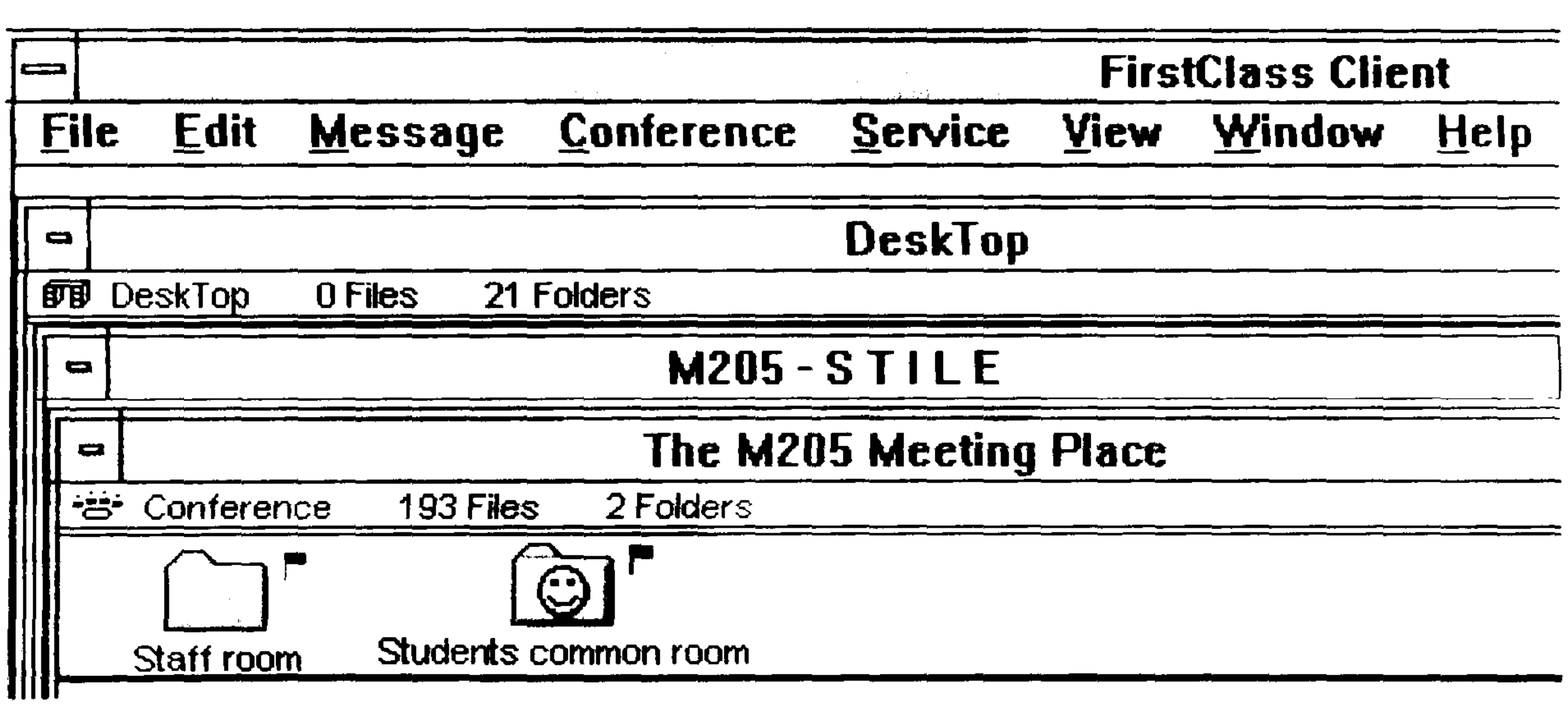


The IMF devised this framework to prevent work overload, to encourage maximum use of work-related areas, to separate out social activity and to allow students and tutors access to their own private conferences. The STILE_Resource conference originally on CoSy was moved to FirstClass and renamed New STILE_Resource. All nine tutors met together in this sub-conference for the first time in early January 1995. The ideal would have been to give the five new tutors joining at this point more experience of conferencing. However, CoSy 2 with Wigwam 1 was still in use before Christmas and the new tutors would have been overburdened, having to learn how to use CoSy at that late stage. This latter conference was closed to students.

The M205 Help sub-conference was an area created for students to direct their course-related questions to other students. The course team was to monitor activity and provide feedback and suggestions. The tutors could opt to join in.

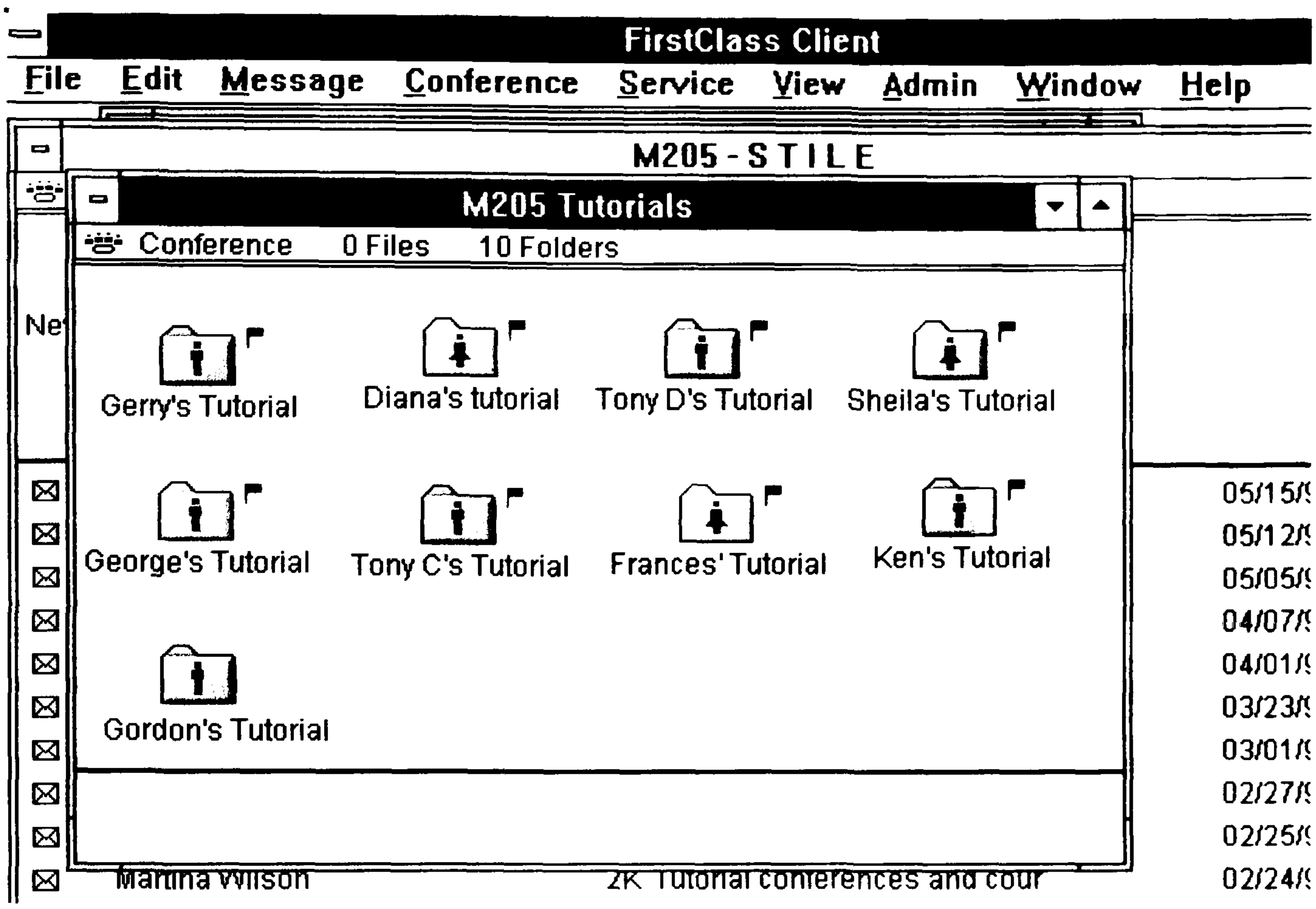
The M205 Meeting Place sub-conference was set up as a social area for all of those involved in the project, that was the tutors, students, the IMF, staff tutors and members of the course team, see figure 4.6. As the computer science students were the only students online apart from the PGCE students, they were not directed to any totally open conferences on the FirstClass server. The Staff room (equivalent to Mason's (1989b) senior common room) and the Students common room were sub-conferences within the M205 Meeting Place conference. Students were not allowed access to the Staff room while tutors were not allowed access to the Students common room, see figure 4.7. These latter areas were created so that individuals could receive encouragement as well as a feeling of social pressure to continue to be involved. Smaller social areas were not created as these were potentially too small to sustain lively debate.

Figure 4.7 The conferences inside the Meeting Place conference two levels down from the desktop



The M205 tutorials conference contained nine sub-conferences with read and write access for a given tutor's students, see figure 4.8. All of the tutors had read and write access to all of the tutorials. The inclusion of this feature supported cover for tutors on holiday and assisted with discussion about the online course material. Students had read and write contact with their own tutor and students in the individual tutorial conferences.

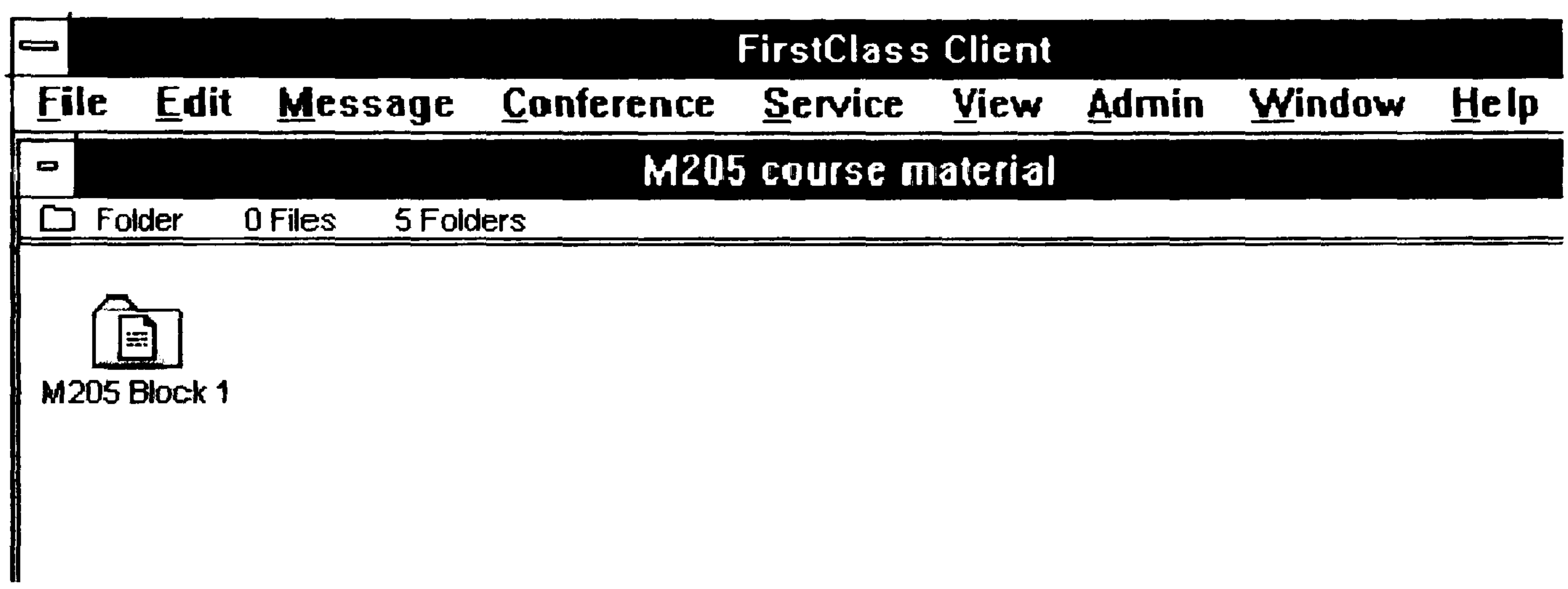
Figure 4.8 The individual tutorial conferences two levels down from the desktop



The tutorial conferences ensured local group cohesion with the tutor. To minimise a tutors' workload, the IMF took the decision not to allow the students to enter tutorial conferences other than their own. This was in line with DT200 An Introduction to Information Technology: Social and Technological Issues, a second-level undergraduate course as discussed by Mason (1989a). However, unlike DT200, a specific chat area was not included within each tutorial conference, as this would have distracted from the course-related discussions, which were intended to take place in the tutorial areas.

An important part of the 'online course-related content' was the supply of online course material which was not available elsewhere. These were to be supplied on the M205 course material bulletin board in a read-only and download area (Harrison and Bergen, 2000). Four tutors were each to devise material based on a block of the M205 course. These part-time tutors tailored their online supplementary materials delivered online to the student needs, based on what they perceived were problem areas on the M205 course. Online course materials were provided with the intention of encouraging interaction; this is in line with Owen (2000). The course materials were intended to stimulate discussion between the participants in the tutorial conferences on FirstClass. Each tutor that prepared extra material was to make a special effort to be available to answer queries about this online course material as soon as it was available to students. With access to each of the tutorial sub-conferences, the particular tutor that had written the course material could see and comment on reactions in the other tutorial groups and interject when a misunderstanding became evident.

Figure 4.9 The bulletin boards inside the M205 course material conference two levels down from the desktop



The IMF made the M205 Block 1 bulletin board available to the students in February (see figure 4.9) and added bulletin boards for the other three blocks as the students progressed through the course. The exercises were posted prior to each block start date as this would particularly accommodate those students who were ahead of the study calendar. Each block of material was divided into a number of sections. New material was introduced in an ongoing manner (Steeples et al., 1993). The IMF first posted the given tutor's first section of an exercise and two weeks later posted a model solution. The next section of the exercise was then posted and this cycle was to continue throughout the study of each block. This iterative presentation of materials was to encourage interaction between students and the authors of the exercises. Students had been unable to engage in this type of activity in the conventional version of the course.

M205-STILE was designed and constructed by the IMF to allow the students to interact within the three-dimensional taxonomy. They could work in privacy, in tutorial groups, request help, socialise and download online course materials. The tutors were encouraged by the IMF to log on two or three times a week and were directed to their mailbox and M205 Tutorial conference only. All other conference activities were optional as these were the responsibility of the IMF. However, it was stressed that the five tutors who prepared the extra materials should look into all tutorials to see how their extra material was being received. The tutors were told that members of the course team would monitor the M205 Help sub-conference but any contributions they wished to make would be most welcome. The other conferences relevant to the tutors (where they had read and write access) were:

- the Staff room,
- New STILE_Resource,
- the tutorial conferences.

The areas relevant to both students and tutors were:

- the M205-STILE conference,
- the M205 Meeting Place conference and
- the M205 course material bulletin board.

The work-related areas to which the students were guided were their personal mailbox, their tutorial conference and the M205 Help sub-conference. The students also had read and write access in the Students common room.

4.4.3.5 The adoption of access permissions, read and write privileges, and message approval

Open access to all areas within the conference structure was considered unwise by the IMF because of the possibility of participants being overloaded with a flood of messages. Therefore the IMF adapted permissions in the different sub-conference areas. The different levels of permissions that could be activated and de-activated by the IMF within FirstClass meant that the online environment could be set up but also changed dynamically during the presentation of the course. Restricted access and use of message approval were adopted in some conference areas at first. Read and write access privileges were also adopted. These are all summarised in table 4.3. For example, the IMF assisted the tutors, to control their tutorial workload, by allowing them to approve all student messages before the other students could read them.

Table 4.3 Access and message approval across the conferences within M205-STILE

	Message approval	Open access
The Meeting Place	No	Yes
Students common room	Yes	For students only
Staff room	No	For tutors only
M205 Help	No	Yes
Tutorial conferences	Yes	For each tutors students

Changes made to the permissions, privileges and message approval over time, are discussed in chapter 5. The effect these changes had on the number of messages in two of the tutorial conferences is discussed in chapter 7.

4.4.3.6 How to overcome technical and navigational problems in the main study

The IMF was to act as a guide in a new terrain and help students and tutors overcome problems. Therefore it was necessary for the IMF to consider what difficulties could arise. Issues that were identified in the pilot study were related to the reliability of the software and navigation in the online system. Indeed the tutors needed support in the pilot study (CoSy with Wigwam). Therefore it was not surprising that two tutors referred to the need for support for their students. This suggested that the IMF should provide documentation to bring the students online and familiarise them with the conferencing software and structure before they started their course work in earnest. The problems identified in the pilot study also suggested that documentation prepared by the IMF should guide the students about technical issues, navigation and netiquette.

The students with different degrees of experience of computers, modems and software, were nonetheless expected to connect to the Open University server from their own home. Technical problems of access to the online system were to be lessened by supplying the participants with the same modem, for the setup and logging-in process. The IMF was able to develop documentation very specific to the modem provided. The students were supplied with a modem, software and comprehensive documentation approximately two weeks before their course started. The ideal was to have the students using the system much earlier; however it was not possible to send modems to the students until they had registered for the course. It was essential to get documentation correct as students were very much on their own in this activity and frustration could set in easily if the supporting documentation was not sufficient. The initial documents supplied were 'Connecting the USRobotics modem to your computer' (devised by Wilson in 1994) and 'Installing the FirstClass Windows client to access the ACS FirstClass server via the USRobotics Sportster modem' (devised by Wilson in 1995). The documentation contained graphical images to help the students connect the modem and install the software. Indeed Sayce (2001) made the assumption that students and tutors would be competent users of IT, but found that she had to write a manual.

Once students had read the documentation, connected the modem to their computer, installed the software and made their connection, the IMF provided them with instructional activities (Rohfeld and Hiemstra, 1995) in the 'M205-STILE FirstClass handbook' (devised by Wilson in 1995). These tasks were developed in the context of M205-STILE structure to familiarise the students with the software features gradually (Derycke and D'Halluin, 1995). The documentation included screen dumps of the various levels of the conference structure to give the participants an impression of the online environment so that they could construct a mental image of it (Derycke and D'Halluin, 1995). The student reactions to 'The M205-STILE FirstClass handbook' and whether it helped with their navigation of the environment are discussed in chapter 5. To minimise the eventuality of 'flaming' the documentation sent to tutors and students included a section on netiquette.

4.4.3.7 The support role the IMF would play in the main study

The IMF was to be independent from the course teaching, and act as the overall facilitator within the main study (FirstClass). To ensure a work focus, the IMF took responsibility for monitoring all of the conferences. With this strategy the tutors were left free to attend to the students in their own tutorial conference and to 'pop into' other conferences as they wished. In order to reduce tutor overload associated with reading social-type messages, the work-related dialogue was separated from chat, not only by creating separate conferences but also by giving sole responsibility for the social conferences to the IMF. The tutors and students would therefore be free to become involved in the specific conferences and relevant communications to their needs.

The IMF realised in the early period that it would be essential to encourage the students to socialise and thus make use of the system before they had the added burden of doing course work. Therefore the IMF assisted the students and tutors to become acclimatised to the structure when the project went live. This meant that the students did not have to resort to their tutor or the course team about the environment itself. They were directed to their personal mailbox to find a welcome message from the IMF. They were asked to respond to this message to flag the fact that they had been able to access the system. Students' reactions to the Welcome message are discussed briefly in chapter 5. Student engagement with other online participants is discussed in chapter 7. The IMF encouraged the students to send a message to introduce themselves (Feenberg, 1989; Harrison and Bergen, 2000; Berge, 1995 and 2000; Rohfeld and Hiemstra, 1995). This introductory message was to be sent either to the M205 Meeting Place sub-conference for all of those involved in the project or, if they preferred, just to their fellow students in the Students common room sub-conference.

The tutors were to be the facilitators as far as the course work was concerned, while the IMF was to be the first point of contact, particularly as the students did not know who their tutor was and no face-to-face meetings had taken place beforehand. This is in contrast with McConnell et al. (2000) and Rohfeld and Hiemstra (1995), who instituted an initial face-to-face meeting with their participants, prior to going online. However, McConnell et al. (2000) would like to create an online environment, which would negate the need for face-to-face meetings in the future.

Apart from support at the start of the project, the IMF was to continue to give ongoing support. Indeed, the participants were not expected to be expert users of the conferencing system and the IMF was the person to be contacted in cases of technical difficulties throughout the project. The IMF was to monitor the environment and pay attention to the concerns of the students and the tutors. Acting as a lynch pin, the IMF coordinated the whole activity, designing the online environment, the instructional materials, and keeping the discussion group going.

The IMF was to encourage the use of the system for learning and teaching. This was to be undertaken by monitoring and encouraging activity in all conferences relevant to the course together. Students were to be directed to the different conferences at the right time. The IMF was to look for developing needs, such as setting up new conferences and access permission as required. The IMF would also send encouraging personal messages to the students and tutors and keep a watchful overview to spot problems before they arose.

The IMF was also to be responsible for a number of other activities involving:

- acting as the overall facilitator and motivator in the interactive environment,
- encouraging participants to utilise the medium to take full responsibility for learning and teaching,
- acting as a guide in a new terrain–advising the tutors and students about how to use the system.

In order to make sure that valid conclusions are drawn from the main study, it has been necessary to describe the details of the study and its relationship to the pilot study at some length. Given the length of the chapter that this has necessitated, the drawing of conclusions from the main study are deferred to the next chapter.

4.5 Conclusions

The pilot study (CoSy with Wigwam, rudimentary text-based system) which was formed of three stages, was conducted with the tutors. As the structure adopted for the first stage in the pilot study did not work as expected, it was necessary to replace the conference structure and finally to develop a new complementary structure for the tutor-and-tutor interaction. The conferencing system (CoSy with Wigwam) limited the structure that could be adopted. The findings suggested that the software selected affected access to conferences and topics. Without a flexible structure it was difficult to guide interaction. Both the 'initial structure' and the 'replacement structure' revealed the importance of a focused structure and the need for an IMF to design interaction spaces, monitor activity and assist the tutors with the development of their online teaching materials.

The CoSy with Wigwam software was not very usable nor reliable, and lacked some of the required features for the main study. The FirstClass software offered suitable features and appeared more robust. This software was therefore adopted for the main study with the students and the tutors. The IMF's rationale for the design of the structure for the main study has been discussed in this chapter. An extended hierarchical structure was adopted, to improve navigation and organisation within the given conference structure. As indicated above, the findings resulting from the changes to the structure for the main study are discussed in chapter 5, which is the next chapter.

Chapter 5: How the structure adopted by the IMF for the main study affected both students and tutors

5.1 Introduction

This chapter addresses the issue of whether the hierarchical structure adopted by the IMF for the M205-STILE conference in FirstClass was effective in supporting both students and tutors. This was the first major research question of the thesis as reported in the Introduction chapter. There are two aspects that require examination for this question. The first is related to the ease of use of the CMC structure (navigation) while the second is to do with participant interaction within areas of the structure (organisation). Of course the usability of the FirstClass software itself could not be neglected. Indeed the length of time students needed to become accustomed to using the software could give some measure of its ease of use.

In order to probe these issues in more depth, data were collected to answer the first research question using the following sub-questions.

1. Did the students find the structure adopted for the main study (FirstClass) easy to navigate?
2. Did the students find the FirstClass environment usable?
3. How did students cope with the amount of information supplied in FirstClass?
4. How did the students navigate both inside and outside the FirstClass structure?
5. How did the students view the online structure in relation to reducing overload?
6. How did the tutors view the IMF's structure of the conferences to reduce overload?

The following empirical data were collected to answer the above sub-questions.

(i) Indepth interviews were used to probe students about the usefulness of the handbook which described the areas within the structure. They were asked for their first impressions of FirstClass, their ability to adapt to the environment and how the structure affected activity.

(ii) Online questionnaires were sent to the tutors to ascertain how the structure adopted could be improved and how the role of the IMF had supported them.

(iii) A tutor debriefing was used to gather data related to the structure of the environment and how the tutor role could be adapted, to encourage more student participation.

The findings are discussed with respect to:

- students' ability to become accustomed to the online environment,
- students' ability to cope with information supplied online,
- student and tutor impressions of the interface and structure adopted.

5.2 Findings related to the conference structure adopted for the main study (FirstClass)

The FirstClass conference M205-STILE was structured to aid navigation, as discussed in chapter 4. Observation of online activity, suggested that students had little difficulty navigating through the conference structure on FirstClass. For example, on the second day of access one student who had no experience of using conferencing software commented, *Isn't this fun? I'm beginning to enjoy this ... I'm off to wander around the common room now and then I must do my Resume.* It was essential, therefore, for the design of future environments, to find out if this was a generally applicable finding. Data confirming this comment are discussed below.

5.2.1 Navigation of the conference structure in the main study (FirstClass)

This section discusses the students' reactions about navigation in the structure adopted for the main study (FirstClass). Their opinions were gathered through indepth interviews. Their responses were positive but mixed. Half of the twelve group one students (who were described in chapter 3) reported that the layout of the M205-STILE conference was *well presented* or *very logical*. The other half of the group one students thought that the layout was reasonable but two of these students were unsure about navigation at first. Three students explained in more detail how they adjusted to the conference structure and how there was confusion, especially at first, about where messages should be sent.

1. *I think I took a week or so just to get ... into ... M205-STILE ... and the mailbox and stuff. I think at first ... a number of people were sending messages ... to the*

wrong conferences ... everyone was initially not quite sure what to do. But ... that would probably happen regardless, it does take you a little while just to get adjusted.

2. *I'm still not too sure about the system, I can't remember all the levels, but I was in an area, I don't know whether it was a conference or what, but I posed a couple of questions. I didn't know who to send them to, you see, so I just sent them to tutors.* Apart from not knowing where to post messages, the choice of using either open conferences or email and the option of contacting either other students or tutors raised dilemmas for some students. They appeared unsure about who to contact in the first instance.
3. *I must admit, as I get deeper and deeper into a conference and I'm opening more and more icons, I tend to lose the drift of where I've come from in the first place. So I end up clicking out of things to get myself back, thinking 'Oh yes, that's where that was' ... if ... I haven't actually made a note about where somebody's particular message was, ... I think, 'Now which conference was that in' ... I don't think that's particularly a fault of the system so much. It's probably a case of some people don't actually know where to put things so ... I think it doesn't really matter where it goes. Now and again, I've looked at something and found it in a different location to where I thought I would have found it.*

Instructions on how to use the FirstClass search facility may have helped this student to relocate the messages he or she wished to find.

A small number of students reported needing time to adjust to the online environment. They were unsure about where to post messages and how to navigate to the different discussion areas. Also they found it difficult to know who to send messages to and where to find messages they had already read. Students using such online systems need a facility to be able to track where they have been. Indeed the Netscape Web browser provides a history feature to indicate the route the user has taken.

The use of icons helped the students to navigate within the structure. For example, at the nine-month point in the course, two of the four students in group three mentioned that they found the icons supplied by FirstClass and selected by the IMF very helpful.

1. *It was much easier for me. I found the way the environment was set up was very good. I was able to picture things a lot better. I realise it's still an abstract concept, emailing and everything, using a computer, ... I had used it before, ... line by line on the DOS screen, ... I just liked the way that M205-STILE was set up pictorially on the computer. It makes things a little less abstract, if you like.*
2. *I think it's quite a good idea. I'm quite sold on the idea of electronic icons ... I think it's good.*

The structure adopted for the main study (FirstClass) appeared to be successful for the majority of group one students (ten out of 12) who thought that the layout was either well presented or reasonable. In addition to the icons, the screen dumps in the FirstClass handbook (supplied to the students by the IMF and discussed in the next section) assisted the students to navigate and orientate themselves.

5.2.1.1 The combination of the conference structure and the handbook to aid navigation in the main study (FirstClass)

The difficulties recounted above by a few students suggested that they had not read the handbook and may have missed vital information intended to help them. Therefore the group one students were interviewed again in depth, to ascertain if this was the case. In fact ten of the twelve students had read the handbook. Seven students indicated that they had quickly scanned the contents: *I'd skimmed through it to get the general gist of it, ... I'm better ... hands-on ... doing practical things, so I thought if I just got in there and navigated myself round the system, I'd pretty soon get a better idea of what's going on.* Two students mentioned that they had referred to it when they encountered difficulties. *When I experienced a few problems, I actually read it about three or four times, ... and it actually was very explanatory, ... It was a bit daunting at first, ... when you log in it's quite simple, it ... does all the work for you ... so that's quite good. ... The only thing I didn't really know about was ... attaching ... files ... and I thought that was very explanatory and I went back and I did it within seconds.* One student felt the need to read the handbook from cover to cover. *It's just a habit of mine, I like to read everything and find out what's on offer. I don't always retain all of it, ... Screen dumps were helpful.* Another student found the handbook an aid to understanding the hierarchy of the conference structure. He had minimal experience of using a modem, but managed to log in on the first day of access. He left the following message on the second day:

I did manage to log in yesterday, but was a bit baffled by all the different conference icons and appear to have replied incorrectly. I've reread the handbook this morning, and it's becoming clearer.

In all cases, the group one students had dipped into the handbook and used it to some degree. Unsolicited feedback from the students was very positive about the documentation. Two students commented on the handbook guidance for FirstClass as follows:

1. *I have successfully managed to get into the system, which thanks to your comprehensive notes, was made relatively easy.*
2. *I checked every item on my screen against your screen dumps and that was how I knew I had it right. Some people forget that other people are novices ... I had no real problems. The documentation was great: possibly the best I've ever seen. I deal with a lot of software and your documentation was excellent and quite reassuring.*

The screen dumps in the handbook helped those students who had used it. However there was a suggestion that it may not have been compiled in a way suitable for all students. Two students would have liked a ten-point list of instructions as a supplement to the handbook. One suggested an automatically *opening page*, as soon as FirstClass was opened, which would contain *seven to fifteen points to know before you start*. The second student indicated that a brief list of what to do would have worked much better. In fact, the students had been sent a FirstClass User Reference card covering the main features in bullet point form but unfortunately this had not been available for dispatch at the start of the course. The students' comments indicated that they should indeed be supported with both forms of instruction.

In summary, the majority of group one students reported in indepth interviews that:

- the structure adopted for the conference on FirstClass had worked for them.
- they had used the handbook,
- the screen dumps in the handbook had aided navigation,
- failure to use the handbook did cause difficulties.

Students only expressed confusion about where to find some of the messages when they first used the structure provided in the M205-STILE conference. The structure adopted for the main study (FirstClass) combined with the handbook supplied by the IMF appears to have fulfilled its purpose of aiding navigation and familiarisation.

5.2.2 Student views on the balance between the M205 Help and Tutorial conferences in the FirstClass conference structure

In this section, the students' views about the importance of two discussion areas in the FirstClass conference and whether they should be amalgamated are explored. The M205 Help conference, was a daily help sub-conference where potentially all participants could answer a query. The tutorial conferences were areas for a tutor to provide domain-specific help to their students. These two sub-conferences were intended to complement each other and form the knowledge-related area of the 'domain of discussion' dimension, which was discussed in detail in chapter 4. The group two students who were described in chapter 3, were consulted for their opinions. Four of the five students in group two felt that it was important to have individual tutorials and a separate free-for-all Help conference. One student was unsure.

> **Student A** thought at first that one big conference may have been better but realised after some thought that it would contain a lot of irrelevant messages. *In a way I think it would have been better to have one big conference, just like the help conference. But that means, I guess, that if they've got a message from their particular tutorial group ... just saying I'm going to be half an hour late, or something, then everybody has to read it.* This comment shows the importance of the message title in finding a balance between having to see all of the messages but not having to *read* all of the messages.

Student B felt that it worked well having the individual closed tutorials at the start of the year and then making them read-only (which is discussed in more detail later) when the groups were established. *I think the system works OK. The M205 Help is very good, you certainly get a lot of questions on there which help jog your memory ... I think the tutorials are quite good because ... you could get one tutor answering one thing and one another. I think as long as you've got the consistency there of ... being able to ... sort of spread it round the group, I think that's quite important. The group culture is there in the OU and you've got local ... students ... I think it's quite important to retain that sort of sense of belonging to a group. Whereas if it was open, I think it would be a free-for-all. I think it needs to be organised.* This student is indicating that the organisation of the tutorial groups worked well (for the group culture) but he liked the openness of the M205 Help area for access to more information.

Student C found the setup of the conferences quite useful. She thought it would be confusing to have one big Help conference with all of the tutors answering questions as compared to having the help conference and the separate tutorial areas. *One big* conference *could get ... confusing* and she found *it quite helpful to go into my tutorial area and see what was happening there ...*

Student D preferred to have the Help conference and the tutorials separated. She would have been overloaded with messages if it were one big conference: *I prefer to have the individual tutorials where you can look at your own group and then to have the Help conference where it's a wider aspect, ... other students helping one another more, I think that's good ... I tend to find when I'm looking through the tutorials, that some ... have a lot more going on in them than others. I tend to log into some tutorials more than others. I would find it a real bind to have to go through lots and lots of messages in the Help if they were all on the same thing. I prefer it more tutorial based, I prefer to have them separated that way ... some of the tutors' styles I prefer to others.* This comment again reiterates the importance of multiple perspectives on a problem from either the students' or tutors' perspectives. The benefits of access to multiple perspectives support the findings of Wegerif (1995 and 1998).

Student E would have liked one big conference. *I think it would have been better if everyone could have gotten hold of everybody* ... This outcome suggests that some students preferred large course-related conferences and to scan them for useful messages.

However, it was also mentioned that it was important to have a critical mass of students in each and every conference to avoid *the pigeonholing of the tutorial groups" which "tends to encourage discussions with the 4-5 people online in one's own group*. Combining two or three tutorial groups with their respective tutors may have had a different result. Indeed one student said *Is there any need to have students segregated into groups like we have been? I know this is standard teaching practice, but do you really need it in an electronic classroom? Apart from that I thoroughly enjoyed myself!*

These students in the main (four out of five) liked the balance between the M205 Help and the individual Tutorial conferences. The IMF appeared to have structured the environment to facilitate access to a number of sources of assistance. This use of structure encouraged students to use these two sub-conference areas which were related to the knowledge aspect of the environment.

5.2.3 Organisation of the FirstClass conference structure in the main study to avoid information and work overload

Prior to accessing the M205-STILE conference, the IMF sent each student a welcome message by email. This was the first message they received when they logged into FirstClass. It is useful to consider this Welcome message here, even though it is not related to the M205-STILE conference itself, because it caused overload for some users. For example, one student described how he was confused by this message which had been sent on a mailing list. He said, *I was initially confused ... there were a lot of messages going backwards and forwards from student to student and to you. I was only expecting one email message from you ... to me. Everybody appeared to be copying their email to everybody. I had trouble picking out your hello message. It was quite a way down the list. Once I clicked on that, I replied to it and sent one back.* The nature of this problem highlighted how easily students could become overloaded with messages when they started using FirstClass. Although the FirstClass handbook had been praised, it appeared that there were some problems for which no advance preparation can be made. Students need to learn or to be taught new skills to cope with these eventualities. In future the students should be informed about mailing lists, and how to respond to messages from mailing lists.

5.2.3.1 Overload in the FirstClass environment

To see if the structure of the M205-STILE conference had an impact on overload, the four students in group three were asked for their opinions. They were asked if they ever felt overloaded with information within the FirstClass environment. They were also asked if they ever wasted time or lost their way when using this medium. Three of the four students said that they were not overloaded within the FirstClass environment and the fourth student only felt overloaded at the beginning. The students' comments are presented below.

Student A was not really overloaded with information in FirstClass. *Not really. I mean, ... it's not like you have to look at everything all at once, so you can actually take your time to look at things. Sometimes ... I'll see a couple of things I want to read, ... I'll just save them and then even a couple of weeks later go back and read them. You can control it.* She only felt she wasted time with FirstClass at the beginning before she decided that it was not necessary to read everything.

Student B was not overloaded in FirstClass. *I'm always a great believer in that if the information is there at least it's available. If you don't want to use it, it's up to you. I don't think you're overloaded at all.* He felt he did not waste time on FirstClass.

Student C did not feel overloaded with information on FirstClass but felt *more overloaded with course work.* She felt that she had only wasted time *in the beginning in the general areas where there were a lot of messages that were unrelated,* particularly from PGCE students. This latter comment reiterates the points made earlier about the confusion caused by the conference created on the desktop by the FirstClass administrator. These were outside the structure adopted for FirstClass.

Student D was a remote student without face-to-face tutorial support. She felt overloaded with information in the beginning with the number of messages in FirstClass. She developed a strategy based on screening skills to cope with this. *I did* [feel overloaded] *at the beginning quite a lot, because I didn't know how to go through a lot of messages and delete the ones that weren't of any interest to me. At the very beginning, everybody was putting on messages that had little relevance; they were just trying out the system. So yes, I did feel overloaded with nonsense information. But, as time has gone on, I've experimented more with the system to the point now where I can quickly look at messages in a conference and if there's nothing of that much interest, I just come out of it, click on the flag, and I get rid of all the messages at once. So I have managed to progress from reading every single message to being able to select what interests me most.* She had developed a strategy to deal with information content. She said that she only wasted time on FirstClass *before I learned to de-select lots of messages that weren't relevant. Because I would go in and I would have to open up the messages and find out what was in them and one thing and another. Now I tend to be able to look at a message and go, 'No, that's definitely not what I'm interested in' and I can de-select a whole lot at once. So yes, I have wasted some time on it. But really that's other people's fault, to be honest, because they put on messages that aren't relevant.*

These responses suggest that the structure adopted by the IMF was appropriate to alleviate the possibilities of overload. The four students interviewed in more depth did not feel overloaded with information in the M205-STILE conference (FirstClass) but one student did feel a little overloaded at the beginning.

5.2.3.2 Students methods of coping with the amount of online messaging supplied in the conference structure on FirstClass

This section discusses the value students placed on message content and the strategies they developed to decide what to read and what not to read. The students in group one (who were described in chapter 3) were consulted to find out if message overload was a consistent problem throughout the presentation of the course. They were asked if they had found most messages in conferences either interesting to read or dull or a waste of time. Eight of the twelve students responded that they had found both interesting messages and dull messages. Three students reported finding only interesting messages while only one student reported finding only dull messages.

Messages that were considered interesting were those when a student asked *a question which I would have asked myself*, for example, when messages were related to Tutor Marked Assignments (TMAs) or other course work relevant at the time. Alternative useful messages were those related to help with FirstClass itself. *For instance I had a major problem where I couldn't get the machine to interpret the attachments. And somebody gave me some very good advice ... and I was able to use that system so the machine could interpret the attachment.* One student also mentioned how it was easy to become engrossed in non-course-related messages. *I think there's some very interesting subjects ... actually. Not just in the tutorial ones but in the general chat ones, you pick the odd thing up. I think I read one at the very beginning that was about matchsticks, I couldn't believe it. Somebody was going on about matchboxes. At the time I was getting engrossed in it, because they were going on about where they were made and how many there were and when they were first made and so on, so it was quite constructive even though it was a silly sort of thing.*

Messages that were considered dull or a waste of time were those sent by the same people and continuing on a topic, which was *not relevant to others*. Some of these messages were considered rubbish because they appeared only relevant to the person who sent them. Other messages, which fell into this category, were those that were sent to the wrong conferences, and early messages when students were first introducing themselves.

It appears that students were quickly able to develop a strategy to cope with the amount of information within the conference structure in FirstClass. The students learned to be selective. Some students realised that they should not undertake all of their correspondence in the M205-STILE sub-conferences and replied directly to individuals. For example a student mentioned posting a message to a conference that *was nothing to do with the course. It was about using Pagemaker and somebody answered so I replied straight to him, because I thought, well, nobody else is probably interested in this. So I replied to him rather than to the conference.* This student realised that it was necessary to post a message to a conference to search for a correspondent on a particular topic. Once she had a response, she knew that any further messages would be irrelevant to other participants in that conference. However this was not always the case and a student who made an additional comment on a questionnaire alluded to overload in terms of messages on topics he was disinterested in. *I also find it frustrating to have emails sent to me that are of no interest to me or were never meant for me in the first place. I am amazed just how much time can be devoted to STILE and I find that it distracts from my study of the other subjects I'm doing.*

The volume of messages in some conferences perturbed students who thought their message could be missed and they might never receive a response. For example, a student *asked a question about the copying, the backing up of ... P system disks, ... and somebody actually replied! After about three days. I was quite surprised that anybody even read it, after I'd seen all the files listed, I thought mine will never stand out. But somebody replied and gave us the slash commands to do this particular task, which was really good. I think I learned a bit there. I think it's definitely worth it.* Students found it risky to post messages online because there was a chance of not receiving a reply.

The issue of overload and how students can flag or filter messages relevant to their needs merited further research and in order to investigate this issue further, the group one students (see chapter 3) were asked if they had decided on a strategy for which messages to read or ignore in a sub-conference. Seven out of the twelve students in group one reported in interviews that they used the message title was their method of deciding which messages to read. They used the message title to judge if there was *anything of value*, if not, they would skip the message. These students had decided that they could not read everything and mentioned the volume of messages in the M205 Help area. *I obviously check for personal mail, in my own tutorial conference. To be honest, I browse through practically everything to see what there is of interest,* *because you might miss something that could actually possibly help you, so I tend to open everything. I don't open all the messages, I look at the titles to see whether or not I think they'll interest me ... I'm more concerned with the academic side of it.* Three students were unsure if they had developed a technique for what to read and what not to read. *I became overwhelmed at one point with all the information on here ... It occurred to me that if you were using this a lot, you'd have to become selective and know what you were looking for or some way of getting around it ... You probably get a lot of trivia.* Two students focused on the message content, particularly *anything that related to the TMAs* (Tutor Marked Assignments).

In summary, the students had priorities, which were related to:

- a consciousness of the amount of time they could spend on online activities,
- learning to be selective,
- the relevance of messages,
  - to the group as a whole,
  - only to the individual who sent them or to particular students,
- methods for scanning for useful messages using:
  - message title,
  - message content,
  - messages related to Tutor Marked Assignments.

The structure adopted for the main study (FirstClass) appeared to enable students to cope with the amount of information supplied online. The number of messages in each tutor group with reasonably good message titles aided selection. The findings suggest the students adapted well to the system making use of available information to make sound and relevant decisions. This is in contrast with McConnell et al. (2000) where most members felt that that they had to read and answer every message.

5.2.4 The effect of moving outside the structure adopted for the M205-STILE conference on FirstClass

The IMF had structured the conference on FirstClass so that the M205 students and particularly the novices (in online working) would not loose their way and wander into the wrong forum. The conference structure in FirstClass appeared to prevent students losing their way, see section 5.2. However, when students ventured outside the structure devised for them on FirstClass they were easily lost. They expressed confusion about conference areas on the FirstClass desktop outside the conference structure. The FirstClass administrator had created these. The following two comments indicate the confusion caused by areas outside the conference structure devised by the IMF.

> *One conference in there ... seems to be mostly taken up with Post Graduate Certificate in Education (PGCE) students, and it took me a while to figure that one out. I'd be going in there and wasn't being able to understand what they were saying. This is not my course, I know that you have to have other students on, but ... I've spent maybe half an hour to an hour opening messages which were nothing to do with me ... they use Macs and we use PCs, so even the textual stuff wasn't any good to me.* Confusion was caused by the much larger population of PGCE students who conversed in a conference created by the FirstClass administrator. A student in an end-of-questionnaire comment reiterated this latter point. She said *I ... felt that the PGCE students should have been informed of our arrival on the server as I spent a lot of time at the beginning answering queries from these students, such as why are you here?, who are you?*

> *There was confusion about what each thing was for, for instance questions and queries, that simply related to the desktop, OU service news etc. it didn't really relate to M205-STILE at all, and I think there's a need to clarify quite clearly at the outset what each of the ... icons are for. Need to clarify the meaning of the open stage.* These conferences and associated icons that were created by the FirstClass administrator caused confusion.

The IMF had not been alerted by the PGCE course team nor the administrator that these conferences would appear on the M205 students' FirstClass desktop. This suggests the need for more consultation and communication between parties involved in setting up conference areas for different student groups.

This indicates how it is important to monitor and guide student activity once they exit the structure for the 'course-related content' supplied for them online. These findings confirm those of Sloane (1997). They also suggest that the attractions outside the structure provided in the main study could easily allow a student to become sidetracked. These pedagogical issues need to be addressed in future presentations of online courses.

5.2.5 The IMF's role in supporting the tutors in the main study

The IMF intended to maintain the momentum in the FirstClass conference by responding quickly and effectively to student and tutor needs. The tutors were asked how helpful it had been to have the IMF taking overall responsibility for the online environment. Questionnaires were sent to nine tutors: 89% (or eight tutors) responded. The tutors valued the IMF's role in the online environment. All eight tutors stated that the role was essential, one mentioned especially so, *considering the steep learning curve being negotiated by staff and students alike*. Another tutor echoed this point saying *I knew nothing about the system to start with, and it took a while to get to grips with it.* The tutors remarked that the IMF responded to needs and controlled access rights to the various conferences. For example, one said, *in any case, how would everyone have the correct access to the relevant conferences if there was not one person in overall charge?* The tutors saw the IMF's role as a must: *Someone to pick up the pieces,* and guide the students in their absence. One of the tutors described some of the essential characteristics of the IMF as being *helpful, hard working, and patient with the tutors who were too busy to always respond on time*. The inclusion of the IMF role makes the FirstClass conference structure a responsive system where users have a feeling of support and control.

The tutors had been instructed to make their tutorial group conference their priority and were only expected to dip into the M205 Help conference if and when it suited them. The tutors were asked in a questionnaire if they ever felt overloaded with messages. Eight of the nine tutors (89%) responded. Seven of the eight tutors who responded said that they did not feel overloaded with messages in their tutorial conference. This meant that they could indeed answer different sorts of queries in the

M205 Help conference. Three of the tutors (C, D and F) reported being able to control their workload, spreading it between their tutorial and the M205 Help conference. Students could benefit from the input from these tutors (in addition to the course team) in the M205 Help conference throughout their course. The tutors were also asked if the IMF's setup of the FirstClass conference structure (with individual tutorial groups and the course team monitoring the M205 Help conference) had affected their perceived workload. Six of the tutors reported that the structure controlled by the IMF helped a lot, and reduced their perceived workload. Two tutors did not really think the structure affected their workload.

Tutor A remarked that he felt overloaded with the message content *sometimes ... the overload was not in the number of messages but in some that needed extra time such as non-working program code.* This tutor had the busiest tutorial and was relieved that he was not duty-bound to respond to queries in the M205 Help conference. He said *it was a great relief knowing that I didn't have to respond to every problem. The temptation is to leave things to others.*

Tutor B did not feel overloaded with messages. He said that the structure using the Tutorials and M205 Help conferences *reduced my perceived workload a lot.*

Tutor C felt that the FirstClass format was fairly useful but found it difficult to know how this had been affected by the conference structure. *Not really overloaded with messages ... Difficult to say what effect the setup of the conferences had. I didn't have as many queries to answer as I thought I would ... one student always sent the messages to both Help and my tutorial and I learned to check first whether they had already been answered by someone else.*

Tutor D responded to messages in the M205 Help sub-conference in addition to her tutorial conference. *No I did not feel overloaded ... I don't know about workload as such the volume of messages in the Help conference wasn't huge and I was sometimes the first to respond. It did presumably mean that the students could rely on a reply within a working day if they raised a query there.*

Tutor E felt that the presentation on FirstClass was good and helped his students. *No not overloaded, could do with more messages ... The conference setup helped a lot. Students viewed the Help conference frequently and were glad to find others had similar problems.*

Tutor F was not overloaded with messages in FirstClass. His was one of the quieter tutorials and this meant that he could spend more time helping in the M205 Help conference. *In fact I looked into the Help conference quite often and intervened when I thought I might be able to make a swift contribution.*

Tutor G said he found the FirstClass format worked well. *No not overloaded, sadly I feel under used! ... Although I have signed on every two or three days most times the outstanding questions* [in M205 Help] *have already been answered and so this has reduced the demands on me very considerably.*

Tutor H did not feel overloaded with messages on FirstClass. He had the quietest tutorial and felt that the setup of the FirstClass conference structure did not affect his perceived workload very much.

Although answering questions in the M205 Help conference was an optional extra for tutors, they frequently accessed this conference. Depending on their workload in their own individual conference they could contribute as and when they were able to queries in the M205 Help conference. The IMF's intervention to sort out responsibilities in the online environment and devising a structure which facilitated the various roles, contributed to this successful outcome.

5.2.5.1 How the structure affected the tutors' role in the M205 Help and tutorial areas

The tutors made comments about the structure of the FirstClass conference at the end of the project debriefing meeting. Tutor B broached the issue of separate tutorials and open access to the M205 Help conference. She commented about one big help conference: *I think there is a danger if you've got two thousand students or whatever it would be, ... it is so easy to be drowned out, ...* (some tutors in agreement). *You* *might ask a question and if the next person who logs in doesn't pretty well pick it up, then it's so easy for it to be lost in the rest ... As it stands at the moment obviously if you are a tutor then you have ultimate responsibility for having looked at and thought about any queries in your own tutorial conference. And I think you do need somebody to have that responsibility and if it was too big a group all throwing in things into one conference then it would be a bit big for anyone unless they were employed full time.* This comment echoes those of the students that one big conference would not have worked as well as separate tutorial conferences with read-only access for all students and the separate free-for-all Help conference.

Tutor A expressed how it was difficult to know whose responsibility it was to answer questions in the M205 Help conference. *When a question came up in the Help conference I felt I wasn't much help because I would think oh gosh I must think about that one. Then the next time I came on there was about six messages, so I'm not sure what our policy was in terms of letting the students try and work through a problem before tutors went in to answer. It's difficult to judge how much you should let them discuss first before you should step in.* The tutors appear to have been struggling with the role of becoming a facilitator.

Tutor B also mentioned the benefits of having the course team on hand to answer queries in the M205 Help conference. *Every time I have logged on I have probably looked at the M205 Help, it's interesting to know what some people were asking. Sometimes I have looked at it and thought oh yes, there is an outstanding query, I can answer that quickly so I will do so but other times if I thought it was going to take me a long time, I'm busy, it was nice to know that somebody else had the responsibility for that and so I didn't feel I had to answer it.*

Tutor G discussed how he navigated through the FirstClass conference structure. *Every time I logged in, I looked at my mailbox first, then my tutorial, then the help conference and then everyone else's tutorial.*

The tutors felt that the balance between the M205 Help and tutorial conferences worked well. The structure adopted for the main study (FirstClass) reduced the tutors' perceived workload. Seven out of eight tutors did not feel overloaded with messages in their tutorial conferences. This meant that they could indeed answer different sorts of queries in the M205 Help conference. They could control their workload, spreading it between these two conferences (tutors C, D and F), depending on the number of messages in their tutorial conference, which remained their main priority. This meant that students had access to a range of tutors (in addition to the course team) in the M205 Help conference for the duration of the course. A factor related to a lack of critical mass could be the chosen ratio of 1:11 students, that is, the IMF together with the nine tutors each responsible for an average of eleven students. The numbers of students in the tutorial conferences is discussed further in chapter 7.

5.2.5.2 Iterative changes made by the IMF to the structure of the computer conferences for the main study (FirstClass)

The role of the IMF provided the potential for change within the conference structure adopted for FirstClass. The IMF changed the structure in response to student feedback, so that the online environment was responsive and flexible. The role of the IMF offered the dynamic element to make both planned and unplanned interventions in what otherwise could have been a very static environment. For example one of the planned interventions by the IMF was to supply the online course materials in a staged approach. The number of downloads of the online course material in the main study (FirstClass), are discussed in earlier analysis in Wilson and Whitelock (1997a). As mentioned in the previous chapter, the IMF adopted message approval and conference access permissions to reduce the possibility of overload. The IMF monitored activity in the main study (FirstClass) and as a result decided to lift the message approval facility from some conference areas, see table 5.1.

Table 5.1 Changes to access and message approval in the FirstClass sub-conferences

	Message approval	**Open access**
The Meeting Place	No	Yes
Students common room	Lifted after one-month	For students only
M205 Help	No	Yes
Tutorial conferences	Yes	Read-only access for all students after April 1st.

The M205 Meeting Place and M205 Help conferences did not require message approval from the beginning of the course presentation. In the latter case, this was to allow the students to answer each other's questions, in addition to the course team, and thus allow peer groups to form within the conference. The Students common room required approval of messages by the IMF at first, while the students adjusted to what was acceptable behaviour in that area. One interesting outcome related to the culture of the online group was the absence of any outbursts of flaming, or harassment in any of the conferences and none were reported to the IMF. This suggested that the IMF's structure and inclusion of netiquette materials had facilitated this successful outcome. For example, the use of message approval in the Students common room area of the structure enabled the IMF to quickly stop and counsel one student who did not realise that their comments about national traits could be misunderstood and cause upset to other students. This action, where no one except the IMF could see the message until it was approved, possibly prevented a flaming session and saved this student from embarrassment. Once this student and others realised what was acceptable behaviour, the IMF removed message approval (this occurred after one-month when it seemed appropriate to allow the students the freedom to socialise together).

These findings suggest that the use of message approval and the influence of the IMF and tutors create a comfortable and safe environment for all participants. A suitable period for which to adopt message approval would appear to be two weeks or until acceptable behaviour has been established. This would require the IMF and tutors to be online more often when the conference and sub-conferences were first opened. The downside of introducing message approval was the possibility of stilting message flow, if the IMF or tutors were not online enough to approve messages quickly. The IMF had enabled the tutors to approve messages in their tutorial conferences. The fact that tutors needed to approve messages before the students could read them did appear to be restrictive in the tutorial conferences. Indeed students did not like to see messages they could not read. *I find it very frustrating being able to see that messages are waiting for me, but I can't view them as they haven't been cleared yet.*

However, a majority vote was not achieved from the tutors to take message approver status away from them. Some pointed out that they logged in regularly enough to approve messages quickly. The tutors were asked for their opinions about message approval in a questionnaire before the end of project debriefing meeting. Questionnaires were sent to nine tutors, 89% (or eight tutors) responded. Three tutors wanted to retain message approval. Two made the following comments:

Yes. It allows you to cope with messages that really should have been sent to your mailbox but were sent to the tutorial conference by mistake.

I'm happy about this as I chose to go online most days. If tutors are unable to do this then the immediacy of help to a student may be lost and with it the whole point of the exercise.

Three tutors said they would not retain message approval. *No, I never disapproved of a message, and if I had, I am sure there would have been no great disaster letting other students see it. It must be very irritating to see that messages exist which you can't read.* This affirms the comment made by one of the students.

Two tutors said they hadn't really needed it. *I can see the reasons for it but in my case it wasn't really necessary.*

At the debriefing meeting it was suggested to the tutors that message approval in the tutorial conferences might have stilted the message flow. One tutor commented: *I just felt it must have caused them a bit of irritation ... I would definitely take it away.* All of the tutors nodded in agreement.

The CMC research literature had indicated that tutors in previous CMC environments experienced an increased workload with the amount of messages they received online. In an effort to curb this and increase the tutors' control of their workload, the IMF had set them up with private sub-conferences for their tutorial group. However the students wanted to be able to attend all of the online tutorials in the same way as they could choose to attend any face-to-face tutorial other than their own. They did not want to see conferences they could not access and this motivated them to ask for changes. Read-only access to all of the tutorial conferences was requested by one of the students from the quietest tutorial conference (see chapter 7), one-month after the project had started. Two weeks later a student from the busiest tutorial conference (see chapter 7) also requested read-only access to all of the tutorials but in addition asked for message approval to be lifted in each student's own tutorial. When students requested access to all of the tutorials, the tutors became concerned that students other than their own would send email and conference messages, which would increase their workload. The IMF negotiated a compromise whereby the tutors agreed to allow all of the students read-only access to all of the tutorials because this would not increase the tutors workload and yet provide more 'online course-related content' for students. On 1 April, the IMF introduced read-only access to all tutorials. This was an example of the flexibility the IMF introduced allowing different types of participation in the tutorials.

5.3 Enhancements to student learning with the main study FirstClass)

Students mentioned above that messages, which were interesting, were those where their colleagues asked the questions they would have posted themselves. This was further explained by a student who could be called a 'lurker'. She developed a learning strategy whereby she followed the questions asked by one particular student whom she felt orchestrated her difficulties. In effect, she was shadowing the other student and using her as a way to filter messages. She said *I've dived in and had a look ... there's one girl who's really honest and I follow her quite closely because she's having the same trouble as I am. But she's much more willing to ask questions, or perhaps she has more time. But I've had a look in hers because she tends to ask a question that's just on my lips at the moment ... Quite simply I read everything by the name of the individual. If it's got A's name on it ... I tend to open hers and it's quite interesting looking at a heading.* This finding about 'watching' provides further evidence to that reported by other researchers (Wegerif, 1998; Collis and Verwijs, 1995; Berge, 1996). For example in Phase One: Browsing and Getting Familiar, Collis and Verwijs (1995, p.13) expect the student to be 'browsing, "listening in" to discussions, "window shopping". Wegerif (1998, p.9) reports that a student 'after a period of watching, waiting and learning from others' was able after time 'to engage more effectively in discussion than she ever had before'.

Read-only access to all of the tutorials enabled students to shadow the interactions between other students with their tutor. This reiterates the value of shadowing. Indeed one student commented, *I do actually go into all the various tutor conference groups too, picking things up in them. Presumably I'm not alone, I find my tutorial group a bit overwhelmed with people who know what they're talking about ... I can't follow the terminology sometimes. I'm not normally easily overwhelmed but I'm wondering if I'm on the right course. I understand the principles, I just can't apply them.* Another student reiterated the latter student's comment about the value of open access to all of the tutorials. *I tend to be selective, ... I don't read everything that's in there. ... I tend to read everything that's in the M205 tutorials, so that's everything there under the new system where you can get into everybody's tutorial, on a read-only basis, I tend to look at that quite a lot ... I've picked up a lot of good information from those that I'm not getting from my own tutor. It's not a criticism of him, but there's something obviously that goes on in other tutorials, you think, 'Oh yeah, I need to know about that' ... I think the problem is if you're used to dealing with one tutor then you tend to take his line on things. It's good to have other people. It's really like having ten tutors on your side, which is probably better.* Access to a variety of tutors teaching styles were considered very valuable.

Students commented in indepth interviews that read-only access to all tutorials was very helpful. They could read the messages in the other conferences, and see the different teaching styles and have multiple perspectives on problem solving which helped their understanding of the subject. *In fact, I have got into the habit of logging into other people's tutorials to see what they're discussing in their tutorial group ... because different tutors have different types of group, it seems, the messages aren't all the same from group to group, and so it gives you a wider perspective on some of the course work.* This issue is discussed further in chapters 7 and 8.

5.4 Usability of the software in the main study (FirstClass)

A secondary aim of this aspect of the research was to check the usability of the FirstClass software. The group one students, described in chapter 3, were interviewed indepth about the ease of use of the software. Half of the 12 students in group one reported that the FirstClass software seemed familiar to them because they were regular computer users experienced with Windows type environments. This may have explained why a number of students did not need to read the handbook in greater depth (seven out of twelve, see section 5.2.1.1). Interestingly, though, two of these regular computer users were of the opinion that computer novices may have encountered difficulties with FirstClass. *I did hear somebody at our tutorial this week who'd never used Windows before and was having trouble.* Four students were very impressed with the software. *I think really I was pleased that it was as straightforward as it had been. I did do DT200,* An Introduction to Information Technology: Social and Technological Issues, *a few years ago, it was really a lot of trouble making a connection, it took me about three weeks. ... it was very straightforward, I don't think I had any problems at all.* This point was reiterated by another student who said *when you've actually used DT200 before and used the software, this seems quite worlds apart.* Students who took the DT200 course had used the CoSy conferencing software, used in the pilot study (discussed in this thesis). Two students were unsure about how to use the software at first but in general students found *it was quite easy just to trawl around* the FirstClass conference structure. This finding supports that of Derycke and D'Halluin (1995) who reported that students quickly learned to use the Co-Learn system and especially the Windows interface, much to the amazement of their tutors.

One of the students who had taken the DT200 course made additional comments about her impressions of using the FirstClass environment as compared to using the CoSy conferencing system. She was based remotely and explained how the concepts and navigation differed between the two systems. She preferred FirstClass. *I thought it was wonderful! Basically because I had done DT200 a couple of years ago and I had used the modem then to connect to various conferences. On that system, I felt that everything was very abstract and happening in my head, I was imagining things like the conference more than now, I've actually got a graphic realisation more of the conference. When I click on things, I find it more real to be able to open up a conference ... I actually feel more like I am talking to someone. I'm having a chat with them. Although again, you are still imagining the person at the other end of the line, for me it appears more real because of the icon, funnily enough. I know it's only a small difference, but it is a difference, instead of just looking at a prompt on the* *screen and typing into the screen from the keyboard. It actually feels to me more real ... I have a better sense of being involved in something through this system than I ever had before.* The icons provided by conferencing systems such as FirstClass make the medium more accessible and give the learner clues as to how they should navigate through the conference structure. The students' ability to adapt to the FirstClass software as compared to the CoSy software they had previously used appears to suggest that the FirstClass software with fewer limitations on structure was more usable than the CoSy software. In comparison with the CoSy software, the only technical difficulties encountered appeared with the changeover from a long-distance access route to a local access route. This at times prevented participants from logging into FirstClass. As the FirstClass software appeared to be usable, this should have enabled students to make use of the conference structure.

5.4.1 Length of time to become accustomed to the software

Although there was no inference that students did not have enough time to become accustomed to the online facilities in FirstClass it was crucial to find out if this was indeed the case. Therefore the group one students (see chapter 3) were interviewed in more depth and asked if they had enough time to learn to use the system before their course started. Half of the twelve students were satisfied that they had enough time to learn to use the system. *Personally, yes. I think if I hadn't seen the system before, it might have been a bit tight, but I was quite happy with the time based on my own experience.* Perhaps this is not surprising since earlier analysis showed that the students had reported being familiar with the use of computers before they had used FirstClass. However four of the six students who had said earlier that they were familiar with this type of software felt that they did not have enough time to learn to use it before the course started. Three of the twelve students were unsure whether they had enough time. *I think I probably could have done with some more assistance in the very early days.* While three of the students reported that the two weeks prior to the course starting was not enough time: *I think it would have been useful to have a few more weeks, especially before the course work came through, because you tend to get tied up with course work rather than the online work.* Learning to use the FirstClass facilities appeared not to be problematic for students, but a longer spell before the course started would have been preferable.

The FirstClass software appeared to be usable since the students adapted fairly quickly to its features. Students who had experience of using both FirstClass and CoSy preferred the former. FirstClass was reported as more reliable and the conference icons helped to focus discussion and aid navigation. Half of the group one students reported that two weeks was enough time to become familiar with FirstClass while the other half were unsure and would have preferred more time to become more comfortable with it before their course work had started.

5.5 Conclusions

Using the main study, this chapter has discussed the effect that CMC structures have on users. For example, it appears that the use of hierarchical structures in CMC environments can aid navigation when accompanied by a handbook. Indeed, the majority of the group one students (ten out of twelve) agreed in indepth interviews that the layout of the conference structure (discussed in chapter 4) was good. The outcomes appeared to substantiate Hiltz and Turoff's (1985, p.681) comment that 'overload and the stress it causes can be mitigated if certain structural design aspects of the interaction space are optimised'. This suggests that the consideration given by the IMF to the design of the online environment was effective. However two students were unsure about navigation at first.

The handbook provided by the IMF had helped students to orientate themselves within FirstClass and most students had read it. Some read it indepth from cover to cover, while others skimmed through it for the information they needed. A number of the students appeared, though, to miss instructions in the handbook which were intended to help them with navigation. It became apparent that in the future it would be vital to supply a quick brief list of instructions in addition to the handbook, in order to suit the different student approaches to the documentation. The findings confirm those of Naidu et al. (1995) who found that learners with variable levels of expertise with the email software and online communication needed a printed list of the main features of the email facility. In the future such handbooks should contain sections that students can read thoroughly or dip in and out of and include a short bullet pointed section of instructions for the more technology literate who perhaps only need a quick reference guide. The 'Open University Internet Access' booklet (devised by Wilson with others in 1997) contained a quick numbered list of instructions for more experienced users. The handbook should include screen dumps of the different areas in the structure which are denoted by icons. An improvement would be the addition of a diagram indicating the overall structure and the various levels.

In a discursive CMC, it is preferable to provide a variety of discussion areas rather than one large sub-conference where messages can be lost. The majority of students in group two felt that it was essential to have individual tutorials and a separate free-for-all Help conference. Three of the tutors reported that the balance between the course-related conferences was about right. However, in the case of tutorial conferences, it appears to be more beneficial to combine a number of tutorial groups rather than have separate tutorial groups. This could provide a critical mass of students and a number of tutors who can be available at different times. Most tutors agreed that shared tutorials (that is two or three tutors and all of their students in one tutorial conference) was a good way forward to tackle problems with critical mass. This would give the potential to have up to seventy-five students in a group tutorial with three tutors. An alternative would be to keep the individual tutorials but ask the tutors to take turns at monitoring the daily help conference. Tutors could alert their students that they would be logging in on specific days at a particular time in the evening to pick up their email and tutorial conference messages. Students could be advised to have their queries posted in these areas prior to the tutor logging in. If queries were easily solvable students might receive a response on the same evening; for more involved problems, perhaps it would be the next day or the next time the tutor was scheduled to log in.

It is beneficial to use CMC systems that are accessible, as a good structure is of little benefit if technical issues impede access to that structure. The use of usable CMC systems and those with which the users are familiar increases the possibility that participants will make use of the conference structure. In the main, the students interviewed reported that they found the FirstClass (main study) software easy to use, though two students were just a little unsure at first. Those who had used the CoSy conferencing system reported how FirstClass was much more straightforward to use and easier to navigate through using the icons provided. Half of the students interviewed would have preferred more time to become accustomed to FirstClass before they had started the study of their course. For more information on the technical and access issues, see Wilson and Whitelock (1997a and b).

At first participants can be overloaded with the number of messages posted in a CMC system. The structure on FirstClass (main study) was set up to minimise information overload for both tutors and students. The structure adopted for conferencing reduced the overload associated with message content. The majority of students in group two felt that the structure was well balanced with the course-related discussion split between the tutorials and the M205 Help areas. They only felt overloaded at the beginning. After time they developed a strategy for filtering information once they realised that it was not necessary to read everything. For example three-quarters of the group one students reported that messages in FirstClass could at times be interesting to read while at other times irrelevant. Interesting messages were those related to the M205 course, while messages that were considered dull were those that were only relevant to the individuals who sent them. More than half of the students in group one were using the message title to decide whether a message was worth reading or not. In effect, they used the message title as a method of filtering messages. The students developed methods for coping with the amount of information supplied, for example, scanning for useful messages by,

- message title,
- message content,
- messages related to tutor marked assignments.

The findings indicated that students were overloaded at first, which confirms those of Alexander and Mason (1994) and Hiltz and Turoff (1985) that 'perceptions of information overload peak ... when communications volume has built up but users have not had a chance to develop screening skills'. However the findings are in contrast with Tonnesen et al. (1995) who reported that 64% of remote students felt overloaded with information at some point in their course. These findings are also in contrast with Owen (2000) who reported that 10% of the students found it difficult to find the messages that were important to them. Participants need to be encouraged to develop a strategy to manage the amount of messages in a conferencing system, while reading enough so as not to feel excluded.

Students found that they were more easily disorientated in the areas outside the structure provided in the FirstClass environment. This suggests that these areas beyond the course level need to be more structured. Indeed Seufert (2000) has a campus level and a course level. It would also have been helpful if FirstClass had provided a trace facility for activities undertaken within a given student session (like the history feature in Netscape), so that students could quickly retrace their steps to find items of interest. In the future it would be beneficial to supply more navigational instructions or tools and training in organisational skills, which would help the students to use these online systems.

The introduction of the role of the IMF in the main study (FirstClass) negated some of the problems identified in the pilot study (CoSy with Wigwam). An important factor resided in the IMF's overall responsibility for designing the conference and sub-conference structure and guiding the tutor and student activity without being intrusive. The tutors as a whole were of the opinion that the role of the IMF was essential. The tutors liked the IMF's structuring of the conferences with the balance between having autonomy in their own tutorial and being available if they wished in the M205 Help conference, where the course team had the autonomy. Indeed the IMF's role in structuring the conferences in the main study (FirstClass) did reduce the workload which had been anticipated by the tutors. For example, one of the gratifying results was that 75% of the tutors who responded did not experience work overload, and felt the conference structure set up by the IMF contributed to this. The structure was successful because it separated work related dialogue from chat and the information overload associated with reading social type messages. Also the IMF acted as a buffer between the students and the tutors. Indeed all eight tutors saw this role as essential. They felt, on the whole, that they were very well supported by the IMF. One said *in general I think the support we got was excellent, really, we couldn't have done it without the support, there was always someone there, FirstClass was useful. When you got that going you could get help*. The overall feeling was one of a successful teaching experience. The IMF's independent role appears to be crucial to course teams venturing into online courses.

The structure and mechanism for change of structure by the IMF led to less information overload. The role of the IMF added a dynamic element to the structure by making changes to access permissions, message approval and read-write privileges as the needs of the participants changed. Indeed the changes to access permissions and read-only privileges in the tutorial conferences improved the structure by allowing the students more opportunities to shadow the activities of other students. Instead of interacting with just their own tutorial group, they could shadow the interactions of other students and tutors. Students commented that they benefited from reading all of the tutorial messages as well as being active participants in their own tutorial. With the M205-STILE conference, they felt they could see whether other students were experiencing the same difficulties as themselves. Students could avail themselves of the different tutors' teaching styles and perspectives on problem solving in the course. To do the equivalent by the traditional method of teaching, students would need to consistently attend all the face-to-face tutorials run by nine different tutors. Therefore the IMF's intervention gave the students access to an extra source of help with their understanding of the course that would not have been possible in any other way. FirstClass appeared to be a good medium for providing access to tutorials (in addition to the student's own tutorial) on a read-only basis, without increasing the workload on tutors. It would not have been possible to provide this type of flexibility with the CoSy 2 system designed by Guelph University, which was the alternative available. An indication that the structure on FirstClass (main study) was working was the request for open access to all tutorials. This access enabled two students to develop a method of filtering messages, by shadowing another student. These students indicated that they shadowed the online interactions of another student who asked the sorts of questions they would like to have asked, if they had had the confidence. In effect, they were relying on another student to obtain essential information for their own understanding of the course. The value of being able to shadow their peers was mentioned by a number of students. This aspect is discussed more fully in chapters 6 and 8. Whether students who shadow other students move on to a stage where they feel comfortable to post messages themselves requires further investigation.

Unfortunately the IMF was not able to prevail on the tutors to abandon the use of message approval in their tutorial conferences. It was suggested that the use of message approval in the tutorial areas from the start of the project may have stilted activity in these conferences. When tutors responded individually in questionnaires about message approval in their tutorial conferences, three of them wanted to retain the facility. However when they were asked as a group, all of the tutors responded that message approval should be taken away. A compromise for the future could be to have message approval at the beginning of the course to protect students, until they understand what are appropriate messages to send, and to which conferences. Then it should be taken away. Message approval could always be reinstated if more control became necessary, for example to contain a disruptive student.

The CMC environment, which was an integrated software package, had the pedagogical advantage of the communicative interactions it provided between students. The discussion in the next three chapters moves on to address the second research question, which is related to the benefits gained from using structured CMC systems.

Chapter 6: Expected and perceived activity within the M205-STILE FirstClass conference

6.1 Introduction

The discussion now moves forward to address the second research question, which is an investigation into the benefits of a structured CMC environment to assist student interaction and access to online materials. Grounded theory has steered this analysis of the data in the main study (FirstClass). It was used to formulate a set of categories identifying ways in which the CMC structure was beneficial to students. A first pass at this analysis established an initial set of categories, which were peer reviewed prior to the writing of this thesis (Wilson and Whitelock, 1997c). This chapter takes these early established categories and refines them further. This involved reanalysis of all of the relevant data collected, which includes both published material and interview, and other data that are unpublished.

The students' expectations of how the structured computer conference would help with their study is explored and comparative analysis is undertaken into how they perceived they made use of this CMC environment. These results are matched against how the tutors expected their students to use the CMC and their perceptions of how the students did make use of the environment. This chapter therefore starts to address how students thought they would use the CMC before their actual usage of the system is explored. Questionnaire and indepth interview data (users' opinions) were analysed, to understand the nature of the students' planned and perceived participation in the structured CMC, to find out if the structure adopted had supported distance learners.

The students were sent two online questionnaires. The first questionnaire was dispatched one-month into the course, to allow students to become accustomed to the online facilities so that they could in fact answer the online questionnaire. One hundred and six students were still online at this time and 58% of these students responded. The second questionnaire was sent out after six-months to the 67 students still online at that point, and 73% of these students responded. This drop in student numbers may appear high. However in actual fact the average online participation levels were 81%

as compared to 83% on the traditional version of the course. Access logs had been monitored to ascertain when students accessed FirstClass, on a month-by-month basis (see earlier analysis in Wilson and Whitelock (1998b)). The logs were also used to ascertain the number of hours throughout the year when participants were online (see earlier analysis in Wilson and Whitelock (1998a, 2000)). These data were compared with two other courses.

The indepth interviews were undertaken with the four students in group three who were described earlier in chapter 3. These four students gave their opinions on whether their expectations had been realised by the end of the course. Two questionnaires were sent to the nine tutors involved to gather their expectations and perceptions and 89% responded.

The online questionnaires and indepth interviews included queries:

(i) about how students expected to use the M205-STILE conference structure on FirstClass, and how they perceived they made use of it,

(ii) to probe the students about whether their expectations had been met by the end of the course,

(iii) to ascertain the tutors' expectations of how the conference structure on FirstClass would be used and their perceptions of how it was used by their students.

The findings are discussed in the following way:

- student expectations of the M205-STILE conference structure at one-month are compared to those at the six-month interval,
- student expectations at six-months are compared to their perceptions of their actual activity at six-months,
- student expectations at the end of the course,
- tutor expectations of their students' use of the conference structure on FirstClass as compared to their perceptions.

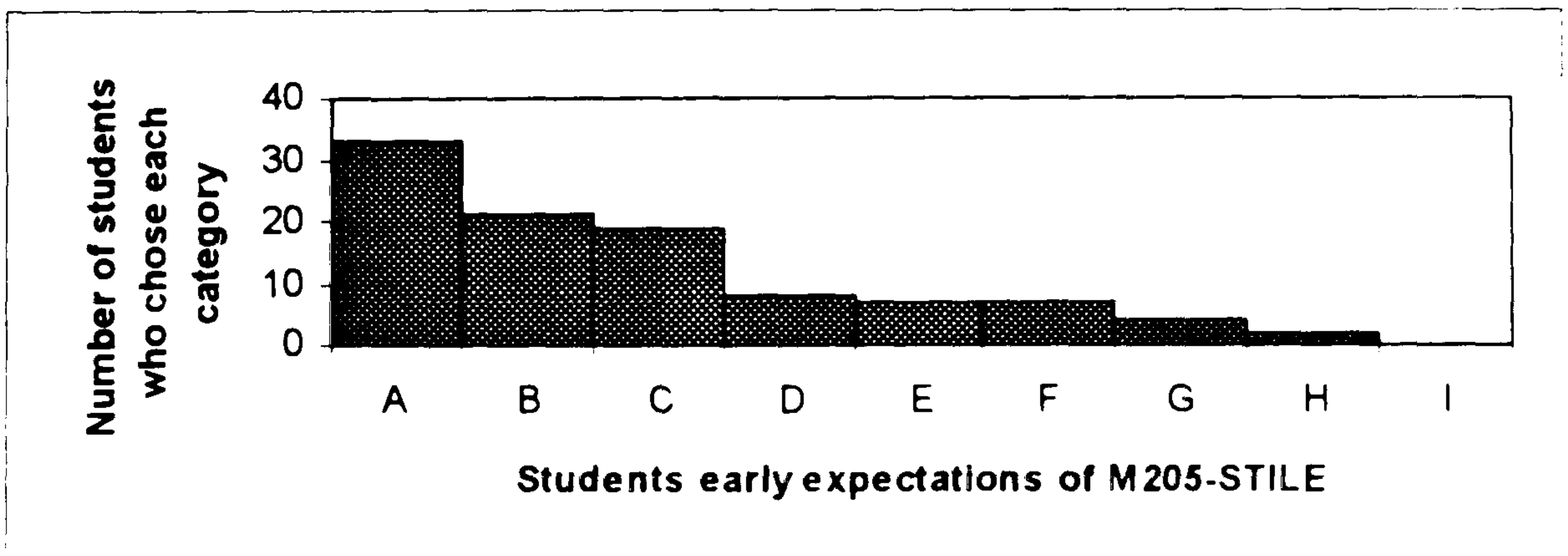
6.2 Students' expectations of the benefits of using the M205-STILE conference structure on FirstClass

The students were probed about their expectations to understand how they might use the system. These initial impressions could also throw light on any disaffections with the system that might appear at the end of the course. The open-ended answers in the first and second questionnaires were analysed and reanalysed to see how they could be broken down into one or more categories (see chapter 3). Comparative analysis was then used between these new categories and those established in advance of writing the thesis, as discussed in chapter 3. A taxonomy of nine categories emerged from the iterative process used and is summarised in key 6.1 below. This taxonomy was given to two independent researchers who attempted to use it on the same data (Preece, 1994; Fowler, 1993; Foster, 1998). The inter-rater reliability of 88% for the first questionnaire and 94% for the second questionnaire indicated a confidence in this set of categories. This taxonomy provided some benchmark data against which other data could be compared throughout this and the following two chapters.

Key 6.1 The students' categories of expectation

A. Communicating with students and tutors
B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
D. Online course material
E. Learning programming
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
G. Don't know
H. Access to the Internet
I. Social interaction

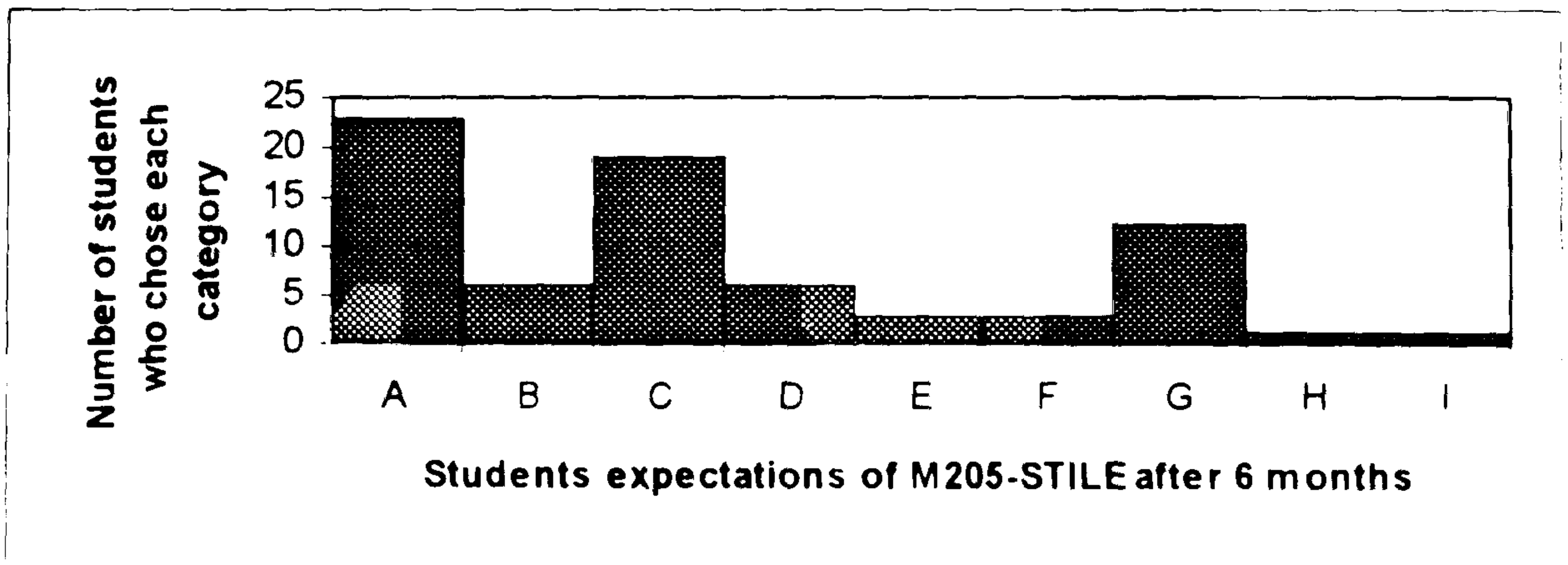
Figure 6.1 What students expected from the structure on FirstClass after one-month



This discussion compares the findings (number of responses in each category) between data taken at the one (figure 6.1) and six-month (figure 6.2) intervals and then moves on to look at the actual responses in each category in more detail. Taking the responses from both questionnaires, category A, Communicating with students and tutors, featured highly in both figures 6.1 and 6.2. This suggests that students, both with and without experience, had an expectation of being able to use the system to interact with others to gain support and encouragement. This is an interesting finding since Davis (1994, p.226) argued that 'a percentage of students find this medium difficult and there are issues in developing good communication practices' when using CMC.

Help with course work and problem solving (C) was also found to be important from the sets of responses in both questionnaires. This suggests that the students saw their interactions being mainly focused on course-related activities. What was surprising, however, was the number of students who did not know (G) what their expectations were after six-months as compared to their views one-month into the course. This could be as a result of being overwhelmed with the potential of the system or may imply that their expectations had been met. At first the students expected the online system would lead to an improvement in skills related to 'Hands-on systems' learning (B). However the importance of this category decreased between the one and six-month points. This suggests that 'Hands-on systems' learning was a good motivator at the start of the course when it was important for students to become competent users of the online system, but became less important when the students became more involved in the actual course and communicating with one another.

Figure 6.2 What students expected after six-months



The social interaction category did not feature in the first questionnaire but was referred to by one student in the second questionnaire. Perhaps students expected just to do course work and had not foreseen the possibilities of social contact and support. To compare these categories in more depth, the number of responses in each was converted into percentages, see table 6.1.

Table 6.1 Percentage change in expectations categories over time

	Total responses in categories	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
One-month	101	33%	21%	19%	8%	7%	7%	4%	2%	0%
Six-months	74	31%	8%	26%	8%	4%	4%	16%	1%	1%
% difference		2	13	7	0	3	3	12	1	1

In the category Communicating with students and tutors (A), the students expected the M205-STILE conference structure to be used mostly for discussion with their peers and their tutor. The type of communication they wished to engage in appeared to be related in most cases to discussion about the course work and collaborative learning. There was no indication of an expectation of social contact, although some students hoped that it would lessen their feeling of isolation. One student described the M205-STILE conference structure as providing *an easy and effective way of communicating with other students and ... my tutor. The system has proven to live up to expectations, and some more!!!* At the six-month point category A, was down by 2%. This might be explained by the fact that two students used this category less than expected because they were coping well with the course and had no *need to go seeking advice* online. This category still accounted for 31% of responses and the students appreciated the *feedback* they had received, the *exchange of ideas* they had engaged in and the *peer teaching going on*. For example, one student said *it's good to get moral support from fellow students as well as the different problems ... which often trigger new thoughts in myself*.

The students in the 'Hands-on systems' learning category (B) were very keen to use the M205-STILE conference to improve their computing skills for their work environment. This is evident by their enthusiasm to understand the communications technology they were using, even though it was not part of the curriculum. 'Hands-on systems' learning could be said to be important for life-long learning. Indeed one student wanted to gain *the knowledge to use other networks that are available and hopefully this experience will be of some use to me in future courses or my day-to-day work.* The reason for the drop of 13% in this category could be explained by a number of students having an unrealistic expectation of learning about networks or how the CMC software interfaced with a network. It appeared that those with unrealistic expectations may have come to understand over time that gaining indepth technical skills was not viable. In fact, the FirstClass conferencing system had been chosen particularly because technical expertise was not required, see chapter 4. The intention had been that students would use the online system as a means to discuss their course work, rather than become immersed in technical details. This finding corresponds with Seufert's (2000) opinion that it is beneficial for learners to use modern tools for acquiring knowledge.

Those students who wanted Help with course work and problem solving (C) expected to be able to ask for help on the system, have queries answered quickly and receive feedback. One student mentioned that he *found it extremely useful this morning for quickly sending ... my tutor a whole coded program which I could not get to debug properly, saving a lot of time trying to explain it over the phone. Now the course is getting trickier I guess I need to use the facility more often (exceptionally perhaps).* The students in this category (C) felt they were able to find the *information* that they wanted and it was *an aid to their regular course work.* For instance, one student mentioned *help when difficulties arise and discussion of TMA and other questions.* In fact this category became more important and had increased by 7% between the one-month and six-month points in the presentation.

The Online course material (D) which was not provided elsewhere, fulfilled some students' expectations and they found it invaluable. As one student put it, *getting extra examples of work ... with answers at a later date are great.* There was no change in importance in this category.

It was not surprising to find that Learning programming (E) was among some of the students' expectations, since the main focus of the course was to teach Pascal programming. They wanted to gain *a good basic knowledge of programming techniques and computer systems*. They could dispatch early attempts at assignments that also included computer code electronically rather than by ordinary mail. A drop of 3% in the percentage of responses related to Learning programming (E) could have been related to a lack of exchanges about program code. This could have been due to students not being fully briefed on how to export code from their DOS compiler. Indeed one student had wanted to swap more program code.

A preferable method of communication (F) was an important category for those students who could not attend tutorials. They found that the M205-STILE conference enabled them to catch up on what they had missed, while other students felt that it was a better medium than the telephone or using ordinary mail. This is discussed further in chapter 8. FirstClass provided *easier communications ... It is much easier to slowly put your thoughts/problems on paper then forward them rather than over the telephone. Email allows this*. This category's importance decreased by 3% and this could be related to less-than-expected use of FirstClass to send program code.

At the one-month stage, a small number of students could not identify what their expectations were (category G). For example one said *as yet, I have very little idea*. After time one might have thought that students would have developed ways to make use of the CMC and therefore would have had new expectations of its potential. However an additional 12% of students appeared in the 'Don't know' category after using M205-STILE for six-months.

The category Access to the Internet (H) was an expectation for 2% of students at first but dropped to 1% at six-months. *Access to the Internet sounds interesting*.

Surprisingly the category Social interaction (I) did not feature at all in the first questionnaire but was a new category mentioned in 1% of student responses at six-months. This single student said *it is quicker to use the M205 conference as there is usually someone around to give an answer and there is more social chat there.*

Figures 6.1 and 6.2, together with the student comments, provide an insight into the types of expectation students had of the M205-STILE conference and how these changed over time. For purposes of organisational clarity, and to facilitate analysis of the data by others working from alternative perspectives, an *a priori* category was used to analyse further the nine categories in key 6.1. This additional *a priori* category is in fact one of the dimensions from the three-dimensional taxonomy introduced in the introduction and literature review chapters, namely the 'domain of discussion'.

Domain of discussion:

Knowledge

Socialisation

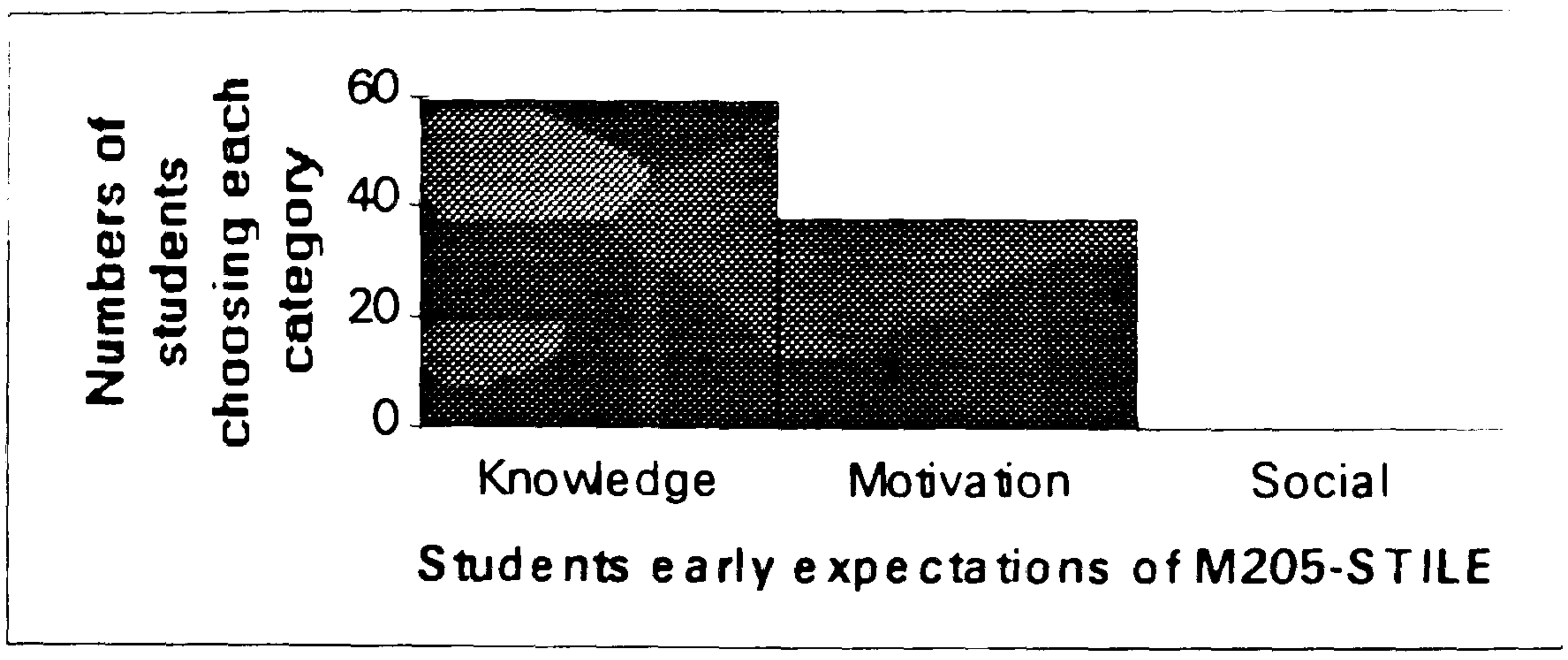
Motivation

The 'domain of discussion' dimension, which includes the above three elements, facilitated further analyses. The student responses could be classified within the 'domain of discussion', as shown in table 6.2. The categories of Communicating with students and tutors (A), Help with course work and problem solving (C), and Learning programming (E) could all be said to be activities that promoted the students' understanding (knowledge). The categories 'Hands-on systems' learning (B), Online course material (D), A preferable method of communication (F), and Access to the Internet (H), proved important to entice the students to use the environment and to sustain involvement in the course (motivation). The category Social interaction (I) only featured in the second questionnaire. The importance of each of these 'domains of discussion' is illustrated graphically in figures 6.3 and 6.4.

Table 6.2 Analysis of the expectation categories in relation to the 'domain of discussion'

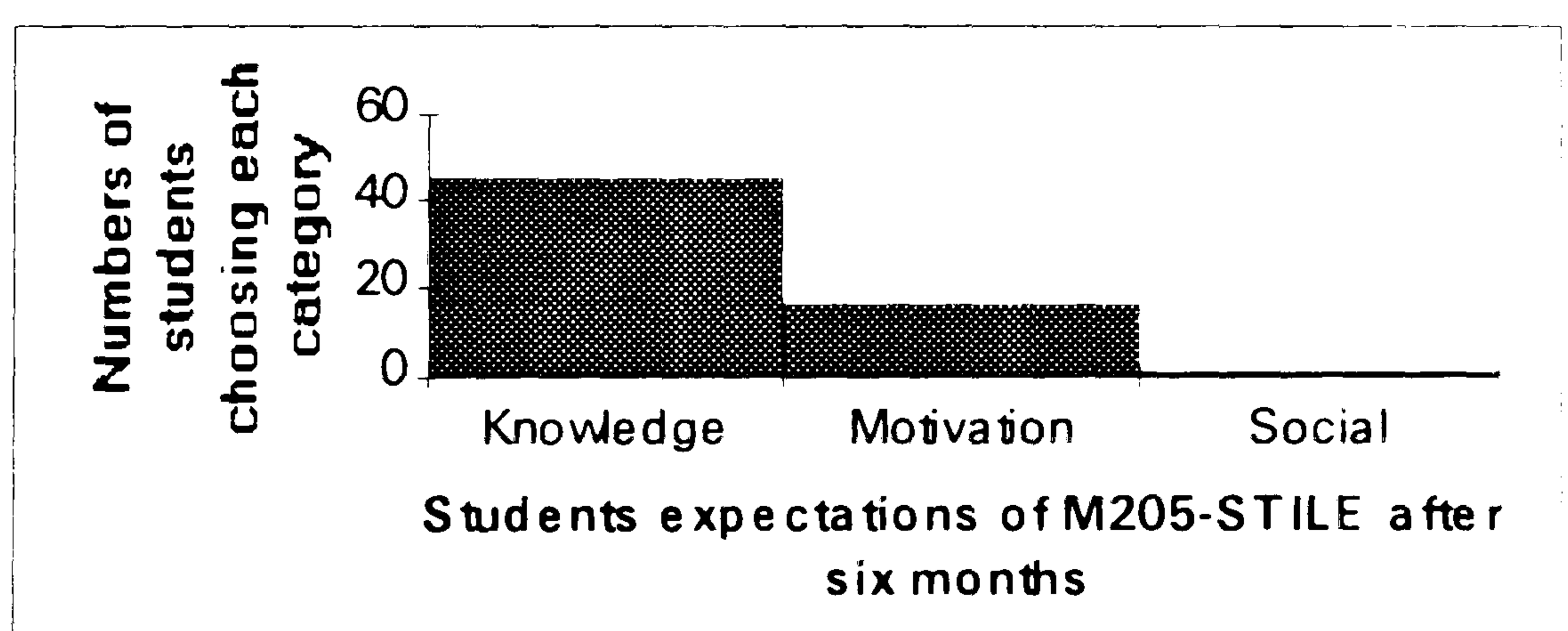
Knowledge	**Motivation**	**Socialisation**
Communicating with students and tutors	'Hands-on systems' learning	Social interaction
Help with course work /problem solving	Online course material	
Learning programming	A preferable method of communication	
	Access to the Internet	

Figure 6.3 Students' expectations of the M205-STILE conference within the 'domain of discussion' dimension after a period of one-month



As the design of the online environment had been constructed to maximise interaction with the 'online course-related content', it was useful to consider how the importance of the 'domain of discussion' changed as the year progressed. A comparison of student responses to both questionnaires indicates that the knowledge domain remained important over time. At the one and six-months intervals, the social domain appears to be a less crucial factor in the CMC. The motivation domain scored well in the early part of the course to sustain involvement but became less important after the six-month period. The motivation domain's importance dropped by 13%, while the knowledge domain gained 12%, as shown in table 6.3 below.

Figure 6.4 Students' expectations of the M205-STILE conference within the 'domain of discussion' after a period of six-months



The motivation domain ranked with two-thirds of the importance of the knowledge domain one-month into the course but dropped to one-third of the importance of the knowledge domain at six-months in terms of student expectations. As the knowledge domain is the most important factor in an online learning environment, this was an encouraging result. The relative importance of the motivation and knowledge aspects of the environment changed. These changes could play an important role in helping to facilitate involvement throughout the course year and could help to prevent early dropouts towards the beginning of a course.

Table 6.3 A comparison of the 'domain of discussion' in terms of students' expectations over time

	Total responses relevant to domains	Knowledge	Motivation	Socialisation
Expectations at one-month	97	61%	39%	0
Expectations at six-months	62	73%	26%	2%
% difference		12	13	2

6.2.1 Meeting student expectations by the end of the course

In order to check these findings from another data source, the four students in group three were interviewed in depth at the end of the course. Their original questionnaire responses were compared with their interview responses. These students' original expectations belonged to the following four categories from key 6.1 which were:

A. Communicating with students and tutors,

B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing),

C. Help with course work and problem solving,

E. Learning programming.

Student (i)'s expectations had been categorised as Communicating with students and tutors (A) and Help with course work and problem solving (C). She responded that the M205-STILE conference had fulfilled her expectations. She said *I was looking for something that allowed me to contact my tutor at her and my own leisure with problems, which would be quicker than the post from Orkney and which I could download and study when I wanted. And to that extent, yes it did, I was really pleased with that.* In actuality, she is expressing that she contacted her tutor rather than other students. In a comment at the end of one of her questionnaires, she also mentioned that *the telephone ... can be an inconvenience for both student and tutor and lacks written support.* As a remote student she benefited from better contact with her tutor and the opportunity this provided to solve her problems.

Student (ii)'s original expectations were categorised as 'Hands-on systems' learning (B) and Help with course work and problem solving (C). This student was slightly more reticent about whether her expectations had been met. She said *Yes, I think so. I wasn't quite sure what to expect.* She mentioned that the use of the technology fulfilled her expectations. However she seemed to have forgotten that she had originally hoped to have *help with study problems* (category C).

Student (iii)'s expectations were categorised as Communicating with students and tutors (A), 'Hands-on systems' learning (B), Help with course work and problem solving (C), and Learning programming (E). She felt that the M205-STILE conference had fulfilled her expectations in categories A and C. However she seemed to have forgotten that she had originally mentioned *extending my knowledge of computers and their applications*, which is related to 'Hands-on systems' learning (B). She also mentioned *Learning some programming*, which relates to category (E).

Student (iv)'s expectation was to Learn programming, category (E). He was definite that the M205-STILE conference had realised his expectations. He did not mention programming but said *I wanted to ... meet other people apart from going for tutorials. It was nice to get a chance to see what was happening throughout the country, it gave some sort of consistency between the ... different tutor groups, so for me it was good.* The ability to judge one's progress against that of other students appears to have been very motivating for this student.

The four students felt that their expectations had been fulfilled. It is interesting that in some cases they had forgotten what their original expectations had been. In this discourse, the students' expectations have been considered at the one-month, six-month and end-of-course points in the course. Most students appeared to exploit the medium over time, to push it to its limits while some neglected some of the possible features completely. The categories that appeared most important in terms of expectations were:

A. Communicating with students and tutors,

C. Help with course work and problem solving, and

D. Online course material.

The next stage was to make a comparison between the students' expectations and their perceptions of how they made use of the online system to help with their study. This analysis is discussed in the next section.

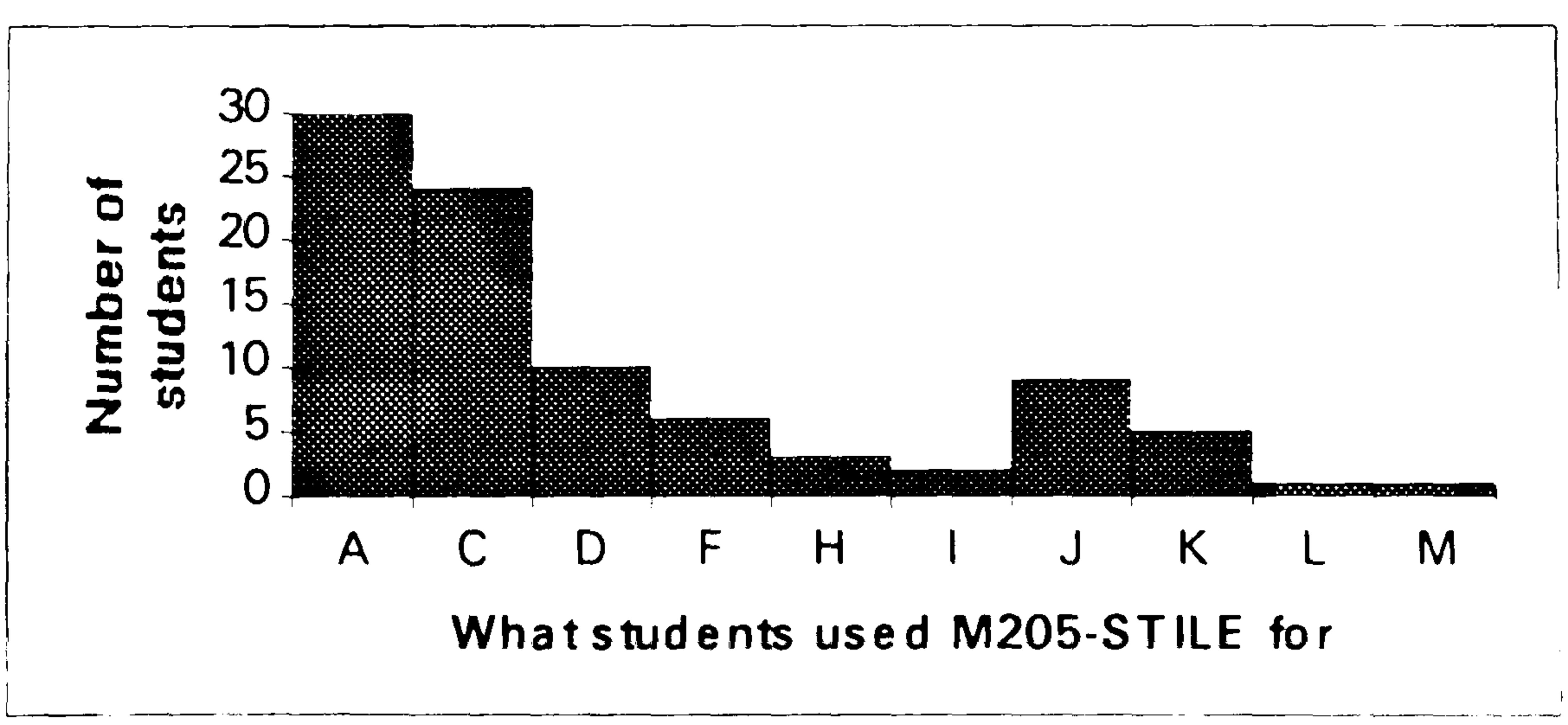
6.3 Students' perceptions of how they used the CMC to help with their study

At the same time as the students had been asked about their expectations at six-months, they were also asked about how they perceived they had used the M205-STILE conference. Each student reported one or more ways in which they used the online environment. Their replies distilled into ten categories (six of which correspond with key 6.1; separate categories were developed for other responses), see key 6.2. These categories also correspond to the 'X' axis on figure 6.5.

Key 6.2 Students' perceived usage categories

A. Communicating with students and tutors
C. Help with course work and problem solving
D. Online course material
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
H. Access to the Internet
I. Social interaction
J. News and information
K. The M205 Help and Tutorial conferences
L. Revision
M. Help on other OU courses

Figure 6.5 How students perceived they made use of the M205-STILE conference



In order to find out how perceived usage differed from expected usage, a comparison was undertaken between the expectation categories and the perceived usage categories (both at the six-month point). This revealed that three of the expectation categories did not feature in terms of perceived usage. These categories were: 'Hands-on systems' learning (B), Learning programming (E) and Don't know (G). The fact that the 'Hands-on systems' learning category has disappeared seems to confirm the suggestion that this category was important at the beginning to motivate students but became less important as the students progressed through the course. Learning programming may not have featured at all in terms of perceived usage as a result of students not being given formal instructions on how to export program code from their DOS compiler and attach it to an email message (see chapter 8). Interestingly, none of the students chose the category Don't know (G) which had been quite prevalent in terms of expectations. This suggests that when it came to usage of the environment, students could see how benefits accrued from its use.

Those categories that were duplicated, in terms of both expectation and perception of usage, were:

A. Communicating with students and tutors,

C. Help with course work and problem solving,

D. Online course material,

F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)

H. Access to the Internet,

I. Social interaction.

Table 6.4 Percentage change between expected and perceived categories, both taken at six-months

	Total responses in categories	**A**	**C**	**D**	**F**	**H**	**I**
Expected at six-months	74	31%	26%	8%	4%	1%	1%
Perceived at six-months	91	33%	26%	11%	7%	3%	2%
% difference		2	0	3	3	2	1

These categories were equally or slightly more important in terms of the perceived usage, see table 6.4 above. There was little change between expected and perceived usage at six-months.

Communicating with students and tutors (A) was the most important category in terms of perceived usage. This category was up by 2% as compared to expectations at six-months. This reconfirms the students' responses related to expectations, both early in the year and after six-months. Students wanted to keep in touch with other students and their tutors, to follow what was going on. Students reported that they were *clarifying points of difficulty on the course. Reading answers to other people's queries to confirm my own interpretation of the material. This has saved me on more than one occasion.* Some students remarked on the benefits of access to tutors in addition to their own. *Seeing responses from tutors other than my own often casts a different light on a problem area.* With read-only access to tutorials students could watch and avail of multiple perspectives to help them solve their problems.

In the category Help with course work and problem solving (C), students reported that the M205-STILE conference was used mostly to help with their study of the M205 course. This was the second most important category in terms of students' expectations at the sixth-month point in the course and remained equally important in terms of the students' perceived usage. This compared with being the third category of importance in the students' early expectations. This suggests that the technology, if appropriately used, can add to the potential for pedagogical improvement. In some cases students sought help from their peers and in some instances they played the expert giving help to other students. *When I get stuck with something, I also look through messages to see if anyone else is having problems that I think I can help with and for tips! Sometimes my question has already been answered.* This was echoed by other students who stressed that someone else had often already asked the question they would like to ask. This also indicates that one answer was read by a number of students.

Students reported that the online course material (D) was valuable. *I have tried some of the additional material provided.* This category was up by 3% when compared to student expectations at six-months.

Those who were based remotely, worked away from home or travelled a lot with their work, found that the M205-STILE conference provided A preferable method of communication (F). The ability to download tutorial notes was important to students who did not have face-to-face tutorials. ... *Anti-isolation, as we do not* *have face-to-face tutorials in Europe, getting news from the Motherland - Motivation etc.* This category was also up by 3%.

Access to the Internet (H) enabled students to avail themselves of new technologies such as the Web. *Having a look at the Internet.* This category was up by 2% as compared to expected usage at six-months.

The synchronous chat facility encouraged two students to engage in Social interaction (I). They had *private chats with fellow students.* This category was up by 1% as compared to expected usage.

The percentage difference between expected and perceived usage (table 6.4) was less marked than the percentage difference between expectations at one-month and at six-months (see table 6.1). The perceived usage categories introduced four new items. These were News and information (J), The M205 Help and tutorial conferences (K), Revision (L) and Help on other OU courses (M). This suggests that when the students actually came to use the online system they found more ways to use it than they had expected.

Students used the M205-STILE conference to browse through the sub-conferences for up-to-date News and information (J) about Tutor Marked Assignments and general queries. *Reading additional up-to-date information on M205.*

Access to the M205 Help and tutorial conferences (K) was of great benefit to some students. *To contact my tutor re problems with course work.* The M205 Help conference provided an open forum where students could ask all tutors and students for help while the tutorial conferences provided access to their own tutor and students in their tutorial group.

A student responded that they intended using the environment for Revision (L), for *exam Help.* This category has probably arisen at this point two-thirds of the way through the course because of the proximity of the exam.

An unexpected additional bonus was supplied through Help on other OU courses (M). This enabled collaboration on another course in addition to M205. *One ... use which is a spinoff from M205 is the contact I have made with a lady doing M246. We have communicated on the 246 course extensively ... This has been invaluable as I have found ... 246 harder than 205.* This category again emphasises the importance of Help with course work and problem solving (C).

Figure 6.5, together with the students' comments above, provide data related to the subject matter that the students perceived they were discussing. The categories that were most important in this analysis were:

A. Communicating with students and tutors,

C. Help with course work and problem solving,

D. Online course material.

These three categories are the same three categories, which were prevalent in the students' expectations. Additionally, A preferable method of communication (F) appeared to be more important in this analysis. Also two of the four new categories, which emerged as important, were:

J. News and information,

K. The M205 Help and Tutorial conferences.

To take this analysis of perceived usage further, the categories were analysed with respect to the 'domain of discussion' dimension, which is expanded on in the next section.

6.3.1 Importance of the perceived usage categories within the 'domain of discussion' dimension

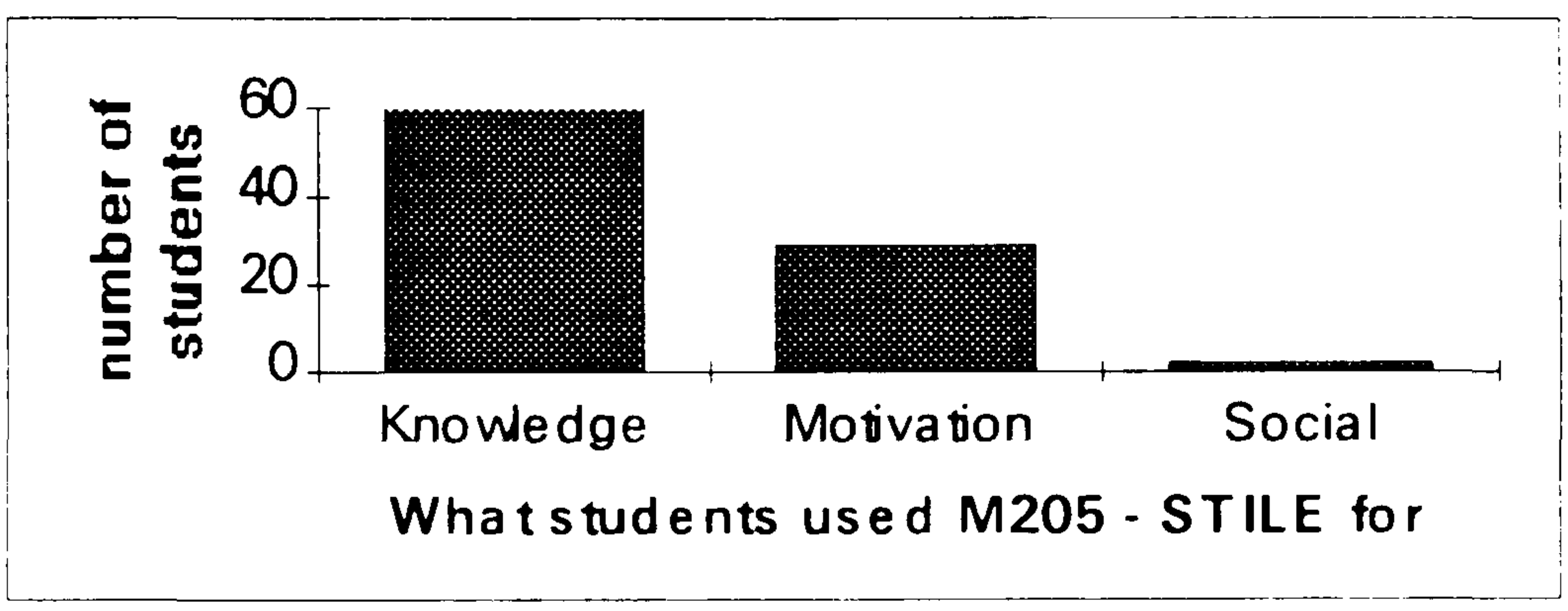
On re-examination of the perceived usage categories with respect to the 'domain of discussion' dimension, it became apparent that the students' new responses related to M205 Help and Tutorial conferences (K) and Revision (L) could be considered as belonging to the knowledge domain of the environment. They were exploring the system to assist their problem-solving ability and understanding of computer science. News and information (J), and Help with other OU courses (M), appeared to be driven by interest, and as such, related to the motivation domain, see table 6.5.

Table 6.5 'Domain of discussion' analysis of the usage categories

Knowledge	Motivation	Socialisation
Communicating with students and tutors	Online course material	Social interaction
Help with course work / problem solving	A preferable method of communication	
M205 Help and Tutorial conferences	Access to the Internet	
Revision	News and information	
	Help on other OU courses	

Looking at the groupings in terms of the student responses about perceived usage, see figure 6.6, knowledge was the main 'domain of discussion' for the students in the online environment. It has more than twice the importance of the motivation domain. Socialisation again was not highly rated by the students.

Figure 6.6 How students used the M205-STILE conference within the 'domain of discussion' dimension



A comparison of student expectations at six-months into the course with an analysis of perceived usage (both questions asked on the same questionnaire), showed that the knowledge domain was used 7% less than had been expected. The motivation domain, however, was used 6% more than had been expected and the social domain was only used as much as expected, see table 6.6. In contrast with student expectations at one and six-months, the percentage gained or lost was partially reversed when the expectations at six-months were compared with perceived usage at six-months. The importance of the knowledge domain dropped by 7% (a 12% gain had been seen between one and six-months in terms of expectations) while the motivation domain increased by 6% (a loss of 13% had been seen between one and six-months), see tables 6.3 and 6.6.

Table 6.6 A comparison of the 'domain of discussion' in terms of students' expected and perceived usage

	Total responses relevant to domains	Knowledge	Motivation	Socialisation
Expectations at six-months	62	73%	26%	2%
Perceived usage at six-months	91	66%	32%	2%
% difference		7	6	0

The knowledge and motivation domains of the environment appear to be more important to students than the social domain. One-month into the course the motivation domain accounted for 39% of student responses in terms of expectation (see table 6.3), while the knowledge domain accounted for 61% of responses. At six-months the importance of the motivation domain had dropped by 13% while the knowledge domain increased by 12% (see table 6.3). This difference between the domains meant that the motivation domain had dropped from two-thirds of the importance to one-third of the importance of the knowledge domain, see table 6.3. It appears that the motivation categories were more important at the start of the course but that the knowledge domain remained important and actually became more important as the course progressed to the six-months point. Table 6.6, however, which compares expected and perceived usage at six-months, redresses the balance to some extent. The motivation domain at 32% is half as important as the knowledge domain which is at 66% in terms of perceived usage. These latter results appear to confirm that the balance for the motivation domain as compared to the importance of the knowledge domain is between one-third and two-thirds. The social domain does not feature to any great extent.

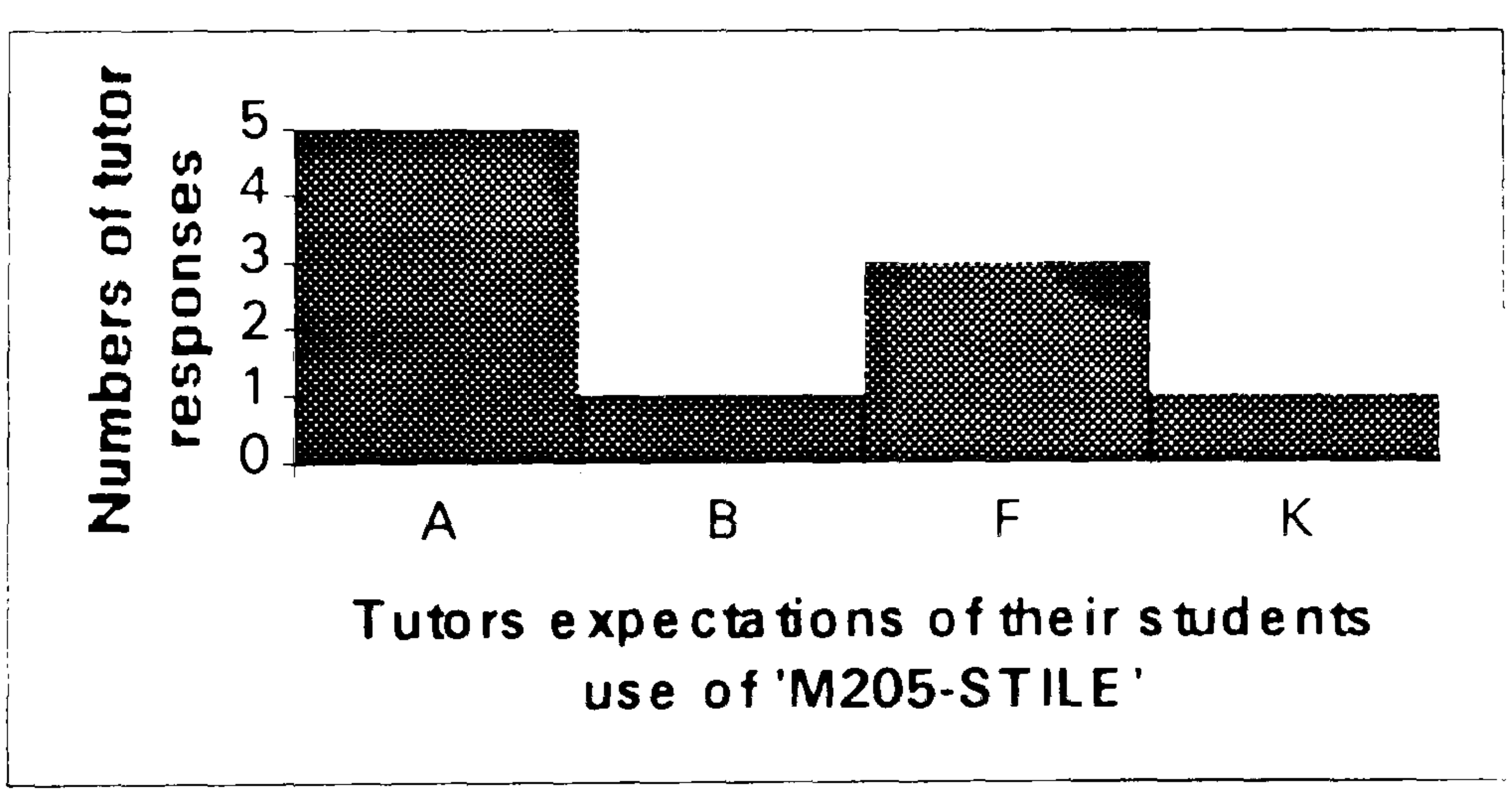
6.4 Tutors' expectations of how students would use the M205-STILE conference

To complete this analysis the tutors were also asked about their expectations of how their students would use the M205-STILE conference (bearing in mind the tutors had already taken part in the pilot study.) Questionnaires were sent to nine tutors, 89% or eight tutors responded. Although a variety of different expectations emerged, there was a general consensus that the M205-STILE conference would be of positive benefit to students studying this particular course. The tutors felt that their students would have better access to help from both themselves and their peers and believed this type of interactions would particularly benefit students who lived in isolated areas or those who missed face-to-face tutorials. The tutors also suggested that students would profit from making explicit to their peers problems they encountered when trying to understand the given curriculum. They suggested that the sending of program code, via email would lead to a swifter response cycle than ordinary mail and that more responsive feedback would increase student motivation. In fact this latter facility was considered to be important (see chapter 4) as files could be easily attached to messages in FirstClass. It was this facility that tutors expected their students to use to send program listings or code by email. Further discussion of students' electronic transmission of program code can be found in chapter 8. The tutors predicted that the system would provide benefits and their responses can be classified as follows:

Key 6.3 The tutors' expected usage categories for their students

A. Communicating with students and tutors
B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
K. The M205 Help and Tutorial conferences

Figure 6.7 How the tutors expected their students to make use of the M205-STILE conference



Five tutors' replies could be grouped into Communicating with students and tutors, category A. The M205-STILE conference was seen as providing them with *plenty of contact with students via FC,* and as a way for students to help each other in addition to their tutor's support. They would be able to *take advantage of the greater opportunity to ask ... questions on their work.* This they thought would be particularly beneficial to their students who lived in remote areas of Scotland where they could not attend face-to-face tutorials. This is a similar finding with respect to the student expectations.

The category 'Hands-on systems' learning (B) featured in one tutor's response. He hoped that students would make use of the *new technology* and *that ... would spur them on to make it work*. A preferable method of communication (F), was cited by three tutors. They hoped to *be able to pass problem code backwards and forwards* and that this would make it *easier to solve coding problems because code would be visible*. This would be possible, as the CMC system would serve *as a replacement for telephone queries*.

One tutor saw The M205 Help and Tutorial conferences (K), as providing the opportunity for students to pick up tutorial notes when they could not attend face-to-face tutorials. Categories A and F were the most important for the tutors.

Six of the tutor responses were in categories A and K, which corresponded to the knowledge domain, while four responses (categories B and F) corresponded to the motivation domain. The tutors' responses rated the motivation domain at two-thirds the importance of the knowledge domain in terms of expectation. This outcome is in line with the student responses in terms of expectations at one-month. However, the social domain did not feature at all in terms of the tutors' expectations of their students' participation.

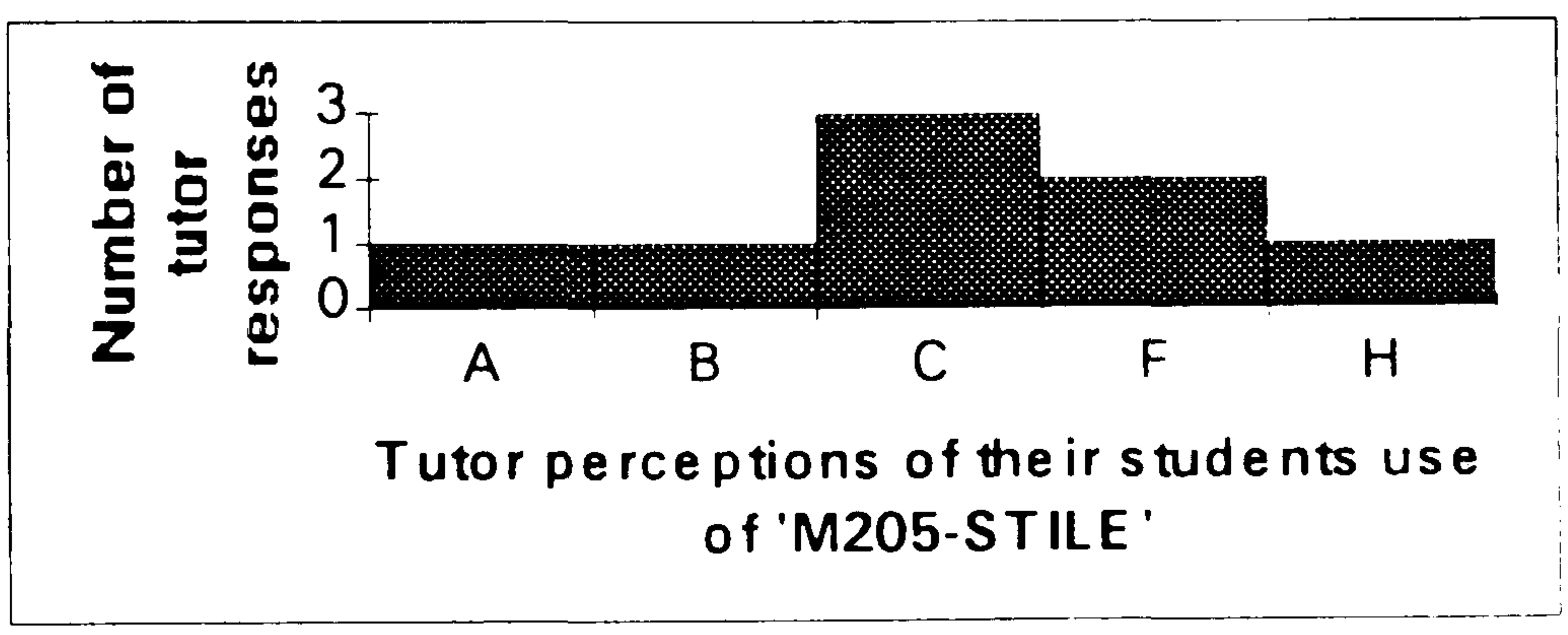
6.5 The tutors' perceptions of student usage of the M205-STILE conference

The tutors were also asked how they perceived their students made use of the M205-STILE conference. Questionnaires were sent to nine tutors, 89% or eight tutors responded. Overall the tutors felt that the M205-STILE conference had indeed given students access to better help with their course work. As had been expected the students did raise problems and queries and sent program code. The tutors' perceptions of how the environment was used form five of the basic categories from key 6.1, three of which confirm the expectations above (A, B, and F in figure 6.7), see key 6.4. The M205 Help and Tutorial conferences (K), appeared to be replaced by the category Help with course work and problem solving (C). Category (H) Access to the Internet appears as a new category for the tutors.

Key 6.4 Tutors' perceived usage categories for their students

A. Communicating with students and tutors
B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
H. Access to the Internet

Figure 6.8 How the tutors perceived their students made use of the M205-STILE conference



One tutor focused on the *mutual support* available to students, which related to the category A Communicating with students and tutors. This category was perceived as less important when compared with what the tutors had expected.

The category 'Hands-on systems' learning (B), was useful for *becoming familiar with the benefits of ... online conferencing.* Although this category disappeared in later analysis of student responses, it appears that two tutors perceived that this category was slightly more important than they had anticipated.

The benefits of being able to solve problems on an individual basis were cited by three tutors. Students were enabled to *request further explanation of points in the course units, worked examples, etc. that ...* were *not understood.* This related to Help with course work and problem solving (C). The tutors had not had an expectation that the environment would facilitate ongoing dialogue to iteratively solve problems but this did appear to happen.

A preferable method of communication (F) manifested itself through two tutors' mention of the ability to send *program code*. This category was equally important in terms of expected and perceived usage by students. One tutor cited using new technologies such as Accessing the Internet (H).

A comparison of what the tutors expected with what they perceived did happen, revealed an improvement in the quality of contact through iterative dialogue, which had not been expected. The categories that emerged as most important to the tutors were, Help with course work and problem solving (C), and A preferable method of communication (F). Surprisingly, the tutors did not cite student usage of the online course material, which they had prepared. This could be related to their perception that students did not use the online material. The tutors' expectations in terms of the 'domain of discussion' corresponded to the motivation domain (categories B and F) rating at two-thirds the importance of the knowledge domain (categories A and K). By comparison, the tutors' responses related to perceptions corresponded to the knowledge domain (categories A and C) in equal proportions to the motivation domain (categories B, F and H taken together), as summarised in table 6.7.

Table 6.7 A comparison of the 'domain of discussion' in terms of the tutors' expectations and perceptions of students' usage

	Total responses relevant to domains	**Knowledge**	**Motivation**	**Socialisation**
Expectations	**10**	60%	40%	0
Perceived usage	**8**	50%	50%	0
% difference		10	10	0

The tutors' perceptions of usage (like their expectations) were again in the knowledge and motivation domains. The knowledge domain dropped by 10% between the tutors' expectations and perceptions of student usage. Meanwhile the motivation domain gained 10%. The tutors' expectations in terms of the 'domain of discussion' match the students' expectations at one-month. However the tutors' perceptions of student usage with equal proportions of the knowledge and motivation domains is in contrast with the students' perceptions, where the importance of the motivation domain rated at half that of the knowledge domain, see table 6.6.

6.6 Conclusions

This overview of expected activity established a set of nine categories ('A' through to 'I' in key 6.5 below) which were compared with analysis undertaken in advance of writing this thesis. This formed a benchmark against which expectations and perceptions of usage at six-months could be measured. The students had a variety of expectations from the online system and these changed with time. Eight out of nine of the student expectations were reasonably realistic and should be achievable in any well-designed CMC system. Category A Communicating with students and tutors (A) remained important throughout the first six-months of the course. Students were *impressed by the way STILE provided a way of communicating with other students.* Use of the M205-STILE conference to Help with course work and problem solving (C) increased in terms of expectation by 7% between the one and six-month points in the course. The online system enabled students to compare their progress against each other. In some cases this would have been motivation because students could see that others were having similar problems, but in other cases this may have caused feelings of envy. At the same time that the importance of category C Help with course work and problem solving increased, the use of the M205-STILE conference for 'Hands-on systems' learning (B) decreased by 13%. This category appeared to be one where a number of students had an unrealistic expectation that they would gain indepth knowledge about computer systems and networks, just from using the online system. Their interest in this area was usually being driven by their occupation and an interest in improving their career prospects. However this category disappeared completely in terms of perceived usage. This is an interesting finding in terms of the importance of technologies for life-long learning, and suggests that course providers (especially the University for Industry) should consider how their curriculum can enhance their students' skills for the workplace. A surprising finding related to student expectations between the one and six-month points was an increase of 12% in category G Don't know. However, when the students were asked about how they perceived they used the M205-STILE conference, this category did not appear which suggests that students did know how to make good use of the facilities.

The category 'Social interaction' (I) was a new category, which appeared to a slight degree at the six-month point. The four students in group three who were interviewed felt that their expectations had been realised when they were consulted at the end of the course. They saw the potential of the M205-STILE conference and used it in more ways than they had expected. The three categories, which were important in terms of the students' expectations, were:

A. Communicating with students and tutors,

C. Help with course work and problem solving,

D. Online course material.

In a comparison of the expectation categories with the perceived usage categories (both taken at six-months) 'Hands-on systems' learning (B), Learning programming (E) and Don't know (G) disappeared. The new categories which appeared in terms of perceived usage were News and information (J), The M205 Help and Tutorial conferences (K), Revision (L) and Help on other OU courses (M). The Revision category (L), may have been more important at six-months because of proximity to the exam. The two new categories, which appeared important, were:

J. News and information,

K. The M205 Help and Tutorial conferences.

The analysis of students' perceived usage introduced four new categories which meant that the key of category descriptions was extended, as summarised in key 6.5.

Key 6.5 The thirteen categories established from expected and perceived activity

A. Communicating with students and tutors
B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
D. Online course material
E. Learning programming
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
G. Don't know
H. Access to the Internet
I. Social interaction
J. News and information
K. The M205 Help and Tutorial conferences
L. Revision
M. Help on other OU courses

Six categories (A, C, D, F, H, I) could be compared in terms of students' perceptions of how they used the system with their expectations (also taken at six-months). This revealed an increase in rating of between 0 and 3% between expectations and their perceptions of usage. The three categories (A, C and D) identified in student expectations were also the most important when compared with perceptions of usage. Additionally the category A preferable method of communication (F) appeared to be more important in this analysis.

The tutors' expectations of the environment were also fulfilled and they too remarked on the improved quality of discussion about the computing subject matter. The categories that emerged as most important to the tutors in terms of expected and perceived usage were, Communicating with students and tutors (A), Help with course work and problem solving (C), and A preferable method of communication (F). The tutors appeared to confirm the importance of three of the four categories that emerged from the student analysis. This suggested that the four categories requiring further investigation should be:

A. Communicating with students and tutors,

C. Help with course work and problem solving,

D. Online course material,

F. A preferable method of communication (an improved mechanism for delivery of program code and for discussion of problems on the course).

It would appear that, on the whole, students' expectations of the online system were related primarily to how they benefited in their academic study (knowledge). For example, category 'A' Communicating with students and tutors is good for any domain taught by distance learning but category 'C' Help with course work and problem solving is especially good for the computing science discipline. Categories (D) the Online course material and (F) A preferable method of communication both appeared to motivate students to use the online system to help with their study. At this point it is useful to consider also how all twelve categories (the 'don't know' category is dropped) correspond to the 'domain of discussion' dimension, as this allocation, summarised in table 6.8, will be used for comparative analysis in chapter 7.

Table 6.8 Allocation of the twelve categories to the 'domain of discussion' dimension

Knowledge	**Motivation**	**Socialisation**
Communicating with students and tutors	'Hands-on systems' learning	Social interaction
Help with course work /problem solving	Online course material	
Learning programming	A preferable method of communication	
M205 Help and Tutorial conferences	Access to the Internet	
Revision	News and information	
	Help on other OU courses	

The analysis of students' responses appeared to suggest that the students' primary intention had been to gain a deeper understanding of their computer science course, that is, the knowledge domain. It appeared that the students were actively engaged in attempting to collaboratively understand the 'course-related content' to find out more about computer science. What was also interesting in these findings was the number of interactions described by students, which could be seen in the motivation domain, for example, making use of the online course material. The interplay between the motivation and knowledge domains appeared to help facilitate this successful outcome. The analysis of the tutors' responses in terms of the three domains (table 6.7) also reflects the changes between the knowledge and motivation domains in terms of their expectations and perceptions of student usage. The students' expectations at one-month corresponded with the tutors' expectations in terms of the three domains. That is, both groups responses put the motivation domain at two-thirds the importance of the knowledge domain in terms of expectations. The social domain does not rate to any strong degree in either the student or tutor responses. It appeared that the tutors did not have any expectation that their students would engage in social interaction. Although the social domain did not appear to be important in this analysis, structured observation of activity indicated that the social domain was used. It will be interesting to see how the social domain features in more indepth analysis using interpretation of naturally-occurring online interactions.

The structure adopted for the M205-STILE conference (FirstClass) appeared to fulfil its purpose of providing 'online course-related content'. Four categories A, C, D and F, emerged most prominently from the thirteen categories summarised in key 6.5. The four categories identified in this chapter helped to define the direction of the research, which is discussed in chapters 7 and 8. Hammersley et al. (1994) describe this as 'theoretical sampling'. The next chapter (7) discusses the first three important categories in more detail:

A. Communicating with students and tutors,

C. Help with course work and problem solving, and

D. Online course material.

To investigate the first two categories, four sub-conferences were investigated. These included two tutorial sub-conferences and the M205 Help sub-conference, which were course-related areas and, as such, supported the knowledge domain (as discussed in chapter 4). The fourth sub-conference area was the Meeting Place conference, which supported the social domain. These were examined through interpretation of naturally-occurring online interactions, to ascertain who was talking to whom and the nature of the subject matter, from both the student and tutor perspectives. In order to unpack the category Communicating with students and tutors (A) further, the students were asked in questionnaires and indepth interviews how they used the resource of their peers as compared to their tutor. The tutors were also asked for their perceptions of their online interactions with their students.

In order to investigate the students' interactions using the Online course material (category D), the next chapter discusses an analysis of how students perceived they interacted with the course materials supplied in the M205-STILE conference. The exchanges related to the online course material supported the motivation domain of the environment. The fact that certain categories became more important while others became less important over time is an indication of the rigorous nature of the analysis. The fourth category to emerge, A preferable method of communication (F) is discussed in more detail in chapter 8. The four most important categories are now investigated in the next two chapters.

Chapter 7: Actual and perceived interactions between students and tutors

7.1 Introduction

This chapter analyses in more depth, the benefits of the CMC structure adopted for the main study (FirstClass). The first aim was to explore the actual type of interaction strategies developed by students in four sub-conferences. These were the Busiest and Quietest tutorials, the Meeting Place and the M205 Help sub-conference, which were described in chapter 4. The structure and creation of the sub-conference areas shown in figure 7.1 section 7.2 were discussed in detail in chapter 4. However, to help the reader remember where these sub-conferences appear in the structure, these are indicated by (2) and (3) in figure 7.1. This first part of the chapter also includes details about whether students interacted with the online course materials on an individual basis or in collaboration with other students. The course materials bulletin board is indicated by (4) in figure 7.1. The second aim of this chapter was to examine students' and tutors' perceptions of their interactions. Both of these facets of analyses were used to explore more closely the first three of the four categories identified in the first phase of analyses in the previous chapter, namely:

A. Communicating with students and tutors,

C. Help with course work and problem solving,

D. Online course material.

The fourth category, A preferable method of communication (F), refers to the methods of communication used and is discussed separately in chapter 8.

The analyses in the first part of the chapter are based on interpretation of naturally-occurring interactions (which was described in chapter 3). This involved examining who the students were talking to and, more importantly, what they were talking *about* in the four sub-conference areas mentioned above. Data could be analysed to see if the participants were socialising or discussing course-related issues; also whether students were talking more to other students or to their tutor. In the second part of the chapter the students' and tutors' perceptions of their interactions with each other are considered from the user opinion data collected.

A range of empirical findings is presented which were designed to address the following sub-questions:

1. How did students and tutors interact online?
2. How did students perceive they used the online course material?
3. What importance did students attach to interaction with their tutor as compared to that with other students?
4. How did tutors perceive they interacted with their students?

In order to answer these questions, a number of evaluation techniques was used. These included:

(i) interpretation of naturally-occurring interactions between students and tutors, to see if these exchanges were course work-related or social. The student-to-tutor and student-to-student interactions were examined in four sub-conferences mentioned above. The message history and message search facilities were used.

(ii) a questionnaire related to students' interest in the exercises which would require group work,

(iii) questionnaires for both students and tutors to ascertain their perceptions of their online interactions,

(iv) indepth interviews with a selection of the students,

(v) a debriefing meeting with the tutors at the end of the project.

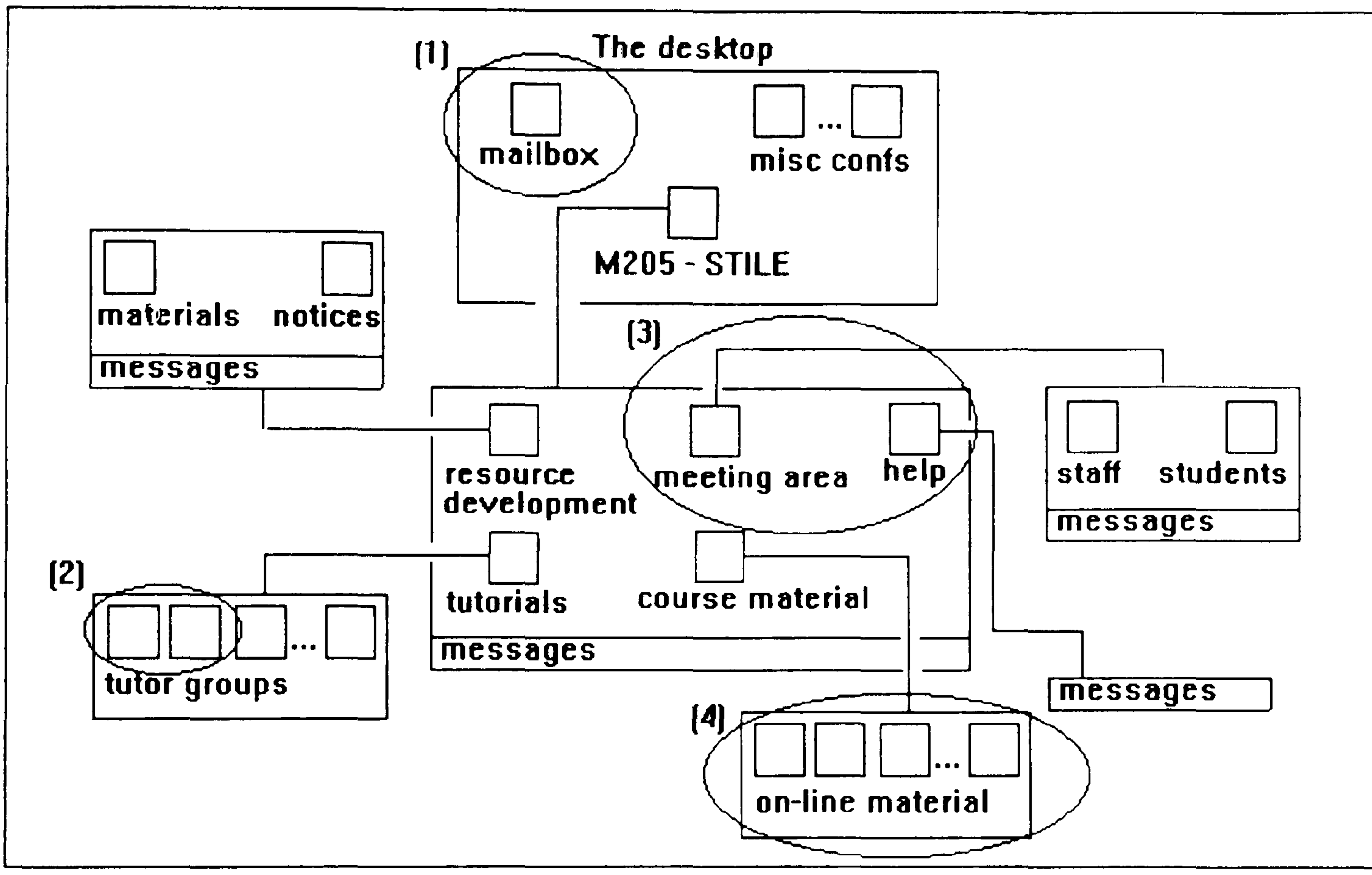
The findings are discussed in terms of:

- student online interaction in four separate sub-conferences,
- students' perceived use of the extra materials,
- student and tutor perceptions of their online interactions.

7.2 Analysis of the natural occurrence of actual online interactions

This section investigates who the students were actually talking to, what the discussion was about, and if that matched the original intention of the discussion areas within the CMC structure. Unlike the tutors, the students had not met face-to-face before using FirstClass. Also the findings of the pilot study suggested that the IMF should encourage discussion in a staged approach to avoid the occurrence of off-topic discussions. In the first stage, the IMF used the Welcome message sent by email ((1) in figure 7.1) to encourage the students to participate in discussions in the Meeting Place sub-conference. This is a strategy encouraged by Rohfeld and Hiemstra (1995). Students started to get in touch with each other. They introduced themselves and said where they lived. In the second stage the IMF actively encouraged the students to use the system to ask their fellow students, their tutor and the course team for help. The students were directed to use their tutorial sub-conference and the M205 Help sub-conference as areas where they could seek help. These are discussed in more detail in sections 7.2.1, 7.2.2 and 7.2.3.

Figure 7.1 Areas analysed in the structure adopted for the main study FirstClass



In order to obtain an overview of where activity was taking place, the number of messages sent to each conference by the end of the year was analysed, see figure 7.2. Messages could be found in each conference area of M205-STILE, though these varied in quantity. The three most important conference areas to the students were: the tutorials, the Meeting Place and the M205 Help sub-conferences. To help the reader, a brief description of the locus of control in these sub-conferences follows. In the tutorials, the tutor was the facilitator. In the M205 Help sub-conference, the IMF was the facilitator but the students were in control and had access to the whole body of students, the tutors and a number of course team members. The Meeting Place sub-conference was an area for all participants to engage in informal discussion in a social setting. The IMF facilitated these latter two areas. Students could also send their queries to their tutor's mailbox where it would receive individual attention.

Figure 7.2 The number of messages sent to sub-conference areas in the period February to end October 1995

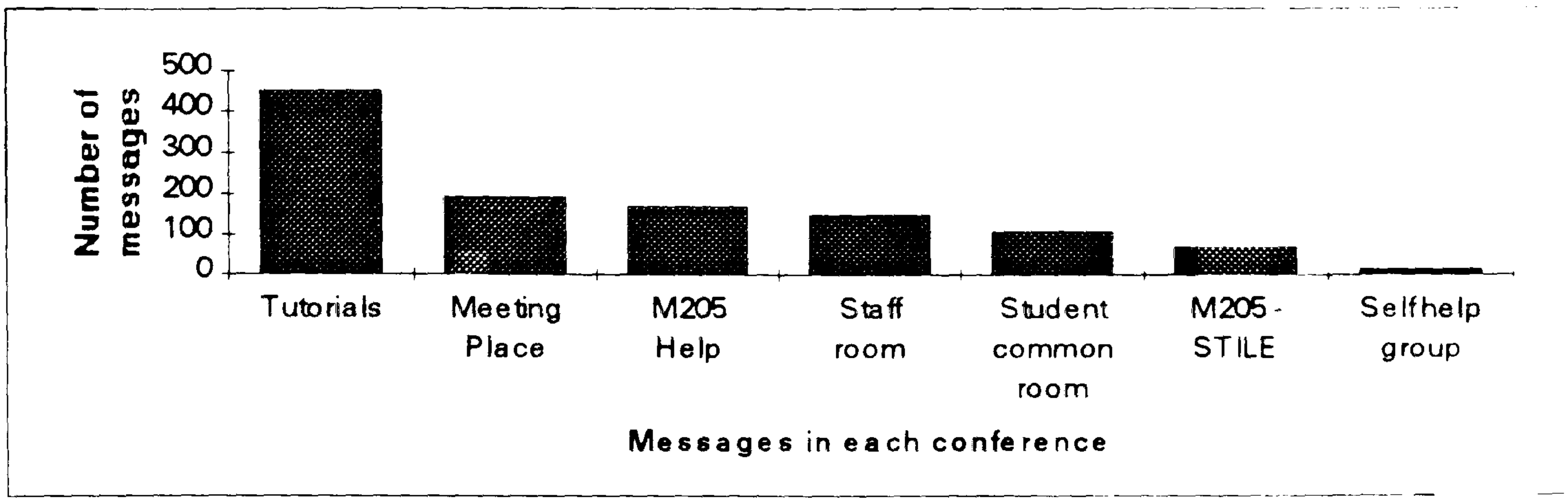


Figure 7.2 suggests that the nine tutorial areas collectively were the most active while the social Meeting Place and the M205 Help sub-conferences were on a fairly equal footing. The intention was to analyse and compare two of the nine tutorial conferences, which were course-related (knowledge). The Meeting Place, a social conference, and M205 Help, a course work-focused conference, were also compared to determine whether category A, Communicating with students and tutors had a bias towards course-related or social contact. The period monitored was between February and October 1995.

7.2.1 Identifying the busiest and quietest tutorials

In order to establish where the most and least discussion was occurring within the tutorial sub-conferences, all tutorials were examined in terms of the number of students and the number of messages posted, see figures 7.3 and 7.4.

Figure 7.3 The number of students in each tutorial group

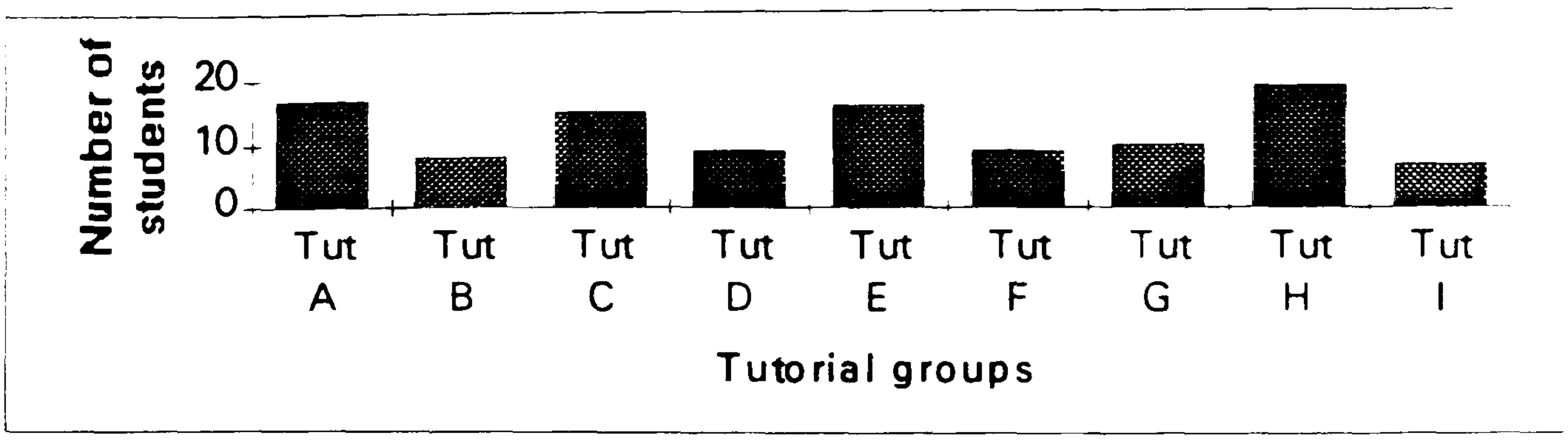
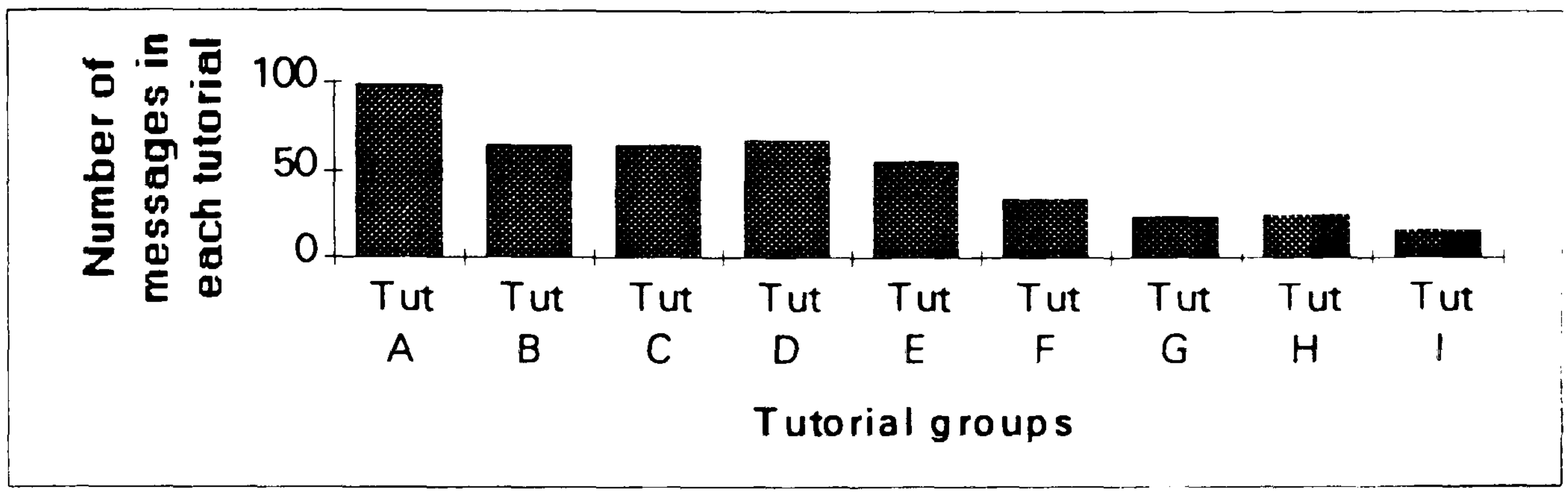


Figure 7.4 The number of messages sent within each tutorial at the end of the project



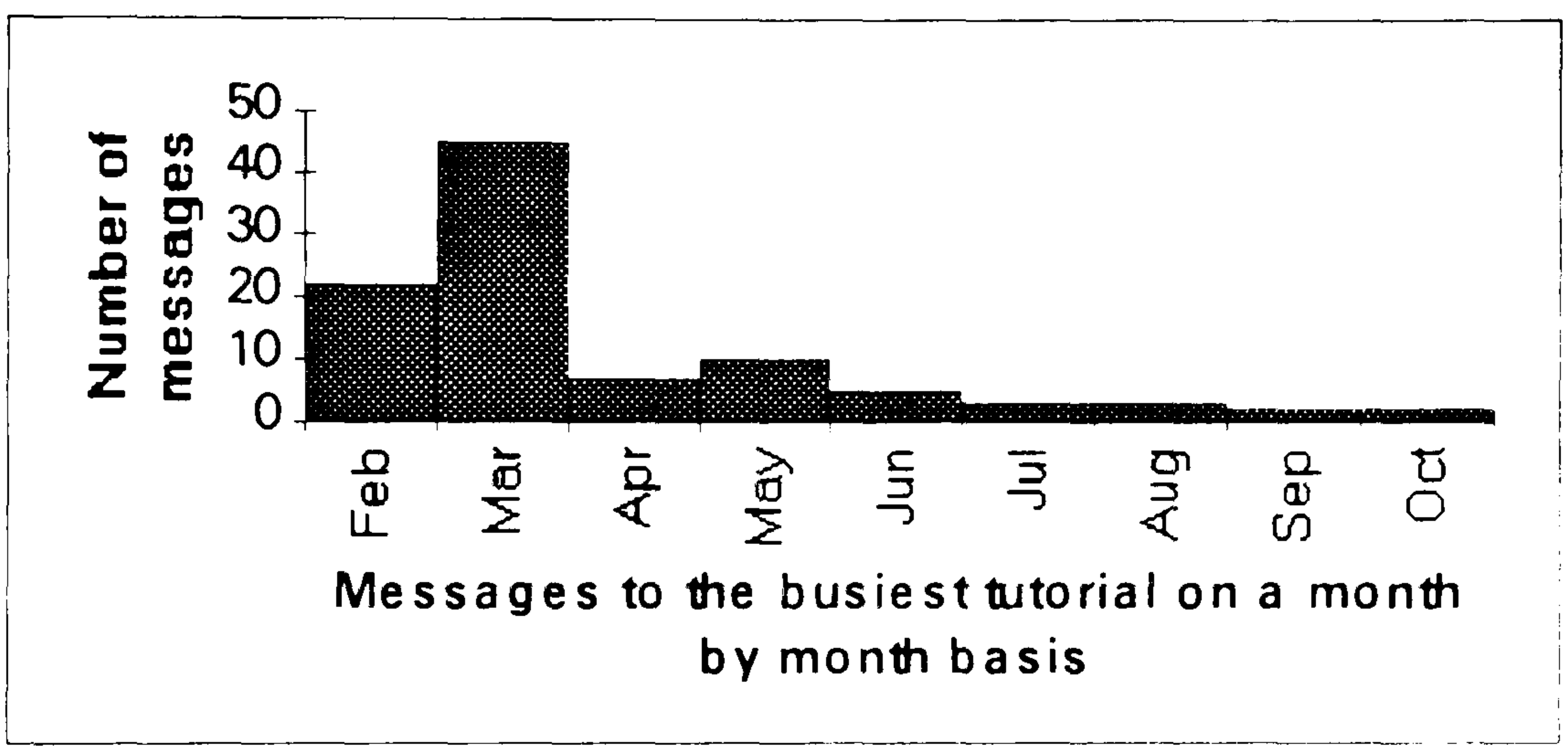
Tutor group H (figure 7.3) was the largest tutorial group with 19 students but it only generated 25 messages, while tutor group A, which contained 17 students, had almost four times as many messages posted (99). The smallest group of students was seven in tutor group I and this group had the least number of messages posted (16). Interestingly, a tutor group with just eight students (tutor group B) had 65 messages posted. Therefore it can be seen that more students in the group does not necessarily correspond to a higher number of messages. Hiltz (1995) suggests that a conference needs at least 10 active participants to sustain a lively debate. However the findings in this research suggest that a critical mass of students is not the only factor that contributes to the level of activity. The way in which tutors and students bond in this medium could also be important. The amount of effort the tutor puts into forming a cohesive group and how comfortable the individuals feel in the tutorial sub-conference could also be essential to sustain active participation throughout the year.

The apparent differences in tutorial group activity were analysed in more detail using the busiest and the quietest tutorials, groups A and I in figures 7.3 and 7.4 above. The busiest tutorial contained seventeen students, located in urban areas. The quietest tutorial contained seven students based in a rural area, however not all could attend face-to-face tutorials regularly because of their occupations. The naturally-occurring online interactions that took place were analysed through:

1. the number of messages posted,
2. monitoring who received the message,
3. the nature of the subject matter discussed.

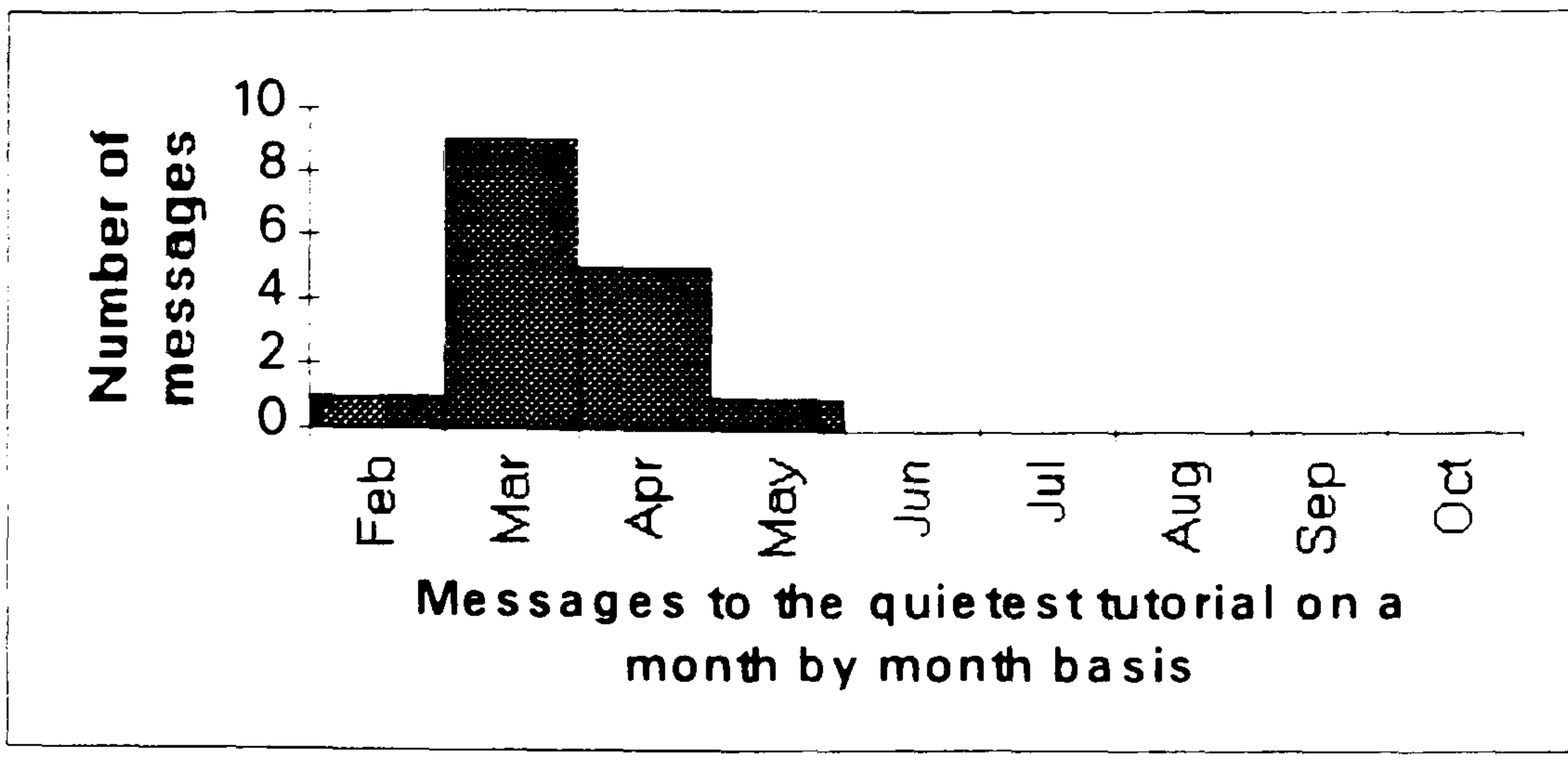
The numbers of messages sent to the two conferences selected were counted on a month-by-month basis for the period February to October 1995. On first appraisal, the number of messages may appear deceptively small. Indeed, the use of message approval and the tutors' slowness in removing it from messages in the tutorial areas may have contributed to this outcome (see figures 7.5 and 7.6). However the actual numbers of message readers was much higher than message senders, see section 7.2.2.

Figure 7.5 The number of messages sent to the busiest tutorial throughout the course



In the case of the busiest tutorial, the period from February to 1 May accounted for 76% of the messages posted by the end of the year. In the case of the quietest tutorial this same period accounted for 100% of the messages posted. As messages were not sent to the quieter tutorial after 1 May, the message content in both tutorials was analysed for the period February to 1 May.

Figure 7.6 The number of messages sent to the quietest tutorial throughout the course



February appeared to be an important bonding period for the busiest tutorial. However most messages were sent to these two tutorials during the month of March. The actual activity taking place on a month-by-month basis in these two tutorial sub-conferences is discussed further in section 7.2.3. In addition to the number of messages, which indicated, when activity was taking place, other data were gathered to try to understand why the busiest tutorial stayed active while the quietest tutorial became silent. This activity included:

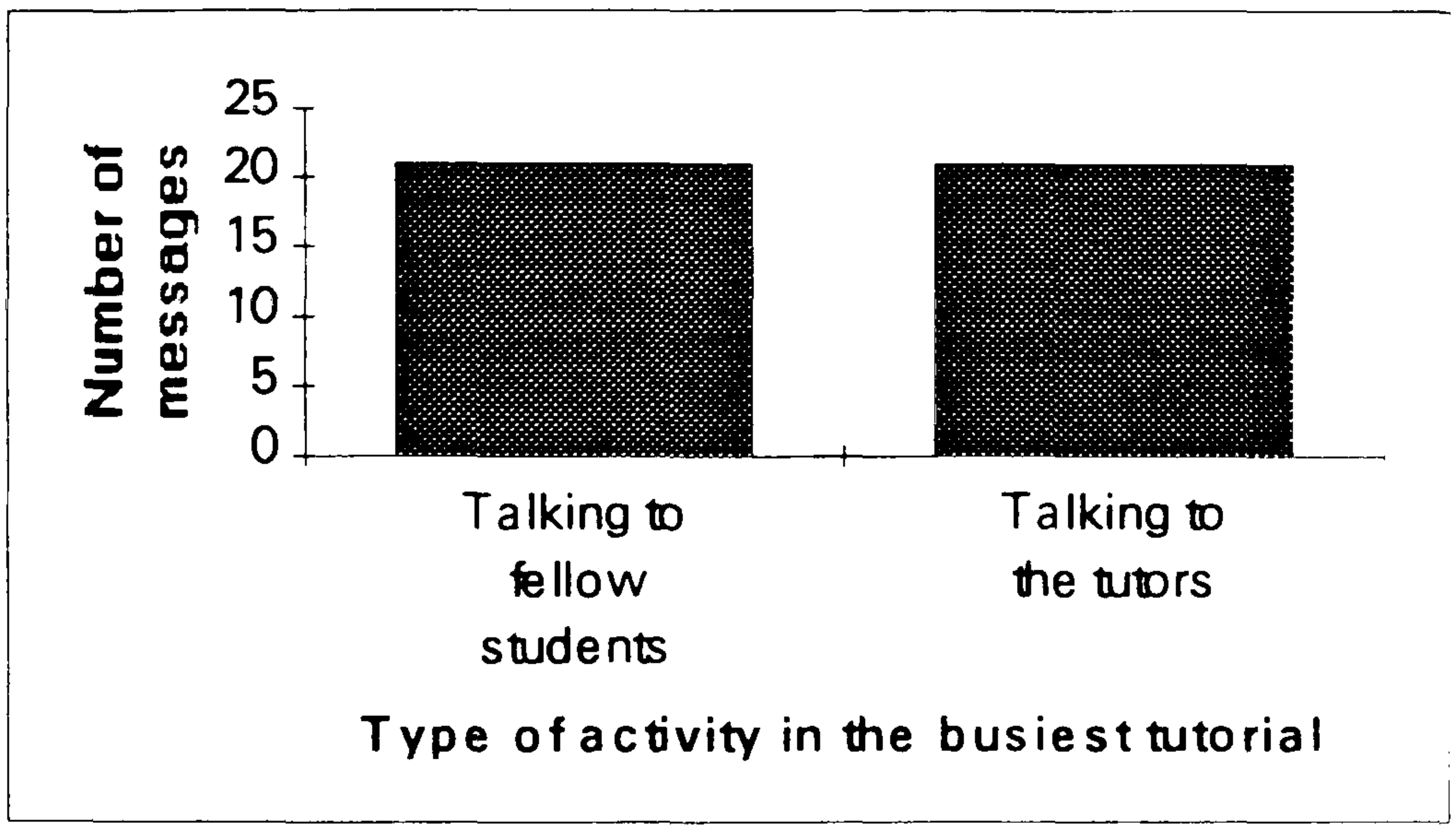
- using the message history feature to investigate whether students were sending messages to their peers or to their tutors,
- using the message history feature to see who was reading the conference messages,
- analysing the messages to discover the subject matter under discussion – first from the students' perspective and then from the tutors' perspective.

This type of analysis, which was described in chapter 3, is called interpretation of naturally-occurring interactions. Hammersley et al. (1994) would call this understanding the events from the point of view of the participants by investigating when and where activity took place and with whom.

7.2.1.1 Activity in the busiest tutorial

To investigate the first category, Communicating with students and tutors (A), in more depth, the 17 students and the tutor in the busiest tutorial were monitored to find out with whom they were corresponding. In the case of the students, about equal numbers of messages were sent to the tutor and to fellow students, as summarised in figure 7.7. This finding supports Mason's (1995) assertion that the student-to-student interaction is just as important as the student-to-tutor interaction. These students appeared to be confident users of the system who took advantage of this learning medium from day one.

Figure 7.7 Who the students were talking to in the busiest tutorial



The conference messages were analysed to discover the nature of the subject matter discussed. Three of the categories that emerged matched those discussed in chapter 6. These were:

B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing),

C. Help with course work and problem solving, and

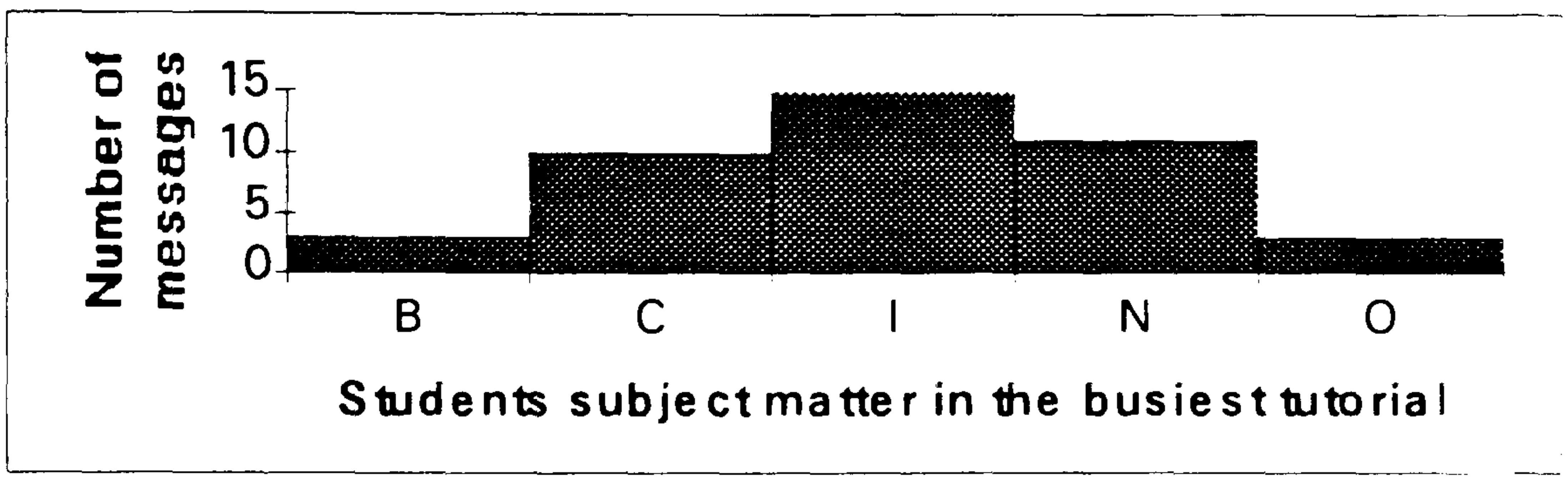
I. Social interaction

As the data discussed here are based on naturally-occurring interactions in conferences rather than student and tutor responses (which was the type of data discussed in the previous chapter) it was not surprising that two new categories emerged. These were Technical assistance (N) and Query raised by face-to-face tutorial (O). Hence the subject matter of the student talk in the busiest tutorial covered five categories. The five categories are shown in key 7.1 and represented graphically in figure 7.8.

Key 7.1 Student discussion categories in the busiest tutorial

B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
I. Social interaction
N. Technical assistance
O. Query raised by face-to-face tutorial

Figure 7.8 The nature of the student discussion in the busiest tutorial



It was not surprising that the first messages recorded were of the 'getting to know you type', Social Interaction (I). They contained information about where the students lived, what their occupation was, and were relevant to their individual tutorial group because they lived in the same region of the country. For example, *For the benefit of ... the North East of Scotland tutorial group, my name is Ian, I am from Aberdeen ... and this is my second year ... I completed T102 last year and hope to commence a new career in computing after this year. I look forward to meeting you all soon.* After a period of one-month, the nature of the messages changed to course-related messages. However social interaction (I) accounted for the highest proportion of student interactions (35.7%) over the full period, see figure 7.8.

Discussion in the 'Hands-on systems' learning category (B), accounted for 7.14% of messages. *How about a new face lift to your workplace? Try holding down ATL and pressing <Enter> to bring up the properties of the icon selected. You can then click on the icon box on the left-hand side to change those boring Mac-like folders into real Windows icons.*

Students used the system to solve specific computer science problems. Messages related to Help with the course work and problem solving (C) accounted for 23.8% of messages. *To what level should the design go? I.e. 1.2.1 or 1.2.1.1? Also I am slightly* *confused as to whether the statements at 1,2,3,4 and 5 level should be left in or commented out?*

About a quarter of the messages (26.1%) related to technical assistance (N), that was, help with the system itself (see figure 7.8). This discussion resulted from the change over from very stable access with long-distance calls to local call access which caused severe difficulties for the students. Rather than using the relevant help conferences available on the system, the students were asking their tutor and fellow students for help. The following example indicates how one of the students had trouble connecting via local call access and illustrates the above issue clearly. She said, *Hello. I'm still terrified of using FirstClass. It's akin to someone handing you a clarinet and saying "play it". For one thing I can't get the Aberdeen no. to connect me. There are several other things I haven't managed to do but being an Aberdonian I'd be happier discussing them at the local call rate!* This student received help and then acknowledged this fact by sending a message six days later to her tutor's sub-conference. She commented in the following way in a message to the Busiest tutorial, on Sunday 5 March. *Thanks very much for your concise and readable instructions on how to access via the Aberdeen number. However I still can't make a connection by that method. As I sit here viewing the USRobotics irksome device I wonder how something so small and silent can cause me such immense irritation. It's a very convenient size for placing under the wheel of a car!* This comment indicates that some students were not as technically expert as others and that frustration can be experienced when the technology fails to work. Timely responses related to help with the system are also an important issue, otherwise students can quickly become demotivated. The lack of a response could also be attributed to the fact that students did not realise they should have contacted the IMF with queries of this nature rather than their tutor. This confusion about staff roles substantiates the findings of Rich (1992, p.27) who said that there can be 'a blurring in many students perceptions between the roles of the computer staff and those of the academics'.

The high proportion of social messages may have been a contributing factor in this tutorial staying more active than the quietest tutorial. Another explanation could be that the students were all experiencing the same difficulties accessing the system at the beginning of the course and this joint problem-solving activity bound them together. This may have helped to give this group its cohesion and make it an active group throughout the course.

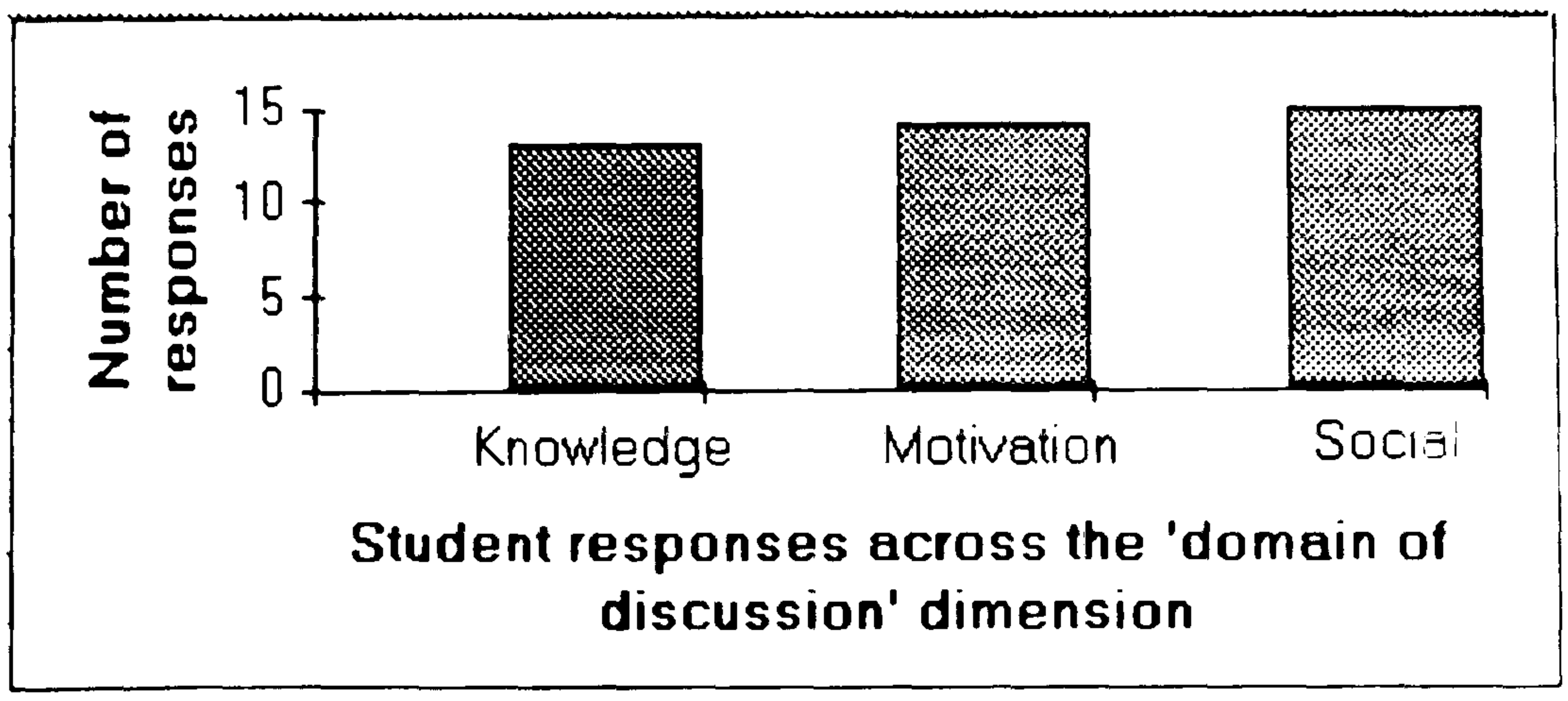
Queries raised by face-to-face tutorials (O) accounted for 7.14% of messages. *Sorry I won't be able to attend* [the tutorial] *this week. Could you please send the details of the subjects covered or post them to my mail box.*

The analysis in chapter 6 produced a benchmark list of categories (see key 6.5). These benchmark categories were allocated to the knowledge, motivation and socialisation elements of the 'domain of discussion' as shown in table 6.8 of chapter 6. The two new categories that emerged here needed to be further analysed to ascertain how they corresponded to the 'domain of discussion'. The new category Query raised by face-to-face tutorial (O), corresponded to the knowledge domain while the other new category Technical assistance (N) corresponded to the motivation domain as students could have become demotivated without recourse to this type of help, see table 7.1. The importance of each of the 'domains of discussion' is illustrated graphically in figure 7.9.

Table 7.1 The 'domain of discussion' analysis of the student discourse in the busiest tutorial

Knowledge	Motivation	Socialisation
Help with course work / problem solving	'Hands-on systems' learning	Social interaction
Query raised by face-to-face tutorial	Technical assistance	

Figure 7.9 Student discourse in the busiest tutorial within the 'domain of discussion'



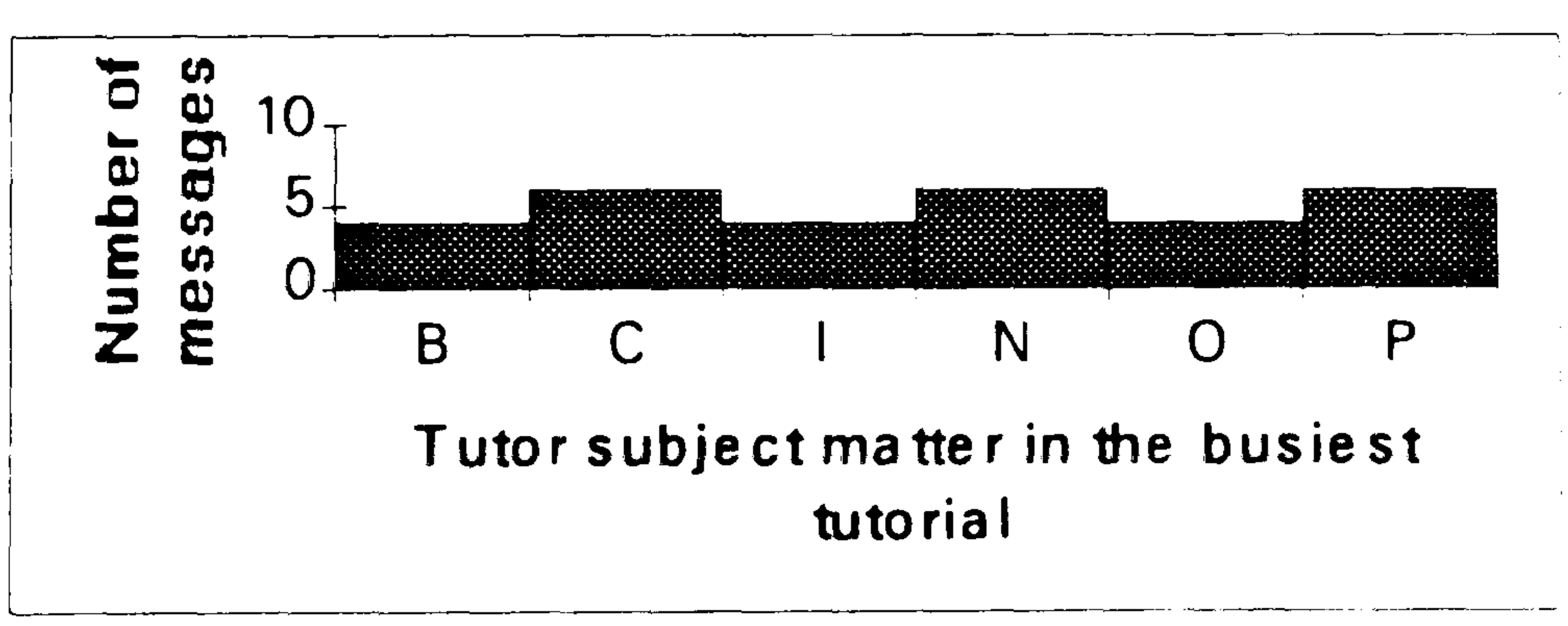
From the students' perspective, all three domains have played a part in making this the busiest tutorial. This analysis was undertaken with messages sent in the first three-months in the period February to 1 May, and varies substantially from the user opinion data collected at the one and six-months points that were reported in the previous chapter. For example, in the previous chapter, the social domain did not feature to any great extent and the motivation domain rated between one-third and equal the importance of the knowledge domain. Both the social and motivation elements are more prominent in this analysis.

The tutor's input to this busiest tutorial affected interactivity. When the number of tutor messages in the busiest conference was examined the tutor had posted almost as many messages as the students. Indeed the tutor's messages in the busiest tutorial related to the same five categories discussed by the students but also included an additional topic, Encouraging participation (P), which contained messages that cajoled the participants to become involved, as shown in key 7.2 and figure 7.10.

Key 7.2 Tutor discussion categories in the busiest tutorial

B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
I. Social interaction
N. Technical assistance
O. Query raised by face-to-face tutorial
P. Encouraging participation

Figure 7.10 Tutor's subject matter in the busiest tutorial



The tutor in the busiest tutorial was very active and sent 13.3% messages related to 'Hands-on systems' learning (B), 20% about Help with course work and problem solving (C), and 13.3% Social messages (I). As would be expected, there were quite a few messages (20%) replying with help in the Technical assistance category (N).

Queries raised by the face-to-face tutorial (O) accounted for 13.3% of replies while 20% of messages were related to Encouraging participation (P). This contrasts quite markedly with the quietest tutorial, see section 7.2.2. The tutor in this tutorial had used the message history feature provided by FirstClass and noted that lots of students were reading messages in the tutorial conference but were not posting messages themselves. An example of a message sent by this tutor to encourage his students to participate, was sent on Saturday, 18 February.

I am glad that many of you have got connected to the Tutorial conference. I am sure that some of you are reading the messages and haven't yet posted any messages. Reading messages without letting others know you are in there is known as 'lurking'. There is nothing wrong with lurking but I would encourage you all to take part in the conference. Please do post, even just a short message to say hi.

Some students who had not already, did post messages as a result but many did still lurk.

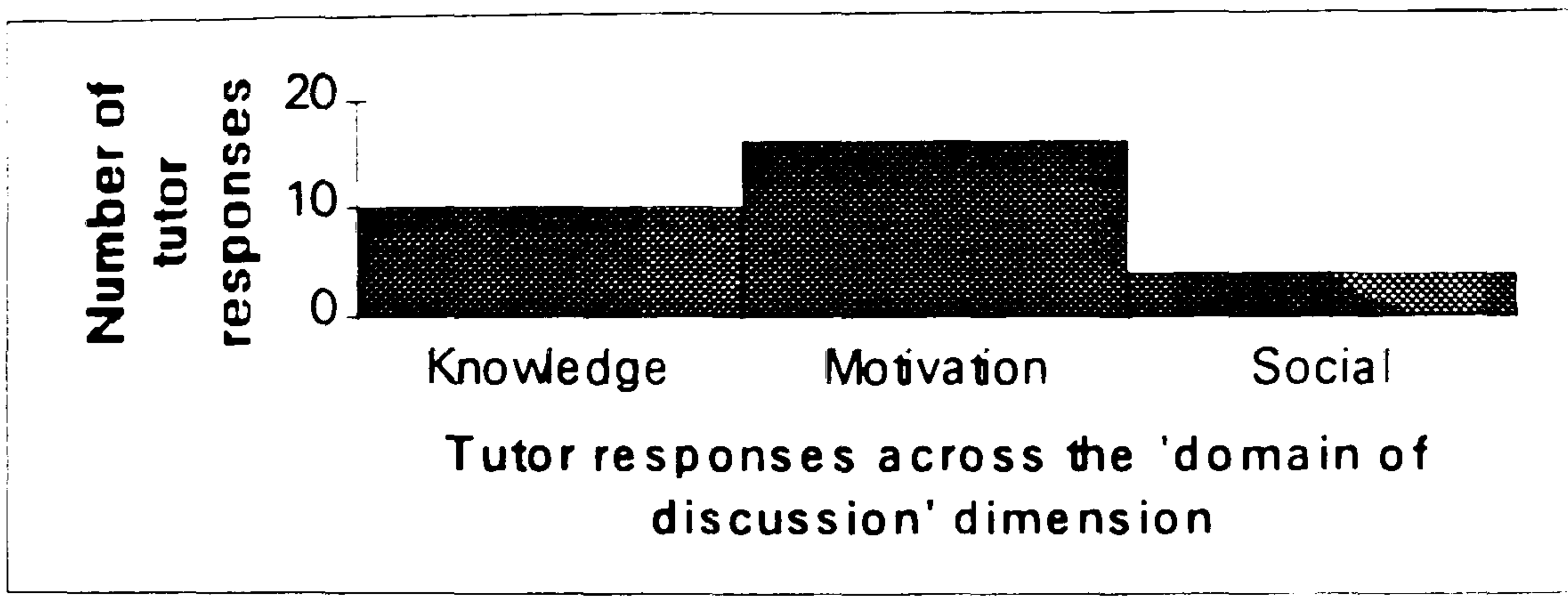
The findings for the busiest tutorial support Mason's (1995) findings from the 'Modems in the North' project, where there was a good deal of interaction related to administrative and social communications.

The only new category arriving from this analysis of the tutor's input to the Busiest tutorial was Encouraging participation (P). In terms of the 'domain of discussion', Encouraging participation (P) was seen to be motivation as it could improve participation levels. The importance of each of the domains is illustrated graphically in figure 7.11.

Table 7.2 The 'domain of discussion' analysis of the tutor discourse in the busiest tutorial

Knowledge	**Motivation**	**Socialisation**
Help with course work / problem solving	'Hands-on systems' learning	Social interaction
Query raised by face-to-face tutorial	Technical assistance	
	Encouraging participation	

Figure 7.11 Tutor discourse in the busiest tutorial within the 'domain of discussion'



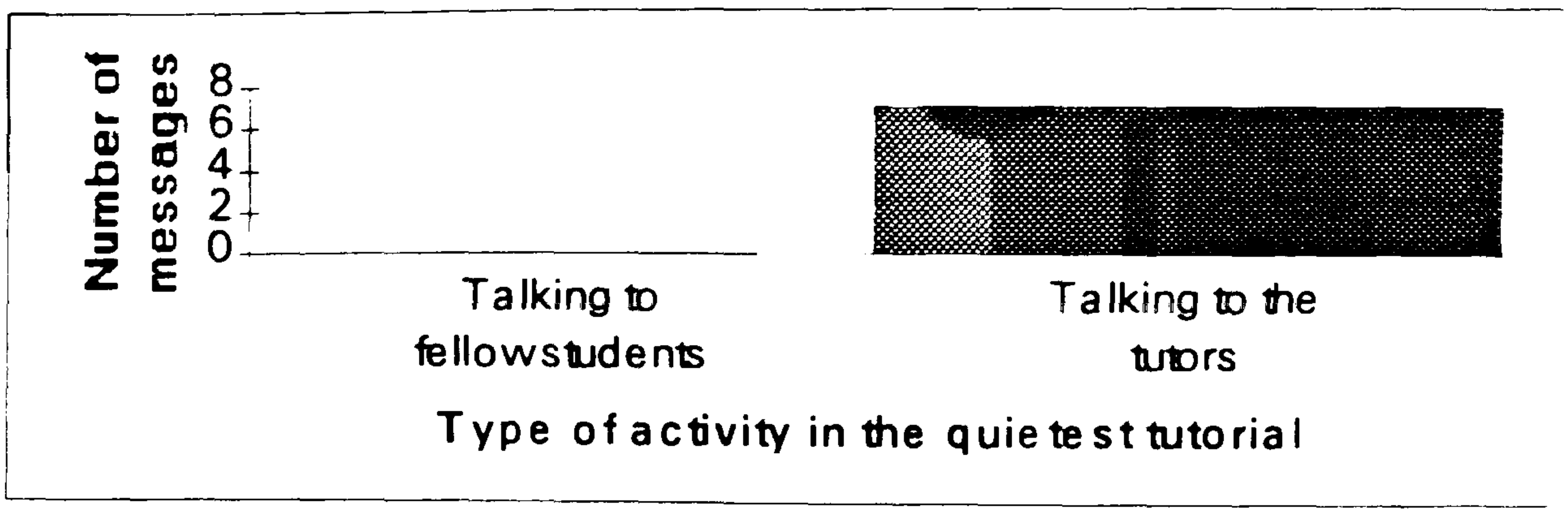
In this analysis (unlike that of the students) the motivation domain rated higher than the social domain. The need for technical assistance and messages encouraging participation formed most of the motivation message responses from the tutor. These students had difficulties with dial-in access when they changed from long-distance calls to local call access, a necessity prompted by a change in the OU procedures. Students in the other groups did not suffer the same difficulties. Therefore the importance of the motivation domain from the tutor perspective may be atypical for this tutor group.

In the busiest tutorial the students sent fairly equal proportions of messages, approximately 50% each to their tutor and their peers. This finding shows an improvement over Mason (1989a) whose findings suggested that between 10% and 15% of students asked their tutor for help when they had a problem that they could not resolve for themselves, as compared to 17% or 18% asking other students. As a source of help, students and tutors seemed equally valuable. The first messages posted were of a social nature and after a period of one-month, students asked for help to solve problems with their course material and for assistance with dial-in access. In fact, they were exploring every avenue possible to solve problems and find help with their course work.

7.2.1.2 Activity in the quietest tutorial

The quietest tutorial contained seven students and unfortunately their tutor was away at the start of the course. In this early period these students were active in the Meeting Place and M205 Help sub-conferences. The fact that this tutorial started later could have had a bearing on it being somewhat quieter. When the students started using this area they directed their messages to their tutor but not to their fellow students at all, as indicated in figure 7.12.

Figure 7.12 Who the students were talking to in the quietest tutorial

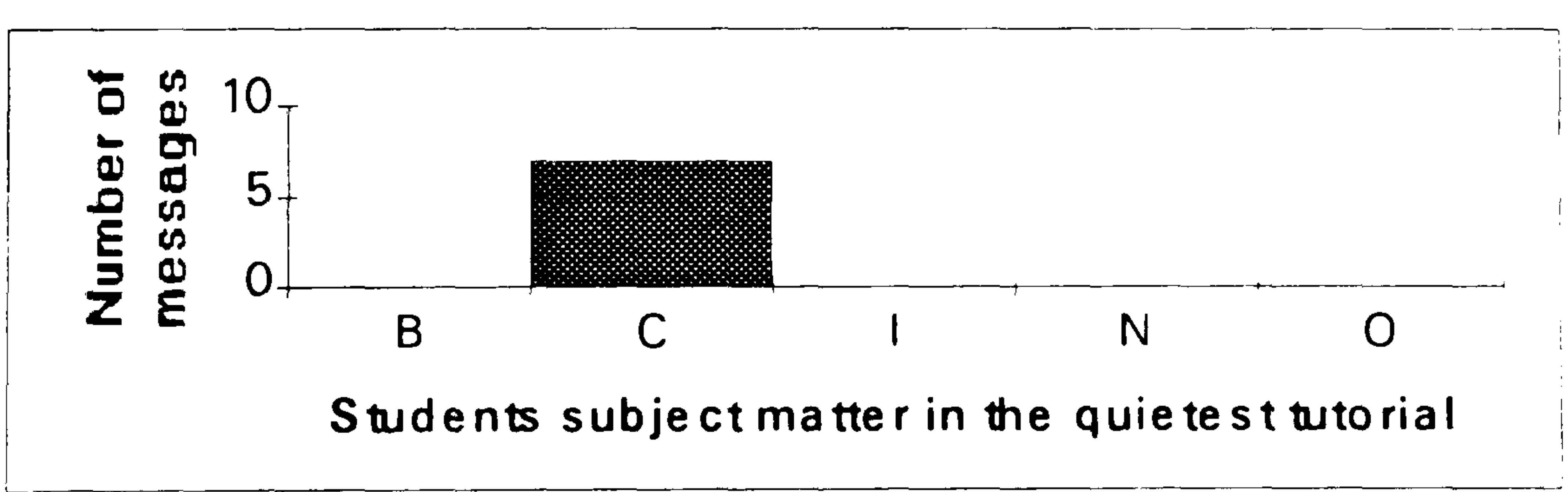


In terms of the subject matter, student talk in the quietest tutorial appeared to only be related to one category, Help with course work and problem solving (C). Students did not introduce themselves in this tutorial (unlike the busier tutorial) in advance of asking questions related to their course work, see figure 7.13. Without the social interaction of introducing themselves it may have been difficult to indicate to each other their level of computing experience, while their tutor's expertise was assumed. Unlike the busiest tutorial, there did not seem to be a common problem to bring these students together nor did they introduce themselves, nor were they prompted to do so by their tutor. Perhaps they felt they had already done this in the Meeting Place sub-conference before they were allowed access to their tutorial conference.

Key 7.3 Student categories in the quietest tutorial

C. Help with course work and problem solving.

Figure 7.13 The nature of the student discussion in the quietest tutorial



An example of a question raised by a student in the quietest tutorial on 14 March follows:

I have 3 queries regarding Block 1, unit 4, page 20.

1) (a) Page 20, right side, 2nd grey box from the bottom. It reads:

```
if ch='a'
then
  value:=true
else
  valid:=false
```

Should the word value actually read valid? Is this a misprint? I have assumed it is.

(b) Same area on same page. 1st grey box from the bottom. It reads:

```
valid:=(ch='a')
```

Is this just another way of saying what the grey box above said? What does this line mean in 'English'? I think it means valid receives the character as True as long as it is a. Am I right?

2) The OU's corrected/revised version of the program in fig 4.4 is on B1:ATESTL.TEXT. In this corrected version there are two begin statements. Why? I'm not clear in my mind why this is so. I know it doesn't work properly with two begins but why?

3) Finally, same revised program on B1 as we've just mentioned. Line 23 reads:

```
wrtieln ('true, character entered is ' ' ',ch, ' ' ' ')
```

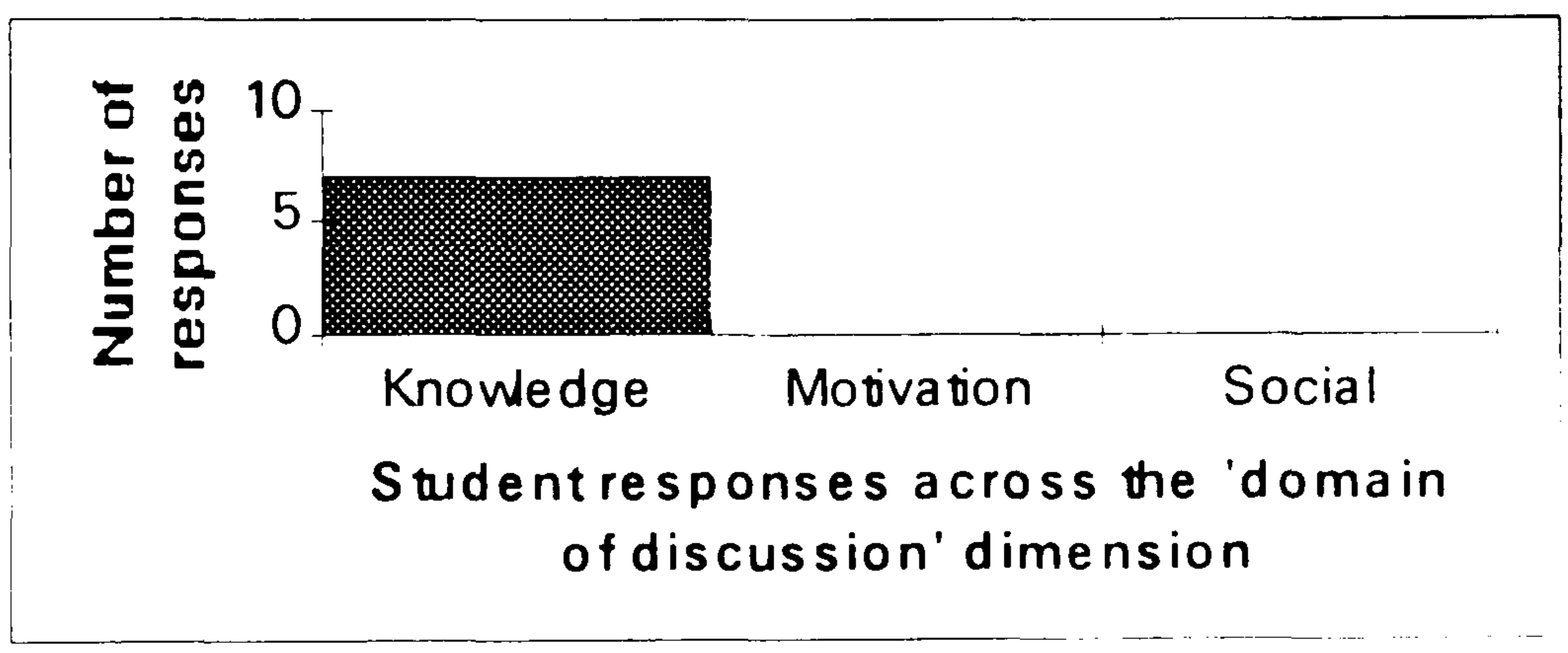
What are the '''' for? There's 3 on the left and 4 on the right. I assume they place the contents of ch in a particular place?

This message was sent one-month after the course started. This student took the initiative without any previous encouragement from the tutor. It seemed to have been clear to him that the tutorial conference should be used to help with his study. The student used the CMC to explain his problem and asked his tutor for help (the tutor's response is given in this section, following figure 7.15). This single category of Help with course work and problem solving (C) corresponded to the knowledge domain as in previous analysis, see table 7.3 and figure 7.14.

Table 7.3 The 'domain of discussion' analysis of the student discourse in the quietest tutorial

Knowledge	**Motivation**	**Socialisation**
Help with course work / problem solving		

Figure 7.14 Student discourse in the quietest tutorial within the 'domain of discussion'



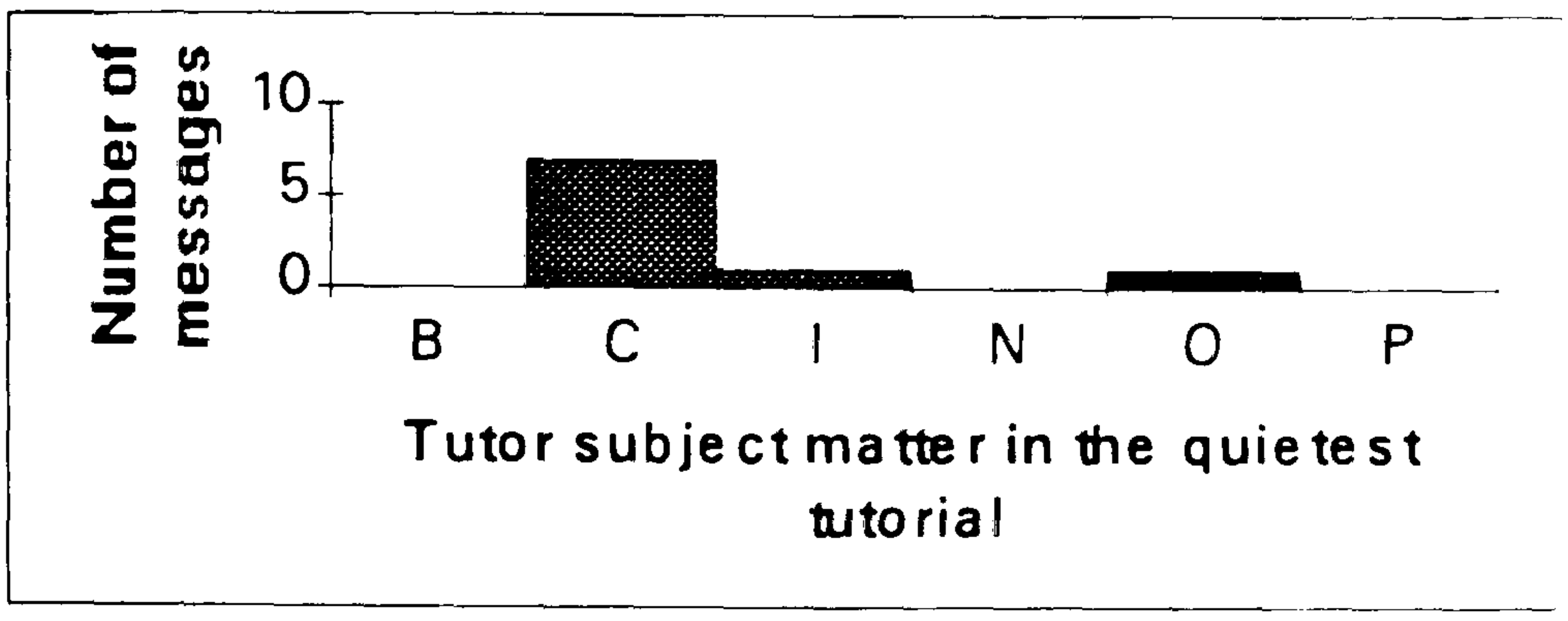
The social and motivation domains appeared not to feature from the students' perspective in the quietest tutorial. The lack of these types of discussion in the quietest tutorial could indicate why this tutorial was so inactive.

The tutor in the quietest tutorial was less proactive than the tutor in the busiest tutorial but the number of messages he sent equaled those of his students. This tutor's talk was related to three of the six categories used by the tutor in the busiest tutorial and is shown in key 7.4 and figure 7.15.

Key 7.4 Tutor discussion categories in the quietest tutorial

C. Help with course work and problem solving
I. Social interaction
O. Query raised by face-to-face tutorial

Figure 7.15 The nature of the tutor's subject matter in the quietest tutorial



This conference tutor responded when asked a question. The majority of his responses (78%) were related to the Help with course work and problem solving (C) questions raised by his students (see figure 7.15). An example of a problem-solving interaction in this tutorial is shown through the tutor's response to the student query mentioned two pages earlier. At first he gave a quick response but also wanted more time to reflect on some of the queries originally posed. The tutor's response was to the student query in the Quietest tutorial on 17 March.

A quick response to your queries:

a. Yes, this is a misprint, for value read valid.

b. Again you are correct. The statement is a shorter way of doing what the 'grey box' does. In English it means:

' Set the value of valid to true or false depending on whether ch = 'a' or not. '

2. I will have to look this up on my disc.

3. One can work this out by checking the syntax of the output string in a writeln statement:

Strings to be output must be enclosed within single quotes so anything within the single quotes must be part of such a string. The first string output will be: true, character entered is "

This is followed by the value of ch

This in turn is followed by"

So assuming that the value of ch is 'a' then the whole output will be:

true, character entered is "a"

I hope this has cleared it up.

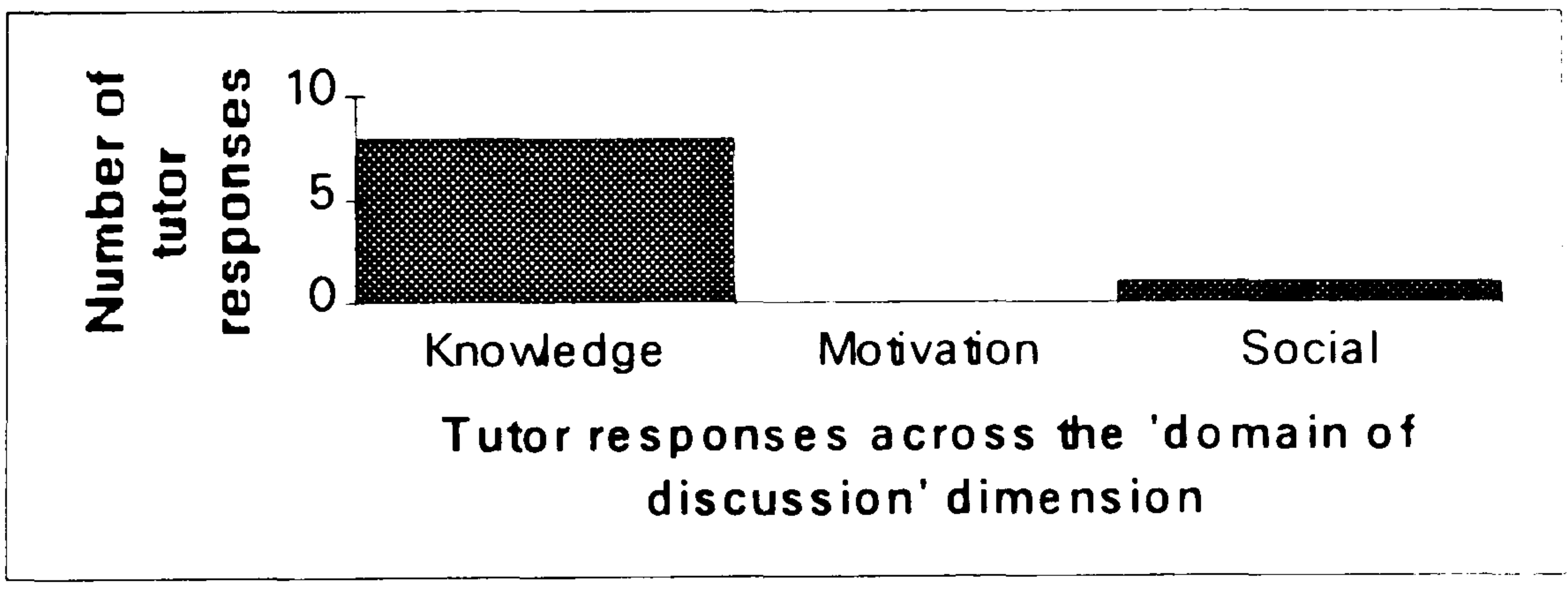
I'll come back to you about no. 2.

This tutor posted one social message (I) to get the conference going and one message related to a Query raised by the face-to-face tutorials (O). These latter two categories each accounted for 11% of the messages posted. The tutor did not post messages related to 'Hands-on systems' learning (B), about Technical assistance (N), or messages Encouraging participation (P). Their were no new topics of discussion. The importance of the knowledge, motivation and social domains are shown in figure 7.16.

Table 7.4 'Domain of discussion' analysis of the tutor discourse in the quietest tutorial

Knowledge	Motivational	Socialisation
Help with course work / problem solving		Social interaction
Query raised by face-to-face tutorial		

Figure 7.16 Tutor discourse in the quietest tutorial within the 'domain of discussion'



There were no responses in the motivation domain while the social domain rated only a small number of messages. The students here did not form a cohesive group. Perhaps if the tutor had posted messages encouraging participation (P) and more social messages (I) this could have influenced students to remain active in this conference. Also these students were disadvantaged as their tutor was on holiday at the beginning of the course. The contrast between these two tutorials raised some interesting issues.

1. It appeared to have been crucial to have the tutor available at the start of the online activity. As the tutor was unavailable, the students in the quietest tutorial group had been informed by the IMF that their tutor was away at the start of the course and that they should use the M205 Help sub-conference to request assistance. As message approval was in place in the tutorial conference, these students could not use the tutorial conference on their own. Without message approval these students would have had the opportunity to mix socially within their particular tutorial group. This could have taken place when there was more time at the start of the course. As a result they missed out on an essential bonding period early on. In the case where another tutor covered a tutorial sub-conference during a holiday period, it was reported that this worked quite well but students commented that they had to adjust to the second or 'stand-in' tutor's style.

2. The number of students in the tutorial group may have affected how the group sustained activity throughout the year. However, this analysis (including that at the start of this section) suggested that the tutor's input and their presence in the tutorial conference had a more important bearing on the amount and type of messages posted.

The amount of input from the tutor appeared to affect activity. The tutor in the busiest tutorial posted more messages than the tutor in the quietest tutorial. These findings related to the amount of activity in the tutorial sub-conferences confirm the suggestion by Mason (1989a) that tutors who continued to input messages cajoling participants to post messages produced the largest number of messages, whereas tutors who only posted opening messages in each topic and expected the students to take over were disappointed. Although the numbers of messages posted by the tutors were markedly different in both tutorials, in each case the tutor posted a similar number of messages to their students. This finding, that tutors post 50% of the messages, supports the suggestion made by Berge (1996) that tutors should contribute between one-quarter and one-half of the online material. However, it is in contrast with Harasim (1989) who reported that the instructor contributed 10-15% of the messages' and Tonnesen, et al.

(1995) who reported that the instructor sent 21% of the messages, while students sent 79.1% of messages. In the busiest tutorial, students responded to both their tutor and other students while in the quietest tutorial students did not interact with other students. The finding from the busiest tutorial supports Riedl's (1989) finding that thirty-two per cent of topics discussed by students were in response to messages from other students. It should be borne in mind that the numbers of messages sent by students and tutors may depend on the level at which the student is studying and the teaching approach adopted.

7.2.2 Comparing activity in the busiest and quietest tutorials

To compare the students' and tutors' interactions in the two tutorial conferences in more depth, analysis was carried out across the 'domain of discussion'. To aid comparisons, the quantities corresponding to the 'domain of discussion' (in figures 7.9, 7.11, 7.14, and 7.16) were converted to percentages, as summarised in tables 7.5 and 7.6.

Table 7.5 A comparison of the 'domain of discussion' in terms of students discourse in the busiest and quietest tutorials

	Total student responses relevant to domains	Knowledge	Motivation	Socialisation
Busiest tutorial	42	31%	33%	36%
Quietest tutorial	7	100%	0	0
% difference		69%	33%	36%

Comparing these two tutorials across the 'domain of discussion', the balance between the social, motivation and knowledge domains appears to have made a contribution to the difference between the two tutorials. In the busiest tutorial, all three domains appeared to be equally important to sustain participation in the busiest tutorial as compared to the quietest tutorial. In the quietest tutorial the students concentrated on the knowledge domain but it appears that the lack of the motivation and social domains contributed to the conference becoming inactive.

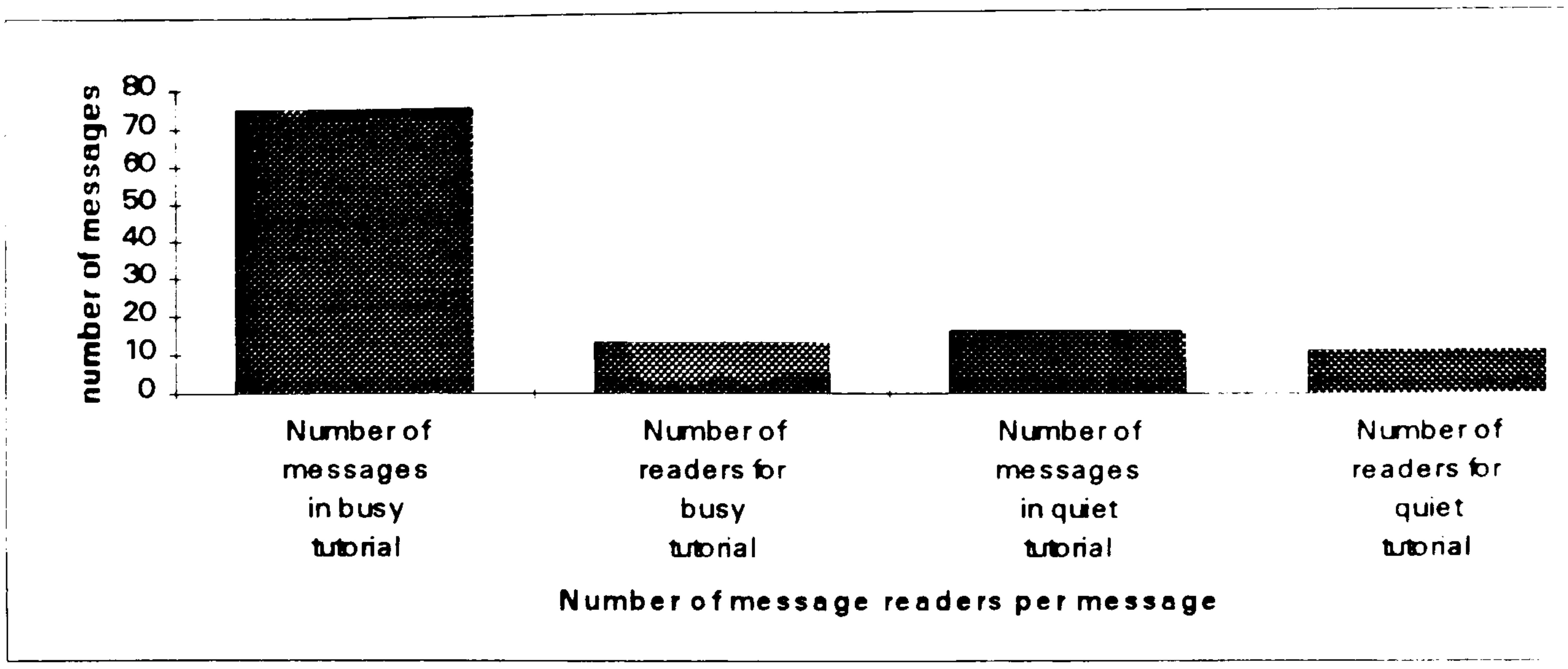
From the tutors' perspective, it appears that it was the input in the motivation domain which was important to sustain participation, as summarised in table 7.6. It is an interesting finding that the social and motivation domains are important but the degree of importance seems to vary according to which perspective is taken, that is whether it is from the tutors' or the students' perspective.

Table 7.6 A comparison of the 'domain of discussion' in terms of the tutors' discourse in the busiest and quietest tutorials

	Total tutor responses relevant to domains	Knowledge	Motivation	Socialisation
Busiest tutorial	30	33%	54%	13%
Quietest tutorial	9	89%	0	11%
% difference		56%	54%	2%

As mentioned earlier, the quantity of student messages in a tutorial conference may appear small and indeed the use of message approval may have stilted activity. Figures 7.3 and 7.4 suggested, though, that the number of participants does not necessarily mean there will be a higher number of messages. When student activity in the M205-STILE conference on FirstClass was compared with two other courses, the M205-STILE students were atypical, in terms of the amount of time spent online (see related analysis in Wilson and Whitelock (1998a)). So what underlying activity was taking place? Closer examination of the busiest and quietest tutorials using the FirstClass message history feature revealed that many students were passive participants, effectively listening. Students have reported that they learned a lot just from reading messages or shadowing other student activity. One student articulated this by saying I look to find *if anyone else has posted a query over something I was finding difficult ... If the question was already there, then I could look for the responses. If there were no questions posted then I could assume that I was making a silly error and if this still failed to resolve the problem then I could post the question myself.* This type of learning strategy was facilitated by the fact that all of the messages remained available throughout the presentation. This was an unforeseen benefit from archiving all messages for analysis purposes. As a result, students could take time to reflect on their problem in the light of other students' messages. The number of message readers was analysed as an indicator of the students who were using the shadowing strategy. The message history feature provided by FirstClass was used to analyse how many students were reading the messages sent to the busiest and quietest tutorials (see figure 7.17).

Figure 7.17 The number of students reading each message



Inspection of the two tutorial conferences over the period from February to 1 May before the quieter tutorial became inactive (as summarised in figures 7.5 and 7.6) revealed a different story in terms of activity. Each message in the busier tutorial averaged fourteen message readers whereas each message in the quieter tutorial averaged eleven message readers, see figure 7.17. This indicated that the quieter tutorial was not necessarily less active because although there were fewer messages, there was almost the same number of message readers or students shadowing other students. As the busier tutorial had seventeen students, it appeared that not all of the students in this group were reading all of the messages. The quieter tutorial had only seven students and indeed not all seven students were reading all of the messages. In fact students from other tutorial groups were using the read-only privilege (allocated to them on 1 April) to read these messages. Perhaps the quieter tutorial attracted other students because the message titles indicated that these messages were of a problem-solving nature. Indeed students reported that they benefited from read-only access to the tutorials other than their own, as discussed in chapter 5.

Not surprisingly, however, the number of message readers did not help the quieter tutorial to remain active. This analysis suggests that the students' use of read-only access to other tutorials was valuable to allow students to shadow the activity of other students and tutors. These findings appear to indicate that changes to the structure affect activity. For example, dynamically changing the structure to allow the students read-only access to all tutorials increased the number of message readers in the quietest tutorial. Students also read messages in the quietest tutorial conference after 1 May, when it had become inactive. This indicates the importance of keeping pertinent messages available. These findings indicate that message reading still occurs when a conference becomes inactive, and complements the findings of Owen (2000) who also used the FirstClass message history feature to analyse the number of message readers. He reported a message reading rate of between 80-100% in conferences that became inactive.

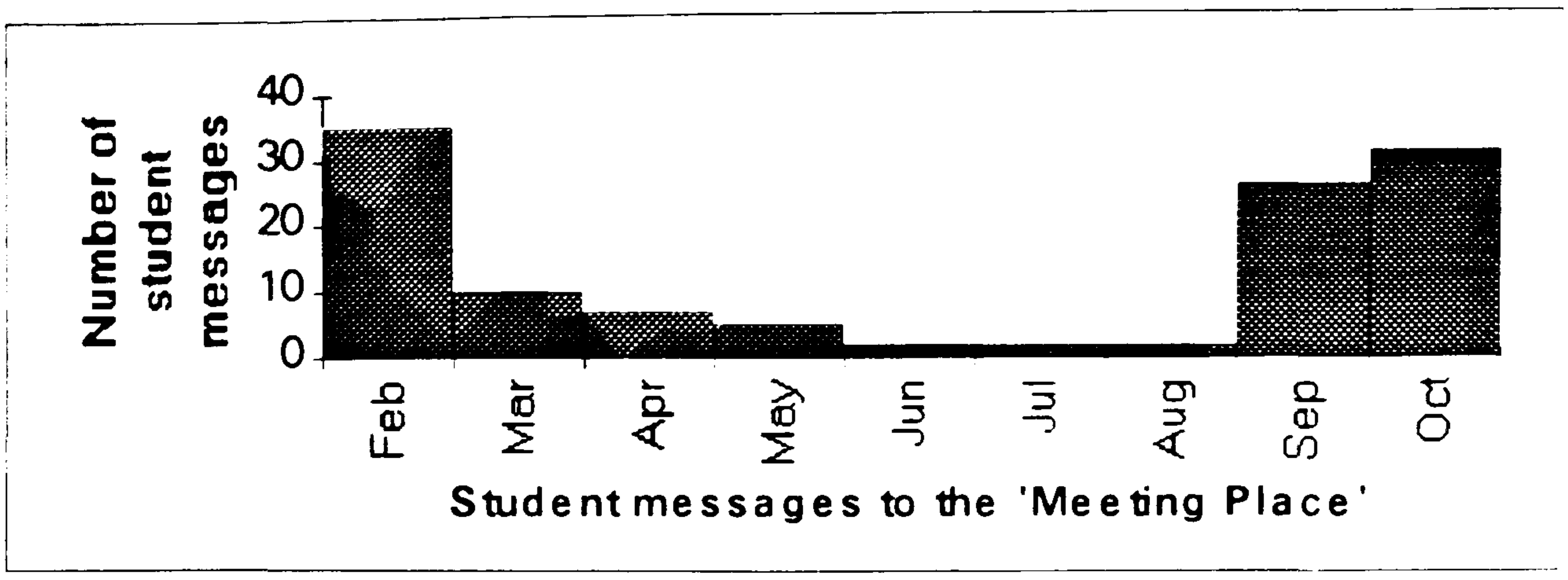
Activity in the tutorial conferences had been restricted to some extent by tutor autonomy and message approval. Therefore, in order to understand if these factors did affect the activity, findings were compared with two less restrictive conference areas, which are discussed in the next section.

7.2.3 Activity in the Meeting Place and M205 Help sub-conferences

To provide a broader perspective of students' online activities, two sub-conferences that could potentially involve all participants and did not make use of message approval were analysed. The Meeting Place was a social venue and the M205 Help sub-conference, was a course-related area. The lack of message approval meant that whenever a student posted a message, the other students could see it immediately and respond without waiting for the message to be approved by the tutor or IMF.

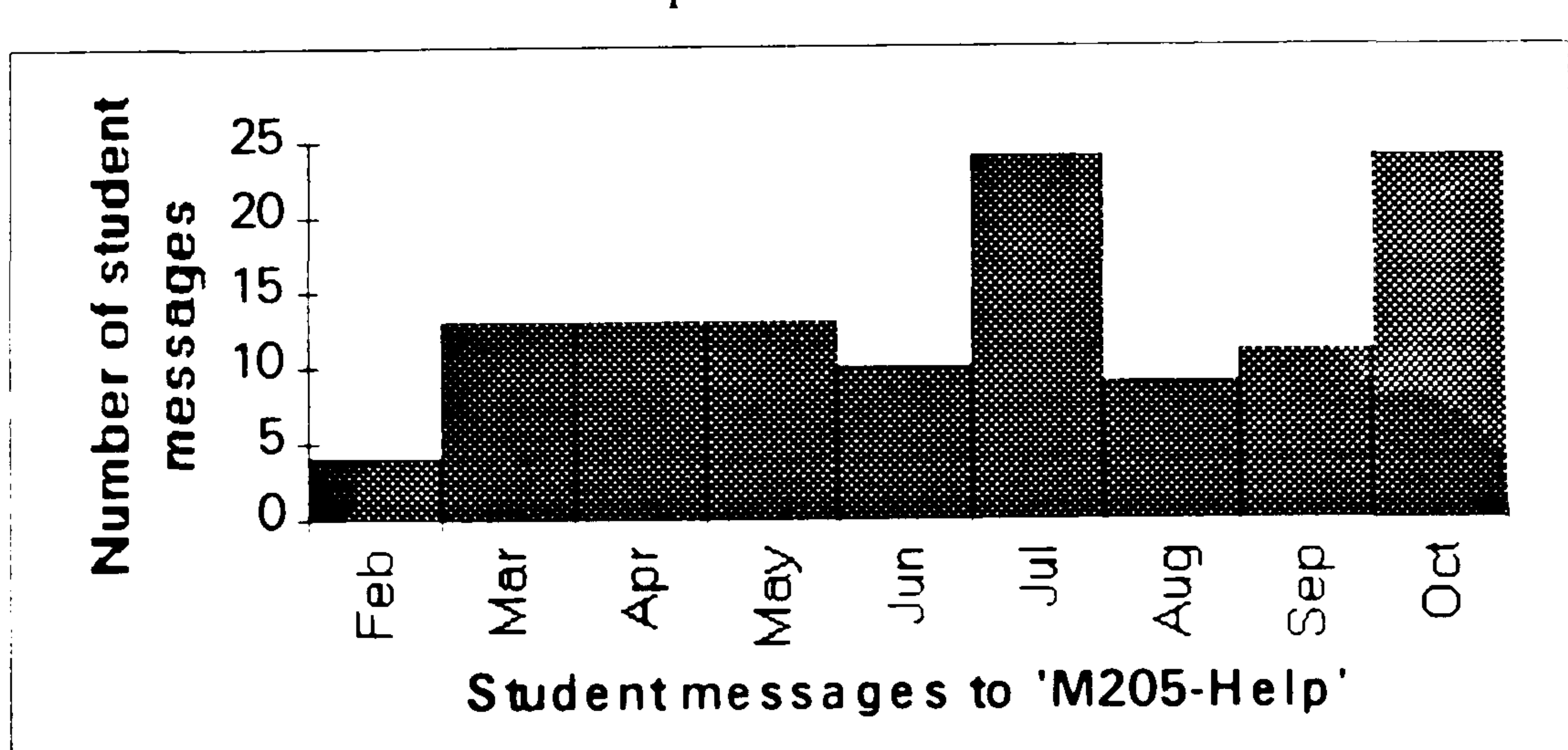
The IMF was the facilitator for these two sub-conferences but the students had the autonomy to seek help from other participants. The pattern of student interactions in both these conferences is analysed from February to the end of October, the full duration of the course. The numbers of messages posted per month are shown in figures 7.18 and 7.19. The Meeting Place sub-conference was intended as a social interaction space for all participants. In the Meeting Place sub-conference, the highest numbers of messages were recorded in February (29%) while almost as many were recorded in the months of September and October. In the first and last two-months the students were using the Meeting Place sub-conference to keep in social contact with each other. Students themselves generated sixty-three per cent of the messages sent to the Meeting Place sub-conference. The majority of their messages were for their fellow students; messages to tutors accounted for only 2%.

Figure 7.18 The number of student messages posted to the Meeting Place per month



The M205 Help sub-conference by contrast was an area set aside specifically for quick responses to course-related problems - it was not intended for social interaction. Members of the course team who originally produced the course material were available here to answer queries. The tutors were also invited to assist if they could. The pattern of message flow appeared quite different in the M205 Help sub-conference as compared to the Meeting Place sub-conference, as summarised in figure 7.19. Very few messages were found in the M205 Help sub-conference for the month of February (3%). The data indicated that there was more activity in the Meeting Place during this first month (29%). The percentage of messages increased, however, in the M205 Help sub-conference as compared to the Meeting Place from March through to August. Of the total number of messages in this conference, 71% were generated by the students themselves. Again the majority of student messages were for their fellow students. Little talk (6% of messages) was directed to the tutor. Student message posting on a month-by-month basis is discussed in more detail at the end of this section where comparisons are made with the busiest and quietest tutorials.

Figure 7.19 The number of student messages posted to the M205 Help sub-conference per month



The pattern of activity for both the above sub-conferences supports the original purposes for these areas, as envisaged by the IMF. That is, the Meeting Place sub-conference would be a valuable venue to get the students started but the M205 Help sub-conference was to be more important when students were more involved in the course.

In order to see what type of talk was going on in these two sub-conference areas, interpretation of naturally-occurring interactions was undertaken. This is discussed in the next section.

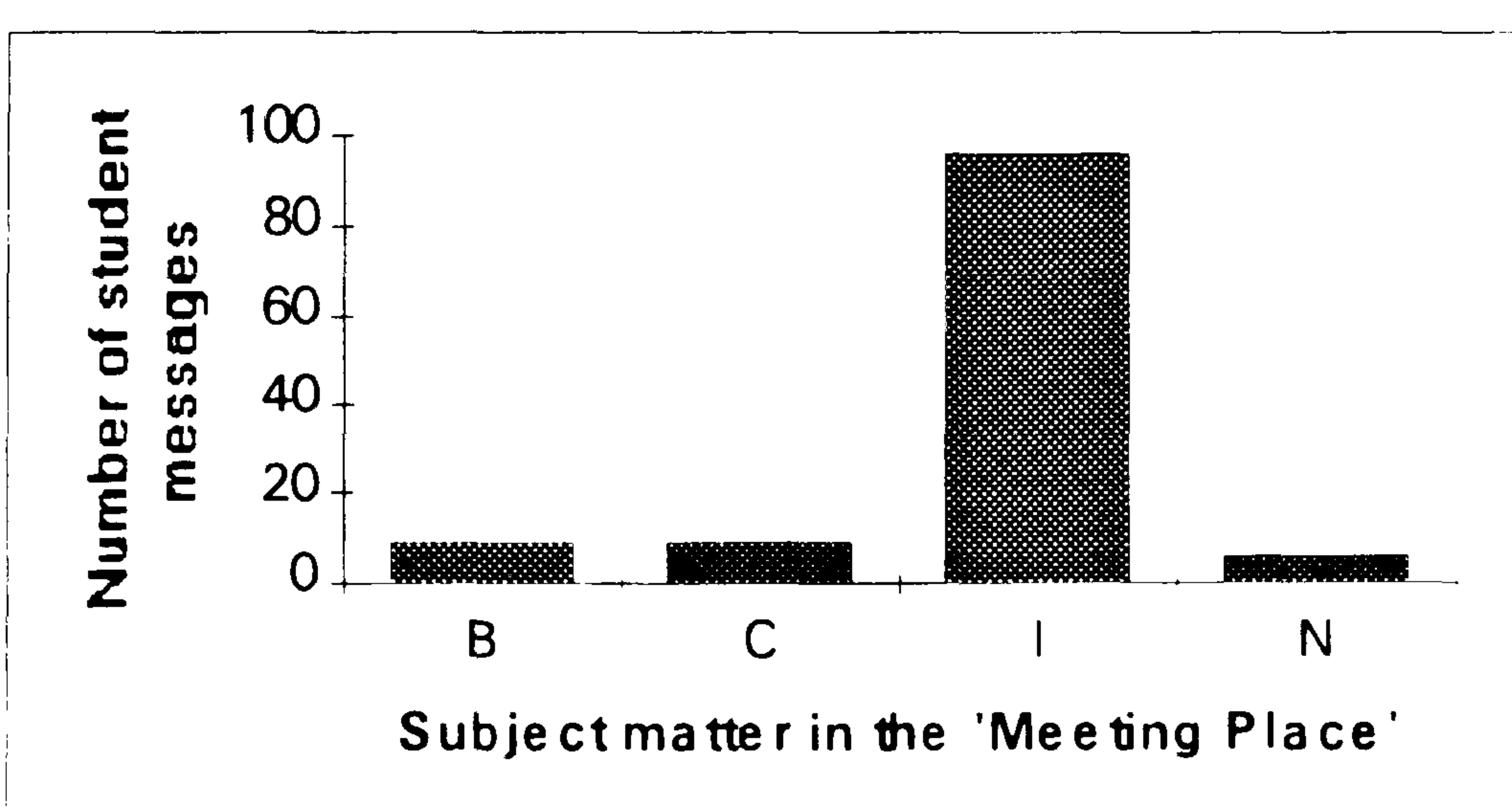
7.2.3.1 Activity in the Meeting Place sub-conference

The subject matter of the student talk in the Meeting Place sub-conference corresponded to four of the five categories in the busiest tutorial conference as detailed in key 7.5 and figure 7.20. The fifth category, which was not found here, was Query raised by tutorial (O), which should not have appeared here in any case.

Key 7.5 The nature of the students' subject matter in the Meeting Place

B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
I. Social interaction
N. Technical assistance

Figure 7.20 The type of student messages found in the Meeting Place.



The categories, which featured least in the Meeting Place, were 'Hands-on systems' learning (B), Help with course work and problem solving (C) and Technical assistance (N). In fact, as was the intention, the majority of the messages were of a social nature, see figure 7.20. There was no need to discuss course-related issues in this sub-conference and this would have been an inappropriate conference in which to do so.

Indeed social interaction within FirstClass (main study) appeared right at the beginning when students tried to get to know the system and each other. Many of the early messages were of the 'getting to know you' type. They started to share personal details about their family, surroundings, age, computing skills, hobbies and their enthusiasm for the online system in the Meeting Place sub-conference. For example, one commented, *Hello to all my fellow students on the M205 course. Apologies to anyone I haven't replied to that I was supposed to. I'm not being rude it's that I'm still finding my way around. Looking forward to using the STILE project to its fullest.* These early messages were sent in February in advance of exchanging messages on course-related issues in the M205 Help sub-conference in March. Students at this time were busy getting to know each other and the system rather than solving computing problems. These social exchanges took place in the Meeting Place sub-conference throughout the year. Although messages were sent to a lesser degree between March and August, the findings show that at the six weeks point, students were still finding their use of M205-STILE 'addictive'. Students felt comfortable enough in the Meeting Place sub-conference to convey more information about their cultural background. Some started writing messages in their chosen language, some in Welsh (four-months after the project started) and some in French (six-months after the project started).

Many early messages from the students to the Meeting Place sub-conference conveyed a sense of humour through their use of language, punctuation and expressions sometimes called emoticons, such as '<grin>' (see related analysis in Wilson and Whitelock, 1997d). One student commented, *it was just fun getting to know other students by reading their postings - which were quite often humorous.* Another student enjoyed using FirstClass so much that she had a letter from French Telecom, asking if she had *funds to pay for the outrageous phone bill,* [she was] *running up.*

This latter student's message to the Meeting Place sub-conference exploited the textual aspects of the conferencing system to the fullest by portraying a picture of herself at the end of the message.

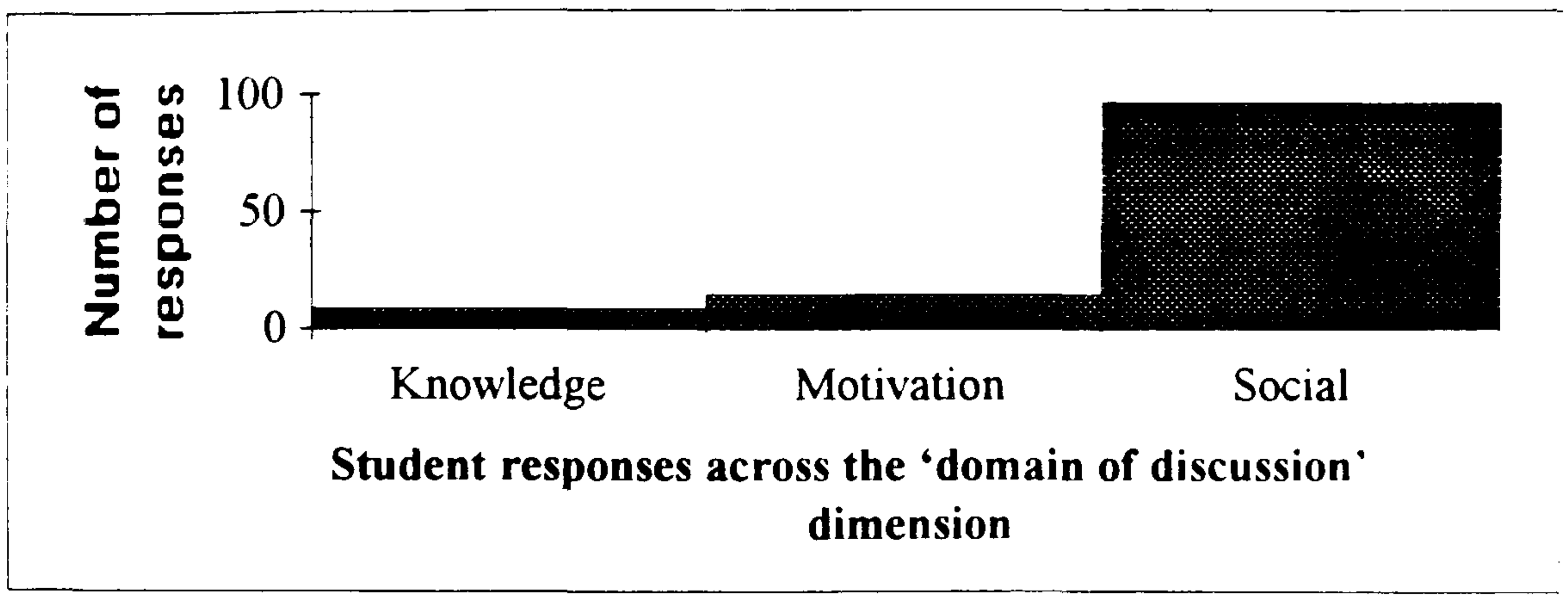
```
///// | \\\\\
||| ~ ~ |||| \|/     Bye for now
|||[ * | * ]|||  |
|||  ~ ||||  |
||| |  | |||||  |
```
This picture is quite inventive and not found in texts on the subject. This student had experience of using email prior to taking part in the M205-STILE sub-conference on FirstClass and used the system to display a sense of humour. However in contrast with these findings, Nixon and Salmon (1995) reported that it was difficult to convey emotions such as humour or anger in computer conferencing. The M205 students did have fun online but some students were more reticent until they gained confidence. For example, one student moved outside his tutorial sub-conference (into the wider M205-STILE arena), for the first time on 4 June, almost five-months after the project started. He posted a message to the Meeting Place saying *I've not got around to leaving a message outside of the tutorial conference yet and thought it was about time I did.* This was unusual, as most students appeared to post their messages to the Meeting Place sub-conference in the first instance. Students appeared to realise that they should post mainly social messages to the Meeting Place sub-conference: a finding, which suggested that the icon adopted by the IMF for this location conveyed the intended content for the conference.

The four categories of discussion underwent further scrutiny, to see how they corresponded to the 'domain of discussion'. These categories corresponded to those for the busiest and quietest tutorials and therefore related to the domain in the same way, see table 7.7. The importance of each of the domains is illustrated graphically in figure 7.21.

Table 7.7 The 'domain of discussion' analysis of the student discourse in the Meeting Place sub-conference

Knowledge	**Motivation**	**Socialisation**
Help with course work / problem solving	'Hands-on systems' learning	Social interaction
Query raised by face-to-face tutorial	Technical assistance	

Figure 7.21 Student discourse in the Meeting Place within the three domains



As would be expected, the social domain is most important for the Meeting Place sub-conference. The knowledge and motivation domains did not feature highly here. The dynamic intervention by the IMF in encouraging the students to use the Meeting Place sub-conference could have contributed to early activity in this sub-conference. Not surprisingly, the tutors found in this first-month that there was very little activity in the two tutorial conferences, which were examined in detail in sections 7.2.1.1 and 7.2.1.2. The social aspect of the online interaction was manifested by the students' enthusiasm to communicate with one another and become familiar with using the online system. It is suggested that these social activities in the first month could have been good precursors to using the system to help with the study of the course. Therefore it was surprising that the importance of the social domain was not more obvious in user opinion responses discussed in the previous chapter.

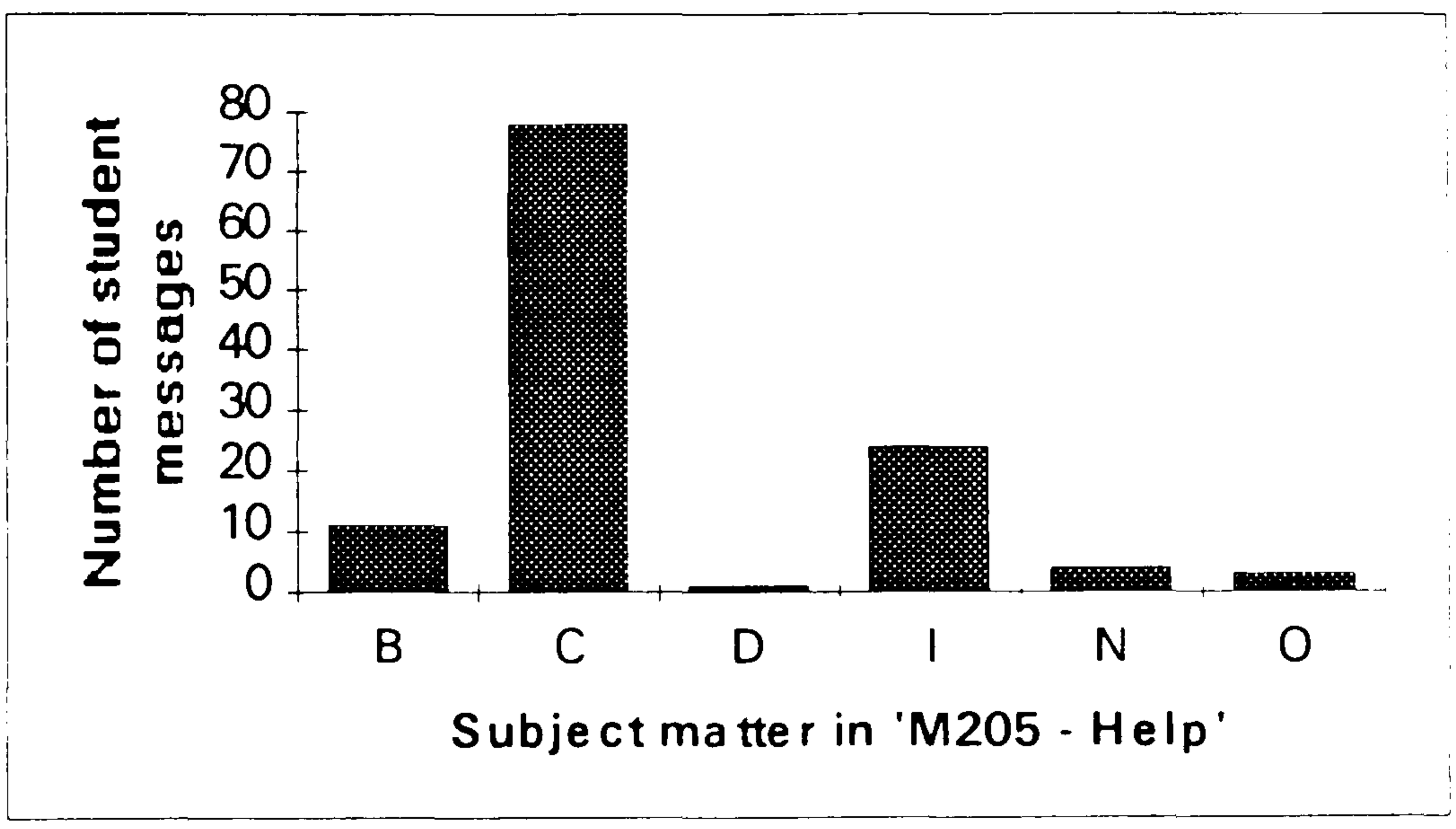
7.2.3.2 Activity in the M205 Help sub-conference

As discussed above, activity in the M205 Help sub-conference was low in the first month. However more work-related activity did become apparent after a period of one-month in the M205 Help sub-conference, as summarised in figure 7.19. For example, a student mentioned at the end of their first questionnaire (sent after one-month) *I am enjoying contacting other users, and hopefully making valid contributions*. The number of messages in the M205 Help sub-conference doubled in July as compared to the previous months. This could be explained by the fact that the students needed to submit a tutor-marked assignment by 1 August. On closer inspection of the nature of the message content in July, students were asking each other for help with respect to their assignments. This finding supports McConnell et al.'s (2000) observation that student participation was highest near the assignment due dates. Overall the subject matter of the student talk in the M205 Help sub-conference covered six categories, shown in key 7.6 and figure 7.22.

Key 7.6 The nature of the students' subject matter in the M205 Help sub-conference

B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
D. Online course material
I. Social interaction
N. Technical assistance
O. Query raised by face-to-face tutorial.

Figure 7.22 The types of message found in the M205 Help sub-conference



When the message content was analysed (see figure 7.22) the majority of messages were related to category C, Help with course work and problem solving. This is an encouraging finding since this sub-conference area had been designed to act as a problem-solving arena. These findings are an improvement on those reported by Mason (1989b) who examined messages sent to earlier versions of OU conferencing systems. She reported that 40% of messages were related to course concepts, between 13-16% on socialising and between 21 and 31% on technical and administration issues. By contrast, the majority of messages in the M205 Help sub-conference were related to students assisting one another with specific problems, which it appears, could be easily conceptualised in this medium. Students not only wanted to ask each other for help, but also wished to check the legitimacy of each other's knowledge in front of the course team and tutors. They were secure in the knowledge that the expert would step in in cases where advice from a student was misguided. Indeed one student who was comparing her interactions between those with her tutor and those with other students commented, *tutors' answers are usually more thought through and you know they are right, otherwise they wouldn't be tutors, whereas students' answers are usually less clear and come with an "I think" and "probably"*. Students' methods of filtering messages were discussed in chapter 5.

The 'Hands-on systems' learning category (B) featured in this analysis and an example of a reply in the category follows:

> 9 April
>
> *You can also save the files you want to keep to a floppy (zero the volume and then rescan volumes so you get it up in your list), then you can just delete the file off ... your user volume.*

The message below is an example of a reply from a student to a student in the category Help with course work and problem solving (C).

> 8 April
>
> *Hi Andie*
>
> *From your reply you still seem a bit confused about how to use the two arrays 'previous' and 'newreadings'. I apologise if this is not the case but if it is, then here is another hint. When you get your electricity bill at home, you get charged for the units used. That is the difference between the previous reading and the new reading.*

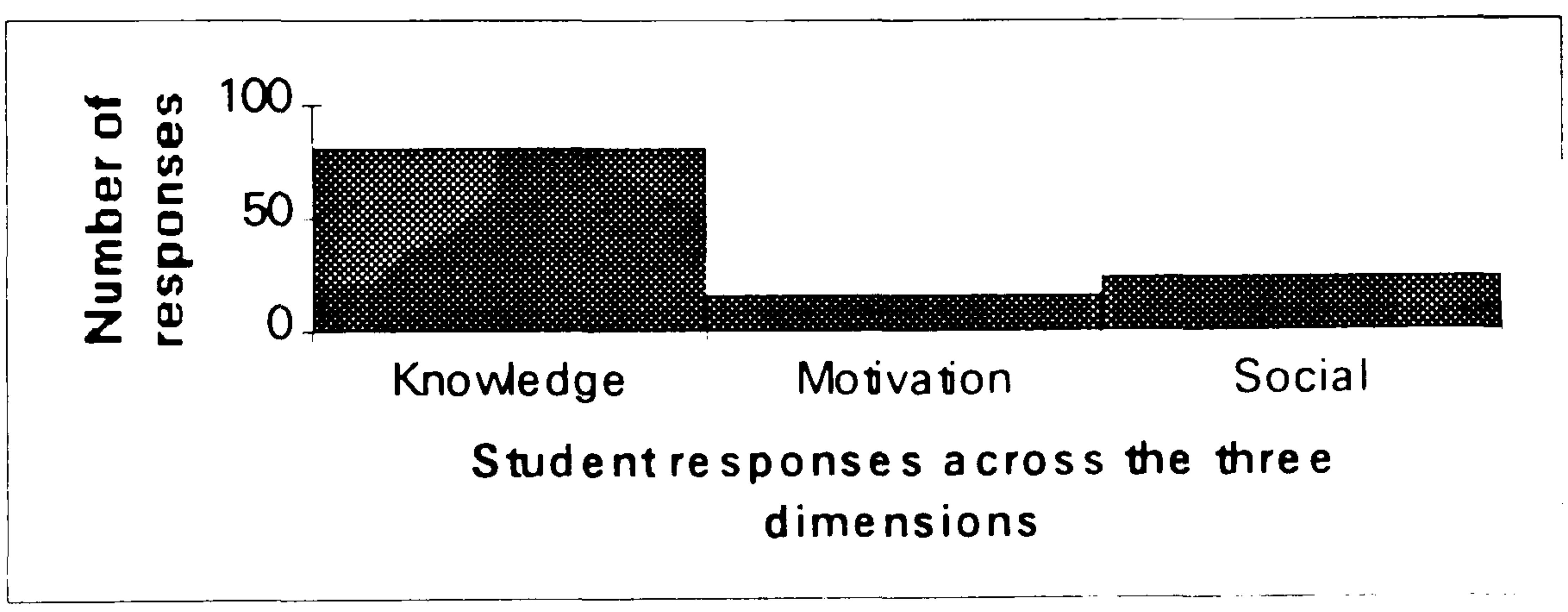
A category, which appeared here but did not appear in the Meeting Place sub-conference was Online course material (D), which had been identified in chapter 6. Interaction with the extra online materials is discussed further in section 7.3. Social messages were fairly important here and as in the case of the busiest tutorial may have helped to keep this sub-conference active throughout the year. Few of the messages could be classified under the technical assistance (N) and Query raised by face-to-face tutorial (O) categories.

The six categories of discussion in key 7.6 were further analysed to understand how they corresponded to the 'domain of discussion'. Five of the categories were also found in the busiest tutorial and corresponded to the 'domain of discussion' in the same way, see table 7.8. The additional category online course material (D), related to the motivation domain as in previous analysis in chapter 6. The importance of each of the domains is illustrated graphically in figure 7.23.

Table 7.8 The 'domain of discussion' analysis of the student discourse in the M205 Help sub-conference

Knowledge	Motivation	Socialisation
Help with course work / problem solving	'Hands-on systems' learning	Social interaction
Query raised by face-to-face tutorial	Online course material	
	Technical assistance	

Figure 7.23 The student discourse in the M205 Help sub-conference within the 'domain of discussion'



In contrast with the Meeting Place sub-conference, the social domain is much less important in the M205 Help sub-conference while the knowledge domain is more important. This fulfils the IMF's intention for this course-related sub-conference. The social domain however appears to have been important to sustain student involvement, whereas the motivation domain featured to a smaller degree. The first month was a critical period for social activity in the Meeting Place sub-conference, before the focus on course content became more important in the M205 Help sub-conference, see figures 7.18 and 7.19.

7.2.4 Comparing activity in the Meeting Place and the M205 Help sub-conferences

The type of student interaction in the two conferences was compared in more depth by an analysis with respect to the 'domain of discussion'. To aid comparisons the quantities corresponding to the 'domain of discussion' in figures 7.21 and 7.23 were converted to percentages, see table 7.9.

Table 7.9 A comparison of the student discourse in the Meeting Place and M205 Help sub-conferences in terms of the 'domain of discussion'

	Total student responses relevant to domains	Knowledge	Motivation	Socialisation
Meeting Place	120	8%	12%	80%
M205 Help	121	67%	13%	20%
% difference		59%	1%	60%

These two sub-conference areas appear to have successfully fulfilled their intended purpose as the knowledge domain was 59% more important in the M205 Help sub-conference, while the social domain was 60% more important in the Meeting Place sub-conference, see table 7.9. This met the expectations of the IMF when designing these areas.

7.2.5 Comparing activity in all four sub-conferences on a month-by-month basis

On comparison of the percentage of messages sent to each of the four sub-conferences, on a month-by-month basis, it was found that social interaction was important at the beginning and at the end of the course. During February the students were actively posting messages to the Meeting Place sub-conference, see table 7.10. In fact, students used the Meeting Place sub-conference throughout October, November and through December. Social interaction was still seen as important even after their exam, which took place on 16 October, see table 7.10.

Table 7.10 A comparison of the percentage of messages sent each month to the Meeting Place and M205 Help sub-conferences

	Number of student messages each month	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Meeting Place	120	29%	8%	6%	4%	2%	2%	2%	21%	26%
M205 Help	121	3%	11%	11%	11%	8%	20%	7%	9%	20%
% difference		26%	3%	5%	7%	6%	18%	5%	12%	6%

The students made heavy usage of the M205 Help sub-conference during October when TMA 8's submission date and their exam were approaching. The students took their exam on 16 October and that evening after the exam was completed, the last messages were posted to this conference. This suggests, therefore, that the conference met its objective as a problem-solving forum. The number of messages sent to the busiest and quietest tutorials (see figures 7.5 and 7.6) was converted to percentages to facilitate a comparison of activity in these two sub-conferences with the M205 Help and tutorial sub-conferences.

Table 7.11 A comparison of the percentage of messages sent each month to the busiest and quietest tutorials

	Number of student messages each month	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Busiest tutorial	53	24%	51%	4%	11%	4%	0	2%	2%	2%
Quietest tutorial	7	0	71%	29%	0	0	0	0	0	0
% difference		24%	20%	25%	11%	4%	0	2%	2%	2%

Students in the busiest tutorial were posting messages during February, however students in the quietest tutorial were unable to post messages as their tutor was on holiday, see table 7.11. Activity in the Busiest tutorial and the Meeting Place sub-conference was mainly social in nature during February. Activity in the quietest tutorial peaked in March when students were put in contact with their tutor, see table 7.11. During the period March to August inclusive the Meeting Place sub-conference became less important as course-related activity started to become important in the M205 Help sub-conference, see table 7.10. Also at the start of this period (during March, April and May) the Busiest and Quietest tutorials were active on course-related issues, but became less important from June onwards. These findings mirror those of McConnell et al. (2000) who reported that the level of postings dropped with time after the initial enthusiasm and not all students participated. In July, there were no messages sent to either the Busiest or Quietest tutorials but the M205 Help sub-conference was very active during July. The tutorials' importance seemed to diminish with time while the M205 Help sub-conference (where the students could interact together without message approval) appeared to become more important. During September and October both the Meeting Place and the M205 Help sub-conferences were very active. Some of the very last messages in the M205 Help sub-conference in the main study (FirstClass) were brief farewells and best of luck with the exam messages. This finding supports Mason's (1990, p.8) observation that the number of messages in the regional conference topics tailed off through the course but picked up again around the exam time when students were expressing 'pre- and post-examination tension'. However, the fact that the M205 Help and Meeting Place sub-conferences reported in this research were still active at the end of the year, is in contrast with Riedl (1989) who reported a decrease in the number of messages towards the end of the year which he suggested could be explained by the need for students to turn more of their attention to their final assignment and to revision for their exam. It could be that the conference structure assisted the bonding of the groups in the M205 Help and Meeting Place sub-conferences. Also the lack of message approval in these areas allowed students to leave more social and supportive messages throughout the duration of the course.

7.3 Students' perceptions of their use of the online course material provided in FirstClass

This section discusses the interactions related to the online course materials (D), which was also the third category, identified in the early analysis in chapter 6. In order to encourage interaction in the M205-STILE conference on FirstClass, extra online teaching materials were included that were not available elsewhere. The online course material for the first four blocks of study was made available to the students on the M205 course materials bulletin board on FirstClass in a read-only and download area. The tutors tailored these supplementary materials delivered online to the student needs, based on previous problem areas encountered by students studying the M205 course. The intention was that extra course material would stimulate discussion between the participants in the tutorial sub-conferences in FirstClass and assist understanding of the course content. Each tutor was to make a special effort to be available to answer queries about the extra material they had produced as soon as it was made available to the students. These tutors were to monitor all of the tutorial sub-conferences and interject when a misunderstanding about the extra material they had developed arose.

How did the students perceive they used and worked on these extra materials? The fifty eight students still using FirstClass at the six-month point in the presentation were asked in a questionnaire if they had used the extra course material provided online. A

73% response rate was recorded. The overwhelming majority, i.e. 76%, stated that they did use the extra materials provided in First Class. Some students made comments about their use of these extra materials:

1 The extra materials were not used as intended:

Occasionally I have browsed but not really used the material as planned.

2 Some students did use the online materials as expected to help with their TMAs:

I've used it once or twice when I've been a bit stuck with a TMA.

3 Some students decided to use the materials for revision purposes, perhaps because it tested their understanding:

a) Some of it ... I intend to use more of it for revision.

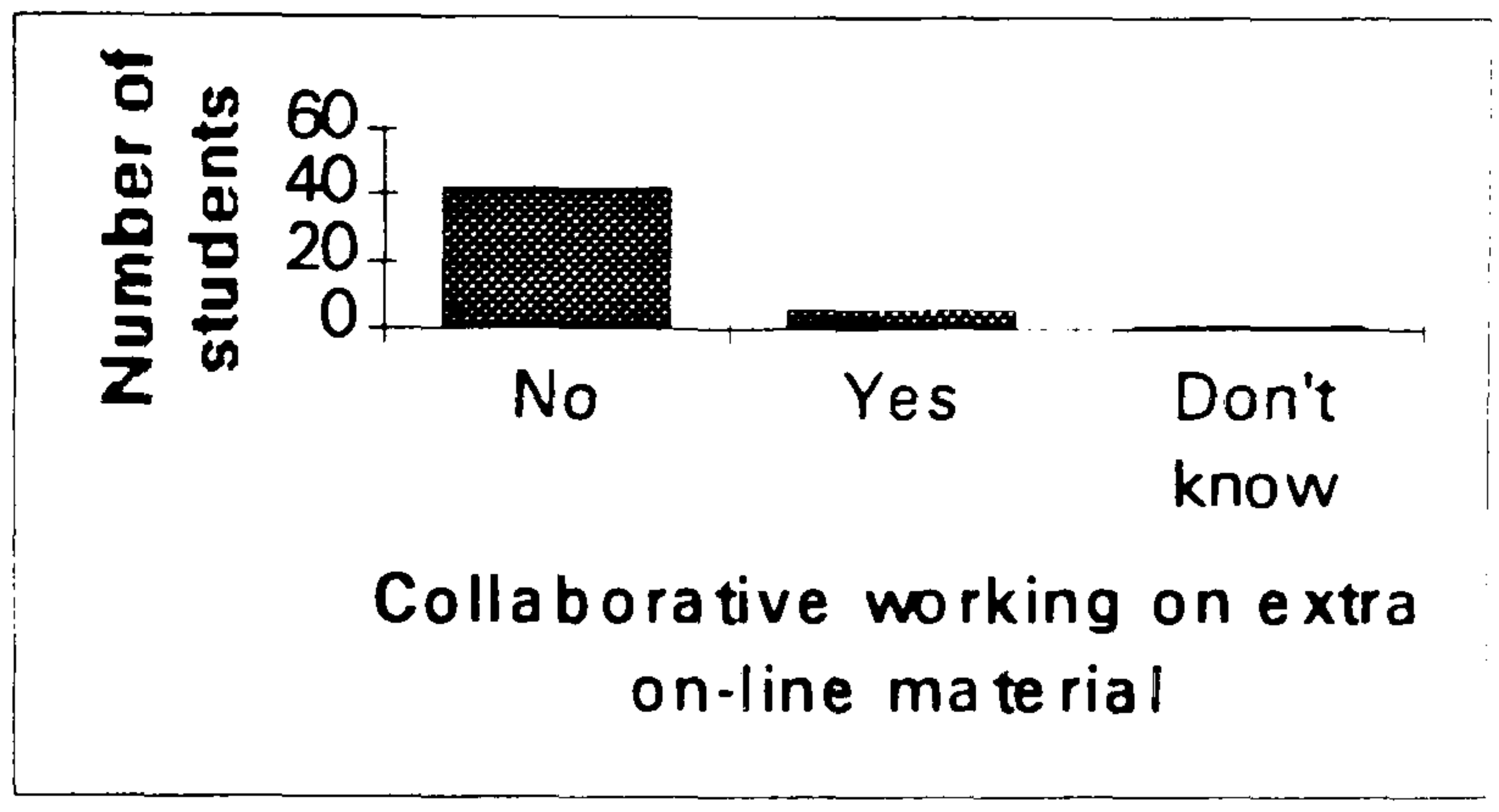
b) I intend to use the extra material more for revision for the exam.

Many students were online during the nine-month period, and the tutors reported that some were working very diligently on the extra material and asking questions online. However, it appeared in the main that students were not collaborating much on the material in the tutorial or M205 Help sub-conferences. The students appeared to have used the materials for self-learning rather than discussing them with other students as was the case with the main course content delivered through books etc. Perhaps students did not collaborate on the extra material because the time investment was too high. One student said *extra course work and group work is a very useful idea but as always the major problem is time.* While another said ... *due to restrictions on my time I feel I could not possibly commit myself to group working to a deadline.* These points were echoed by students who reported that their lack of spare time was a major factor, which affected their participation (see earlier analysis in Wilson and Whitelock (1998a)). Indeed Owen (2000) also reported that 25% of the students lacked time to collaborate with other students.

Collaboration was intended to be informal, as the use of CMC was an experimental addition to the course, which could not be made compulsory. However, it would appear that the tutors did not take an active enough role to encourage the students to work collaboratively on the extra material they had provided. In order to see how the online material was affecting group interaction via email, questionnaires were sent to the fifty-eight students who were still online at the six-month point in the presentation.

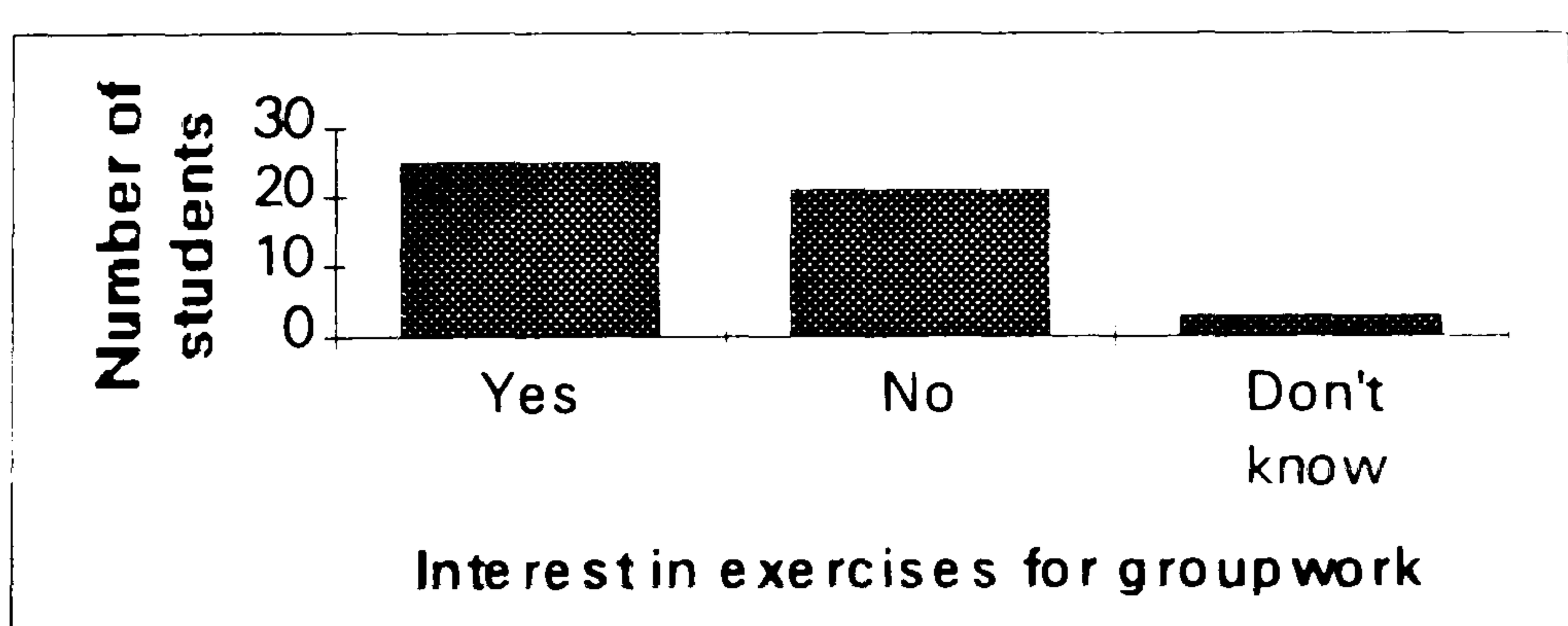
Of these, 73% responded, and in fact 12% of the students reported that they had discussed the extra material with other students via email and not in the conference forum. This was at their own instigation and they did indeed form a group, see figure 7.24. These students, without any prompting, saw how the medium could be used to collaborate together via email out of sight of the tutors.

Figure 7.24 Students who worked collaboratively on the extra material



However the overwhelming majority of students who responded, said they did not collaborate via email with other students. Perhaps the majority of students were not interested in group work. To find out if this was indeed the case, students were asked in the same questionnaire how they would react to activities that required online group work. Half of these students were predisposed to form groups, as shown in figure 7.25. This would seem to indicate that they were comfortable with their use of the system and feeling confident with one another.

Figure 7.25 Student interest in using the medium for group work



However even though half of these students replied in favour of group work, they could not see ways to work collaboratively on the extra material in the tutorial sub-conferences. Perhaps this relates to how the Open University teaches its students to be self-sufficient to a large extent in their method of learning. If this was the case, then it may be difficult to instigate collaborative projects online unless students are encouraged to participate in group work throughout their course and awarded marks for group activity. Indeed Alexander and Mason (1994 p.16) concluded from their study that 'for effective collaboration between students to occur ... they ... need structured exercises in which they get to know each other and form groups, with good staff support'. Formalised group work in the M205-STILE conference was not feasible as it would have involved more time from the students and their time investment was already high. Indeed English and Yazdani (1999) reported on a virtual reality project where students were working independently, and as a result competition for grades prevented students from working cooperatively. This could be true of this project. A selection of the students' comments follows.

1. *Although I don't especially like group work, it has been easier this year because I really have felt less isolated and more likely to ask for help than I would if we didn't have access to the FirstClass conference.*

2. *I think maybe working as a group on some work would have encouraged me to use the system more.* This and the two comments below suggest that participants could perceive benefits from group working and would use the medium more if it were made compulsory.

3. *Maybe if a project was introduced for each area to complete, this would encourage interaction as well as being a more independent and experience-gaining way to learn.*

4. ... *I think for the future maybe an element of conferencing with a team project or something would be a lot more useful for interaction.* Some students reported that they would use the system more for their next course because they had not realised how beneficial it was until the project was coming to an end.

The tutors were unaware that the students were making use of the online course materials because they could not see them collaborating on these materials in the tutorial sub-conferences. On the whole, the tutors were disappointed with their perception that the students did not work together through the extra materials provided in both environments. They had hoped to see more discussion in the tutorial and the M205 Help sub-conferences. The tutors, however, did not make it explicit that they expected the students linked together by this technology to work collaboratively on the extra material. The students themselves, without receiving instructions, may have felt that working collaboratively on the extra material was some form of cheating. It was not obvious to the tutors that students had downloaded and used the extra material on an individual basis. However Mason (1996, p.4) stated that the use of the online course materials in M205-STILE was as successful as could reasonably be expected since the materials were additional and optional.

The student responses suggest that they did find the extra online materials valuable but found it easier to work on them on a self-learning basis rather than as a group. This was an unexpected finding as the focus of the research was on online communication rather than one-alone learning where the learner does not need to communicate with the teacher or other students (Paulsen, 1997; Collins and Berge, 1994). These findings confirm that students were not used to collaborative learning and this approach was challenging for them (McConnell et al., 2000; Naidu et al., 1995). The findings are in contrast with researchers' expectations that students would interact together about content, which they call 'social activity' (Collins and Berge, 1994 and 1996; Berge, 1995 and 1996).

7.4 A synopsis of the findings related to naturally-occurring online interactions

The IMF designed the conference areas to promote work-related dialogue, to facilitate social interaction and provide motivation support. This combined 'domain of discussion' dimension promoted openness and willingness to discuss academic ideas. The findings reported in this chapter suggest that, as intended, students could obtain help with their M205 course work in the M205 Help and tutorial sub-conferences. The main social 'chit chat' took place in the Meeting Place sub-conference while the course material bulletin board motivated students to use the M205-STILE conference. Remote, rural- and urban-based students all benefited from contact with other students and their tutor.

Analysis of the busiest tutorial sub-conference illustrated five major categories of talk between students themselves and their tutor. Two of the categories were course-related, one was related to technical support, one to 'Hands-on systems' learning and one to social interaction. Indeed, social messages were the most important category, in the busiest tutorial (see section 7.2.1.1) at the start of the year when the students were establishing themselves as a group. This result supports Hasemer's (1994) findings that social interaction helped the peer group to form so that they could discuss course-related content and that chat about subjects not related to the course at all helped to strengthen the peer group atmosphere.

The busiest tutorial remained active throughout the year from February through to the exam in October while the quietest tutorial became inactive approximately one-third of the way through the course. In the busiest tutorial students sent equal numbers of messages to both their tutor and fellow students. However in the quietest tutorial, students only sent messages to their tutor. Part of the busiest tutorial group's cohesion could have been due to the students suffering from the same problem with local access numbers, early on in the course. Perhaps this feature of a problem to solve quite early in the course could be adapted in the future to help group formation. Unfortunately the tutor in the quietest tutorial was away at the start of the course. However when this tutor was available, the students only sent messages to him, not to each other. These factors could have had a bearing on why this tutorial sub-conference did not remain active beyond May, less than one-third of the way through the course. The lack of student-to-student feedback here could be a very important factor, perhaps even more so than feedback from the tutor. If the quieter tutorial had not had message approval and the students had been able to socialise as a tutorial group from the start, they might have formed a more cohesive group.

The tutor in the busiest tutorial used the same five categories of talk but in addition added messages that were aimed at encouraging participation (P). These accounted for 20% of his messages. The tutor started the discussion and interjected to stimulate and focus discussion. Indeed, from the tutor's perspective, the busiest tutorial also featured all three domains but the motivation domain was 21% higher than the knowledge domain.

From the students' perspective, the knowledge, motivation and social 'domain of discussion' were all of equal importance in sustaining activity in the Busiest tutorial. However, neither the motivation nor social domains featured in the students' messages in the quietest tutorial.

The social domain involving all participants and the motivation element introduced by the tutor were key factors to the success of the busiest tutorial. For example, a comparison of the busiest and quietest tutorials from both the tutor and student perspectives (see figures 7.9, 7.11, 7.14 and 7.16) indicates that the social and motivation domains were missing in the quietest tutorial from the students' perspective, while only the motivation domain was missing from the tutors' perspective.

The use of the message history feature in FirstClass indicated that more students were reading messages rather than generating their own messages. They said that read-only access to all tutorials enabled them to obtain enough information through shadowing other students' question and answer interactions.

Social activity among the students was more prevalent at the beginning of the course and at the end of the course. From this perspective of actual usage, social interaction appears to have been important. This is in contrast with the previous chapter where user opinion data were gathered and social interaction featured only slightly. Perhaps the students felt guilty about their social interaction and declined to mention its importance. A comparison of the Meeting Place and M205 Help sub-conferences (see figures 7.18, 7.19, 7.20 and 7.22) suggests that the critical period for the students to get to know each other and the system was one-month. Only then did they make use of the M205 Help sub-conference for their course work. Students were interacting in work-related dialogue with each other. Activity in the Meeting Place and M205 Help sub-conferences was complementary for most of the year but both conferences were busy during September and October. These two conferences fulfilled their intended roles: the Meeting Place for social activity particularly at the beginning and end of the course, and the M205 Help sub-conference for work-related dialogue, which started after one-month. The social domain was very important for the Meeting Place sub-conference while the knowledge domain was very important for the M205 Help sub-conference. This was exactly what the IMF had intended in designing these interaction spaces in the M205-STILE conference, see chapter 4. One factor related to whether the students asked for help in the M205 Help sub-conference rather than their Tutorial area could be the fact that the messages to tutorials had to be approved by the tutor before the other students could read them. The M205 Help area, on the other hand, did not require approval. For example, if a tutor did not approve messages in the tutorial sub-conference for a day or two, students were unable to help each other in the meantime and resorted to the M205 Help sub-conference instead. One student trying to get a reply as soon as possible avoided this scenario and sent her messages to the tutorial sub-conference and copied them to the M205 Help sub-conference. This raises an issue about the use of this medium and the expectation of a quick response, which is discussed further in chapter 8. Whether the message-approval feature is used or not could have a great bearing on the flow of messages. Indeed some students reported frustration in the tutorial sub-conferences when new messages were posted but not readable because they had not been approved, see chapter 5. The analysis in this chapter suggests that the students need equal proportions of the three domains of discussion in order for a tutorial sub-conference to remain active. From the tutors' perspective the social domain may be less important but the motivation domain is more important than the knowledge domain to sustain conference activity. In the case of the Meeting Place sub-conference, an area intended to support the social domain, social activity was indeed very important. Equally the M205 Help sub-conference was devised as part of the support for the knowledge domain and this was indeed the most important domain here.

The categories that were most predominant across the two tutorial sub-conferences (analysed over the first three-months) from the students' perspective were:

C. Help with course work and problem solving,

I. Social interaction

N. Technical assistance.

From the tutors' perspective the most important categories in the two tutorial sub-conferences (analysed over the first three-months) were:

C. Help with course work and problem solving,

N. Technical assistance,

P. Encouraging participation.

In the case of the Meeting Place and M205 Help sub-conferences (analysed over nine-months) the categories, which were most important from the student's perspective were:

C. Help with course work and problem solving, and

I. Social interaction

The social domain appeared much more obviously in the analysis in this chapter than in the previous chapter.

Three new categories emerged from the analysis of naturally-occurring online interactions in the four sub-conferences. These were: Technical assistance N, Query raised by face-to-face tutorial (O), and Encouraging participation (P). This meant that the overall key of category descriptions was extended, as summarised in key 7.7.

Key 7.7 The 16 overall categories resulting after analysis of naturally-occurring interactions

A. Communicating with students and tutors
B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
D. Online course material
E. Learning programming
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
G. Don't know
H. Access to the Internet
I. Social interaction
J. News and information
K. The M205 Help and Tutorial conferences
L. Revision
M. Help on other OU courses
N. Technical assistance
O. Query raised by face-to-face tutorial
P. Encouraging participation.

At this point it is useful to consider also how all fifteen categories (the 'don't know' category is dropped) correspond to the 'domain of discussion' dimension, as the allocation summarised in table 7.12 will be used in chapter 8.

Table 7.12 Allocation of the fifteen categories to the 'domain of discussion' dimension

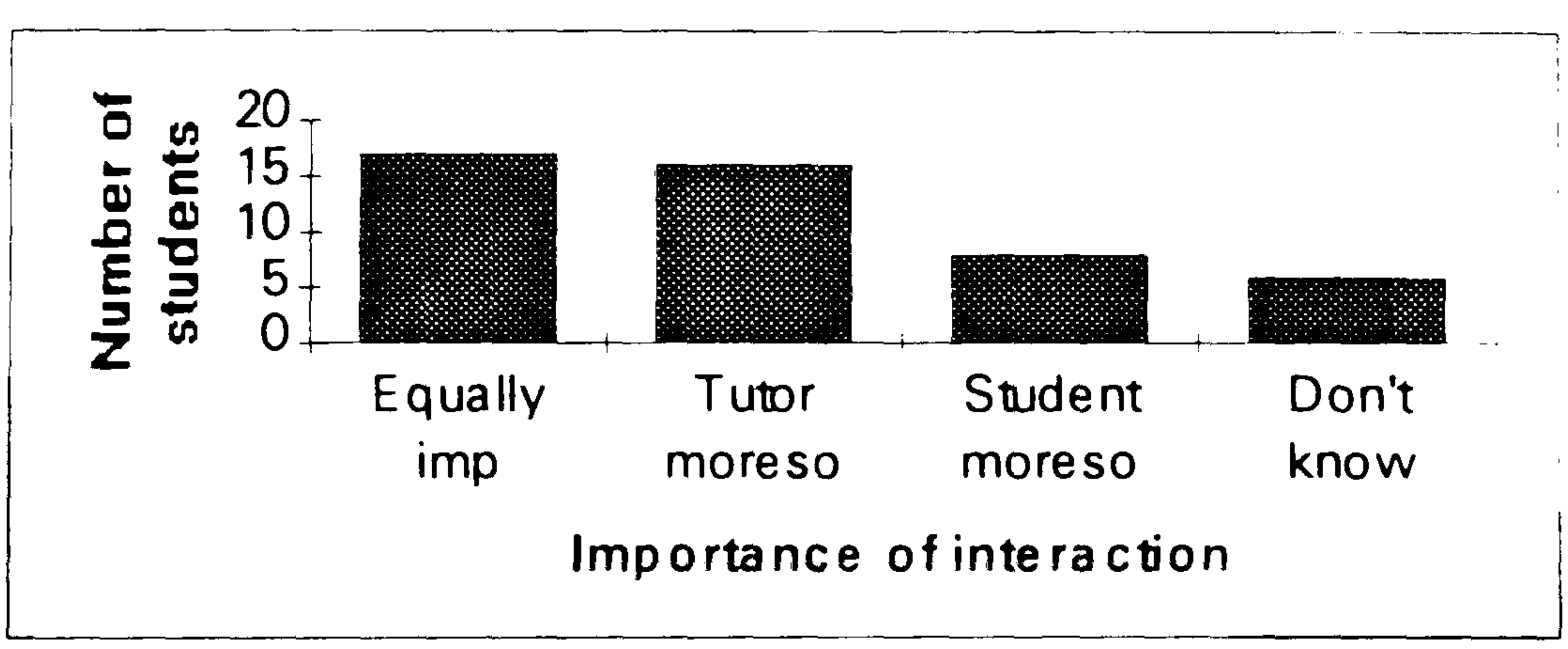
Knowledge	**Motivation**	**Socialisation**
Communicating with students and tutors.	'Hands-on systems' learning	Social interaction
Help with course work /problem solving	Online course material	
Learning programming	A preferable method of communication	
M205 Help and tutorial conferences	Access to the Internet	
Revision	News and information	
Query raised by face-to-face tutorial	Help on other OU courses	
	Technical assistance	
	Encouraging participation	

Although the extra materials were provided to encourage interaction, a high proportion of students (76%) said they used the extra materials provided in FirstClass for self-learning. Only a small percentage reported collaborating on the extra material via email. When asked about their interest in group work, 50% were in favour of this type of activity but a high proportion of these students remained to be convinced. This could be a feature of Open University study, where students are taught to be independent and didn't not realise the benefits of working on this type of material with their peers. It appeared that although the students could collaborate and were predisposed to form groups (see section 7.3) in practice they could not form a group to work on the extra material. This suggests that there was a problem with the structure of the environment. The conference for the extra material was a form of bulletin board, which was read-only, and contained a download area for each block of the course where the IMF could post the extra course work and later post solutions. There was no discussion area attached to this bulletin board and students were expected to collaborate on this material in their Tutorial or M205 Help sub-conferences. The fact that a collaborative area was not attached to the course materials conference may have inferred to the students that they should work on the material on an individual basis. In the future it would be recommended that a discussion area is attached to each block bulletin board where the tutor who prepared the online course material could engage in dialogue with the students. The extra course material on FirstClass should also be adapted in the future to take more advantage of the conferencing medium. Collaborative activity could be more integral to the course with an emphasis on group work and making the activities into an interactive game. The tutors also need to take a more active role in encouraging students to work collaboratively.

7.5 Students' and tutors' perceptions of person-to-person online interaction

The following narrative explores who the students perceived they were talking to and who was seen to be a reliable source of knowledge. As discussed above, the students in the busiest tutorial had sent equal numbers of messages to their tutor and to other students. In the quietest tutorial students directed their messages to their tutor only. However, in the more open forums of the Meeting Place and the M205 Help sub-conferences, the majority of messages were sent to other students rather than tutors. Therefore what importance did this population of students attach to dialogue about course work with their tutor as compared to this type of interaction with other students? In order to explore this issue, questionnaires were administered to the students at the seven-month point in the presentation. They were sent out online to the fifty-eight students who were still using M205-STILE; 81% of these students responded, see figure 7.26.

Figure 7.26 The importance of student interaction whether with tutor or student

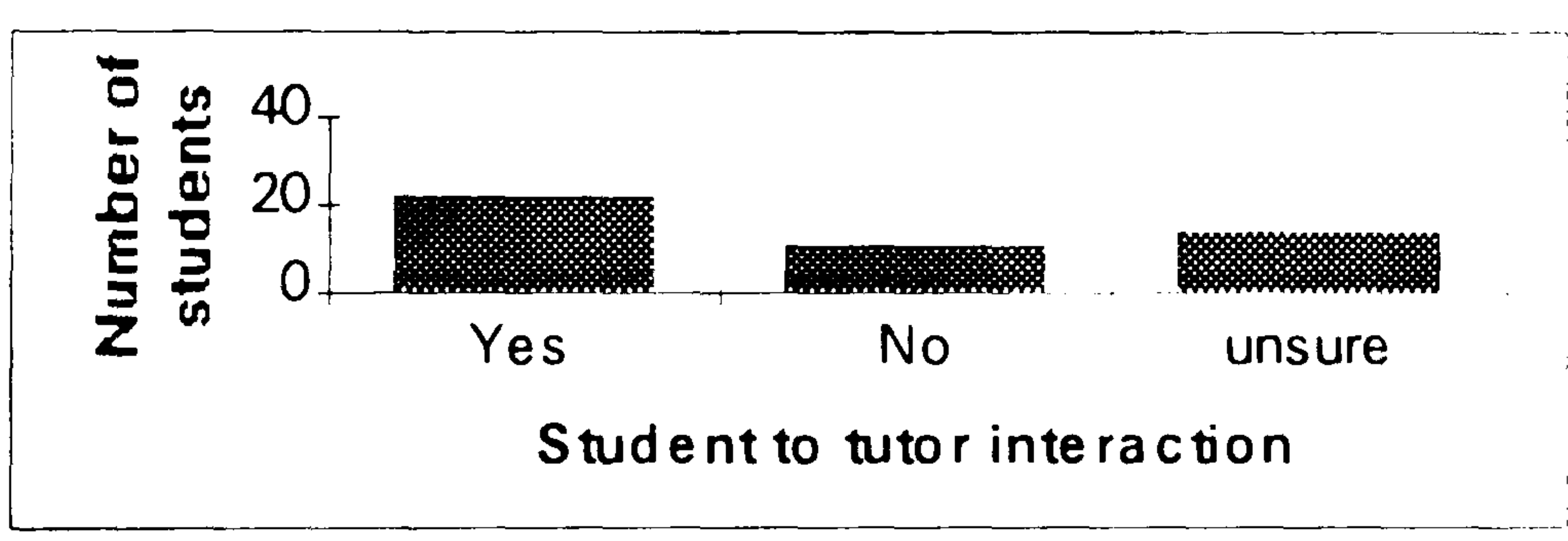


Approximately one-third of the students valued equally the interactions with both their tutor and other students. Another one-third valued the interaction with their tutor more than their interaction with other students. If this were representative of most student views, one would expect that one-third would value the interaction with other students more than interactions with the tutor. In fact one-sixth rated interaction with other students as more important, while 13% of the students could not form an opinion about whether interaction with their tutor or other students was valuable. These findings are in contrast with Selinger (1998), who reported that students were more likely to approach their peers for help rather than their mentors, their tutors or their course team. Unfortunately she does not indicate the numbers contacting each source of help. Mason (1989a), also contradicting the findings here, reported that 10% to 15% of students found their tutor helpful while 17% or 18% found other students more helpful. This suggests that the students were seen to have a better understanding of the problem. Students valued the interactions with their tutor but how did their perceived interaction with their tutor affect their learning? This will be discussed in the following section.

7.5.1 Students seeking help from their tutor

Students were asked if their online interactions with their tutor in the M205-STILE conference had helped their learning. The value they placed on this type of interaction is shown in figure 7.27.

Figure 7.27 The student to tutor interaction and effect on learning



Forty-seven per cent of the students felt that their interactions with their tutor in the M205-STILE conference had helped their learning. Four students remarked on the benefits of online interactions with their tutor. Three of these comments were related to category C, Help with the course work and problem solving. The fourth comment was related to category F, A preferable method of communication.

1. *I think it has been making the learning process more accessible.*
2. *I found the opportunity to highlight problems/errors in TMA questions back to my tutor very useful.*
3. [It was] *good to find out* [from the tutor] *why I went wrong in some places.*
4. *It has been very useful to make queries and submit examples extra work in ways that I wouldn't have done without FirstClass.*

The fact that half of the students were either unsure of or could not see a benefit from their interactions with their tutor (groups 'no' and 'unsure' in figure 7.27 taken together) merits further investigation. Perhaps some students were self-sufficient and did not need support from their tutor. Indeed one student reported not needing *much in the way of advice on the course, but knowing that it was there if needed was a comfort.* Some students reported that the slowness of response had deterred them from seeking help. They felt that the tutor's perception of their problem was from an expert's perspective and therefore not always helpful. *The tutor always seems to get the wrong end of the stick, whereas the students are doing the work at the same time and seem to understand the questions you ask.* Indeed, some remote students felt *we only have each other to depend upon.* The ability to shadow other students may also have been an incentive to continue to use the online system.

In addition to the online facilities, the students could contact their tutor through the traditional methods of the telephone or surface mail. They used whatever method of contact was best for them. An urban-based student alluded to this fact, saying *if I needed help from my tutor I still went direct by phone. I accept that this is a failure on my part to get the most out of the technology. Changes like this will inevitably take time.* This comment highlights the importance of having confidence in the system and, if it is perceived that it will take some time to receive an answer online that students will resort to using another method. In effect, this student wanted at times to have the facility to use synchronous communication rather than asynchronous communication.

Some urban-based M205-STILE students found that online interaction with their tutor and other students provided supplementary help with their learning in between face-to-face tutorials.

1. *I have been able to ask questions when I got stuck and not have to wait until the next tutorial. I have also received answers more quickly than before.*
2. *Answers to questions were available even when no tutorial was scheduled or I was unable to get to tutorials.*

In some cases interaction with their tutor online was a substitute for face-to-face tutorials, which students could virtually attend.

3. *I never attended tutorials. My tutor ... posted his tutorial notes and I could download them. I could also download anything of interest from the other tutors, so I found M205-STILE quite useful.* This comment reiterates the value of multiple perspectives on problems, from a variety of tutors' view points.
4. *As I missed tutorials my tutor put notes on FC which was great.*

These comments reiterate Naidu et al.'s (1995, p.69) suggestion that 'students enjoyed the opportunity to interact with their peers in an ongoing manner without being constrained by the hours of a lecture and tutorial session'. The students reported getting more 'involved' in their study.

Most of the remotely-based students did not have face-to-face tutorials. They found the M205-STILE conference provided a lifeline through which they could interact with their tutor to sort out their problems efficiently. One said, *I find that when I have a problem I can leave a message for my tutor to read at her convenience. I feel that telephone tutoring is largely a waste of time. This is due to the fact that it is difficult to explain a programming problem over the telephone and answers have to be hastily scribbled down lest they be forgot. M205-STILE provides me with a considered, written response at the tutor's convenience.* This student found that working online proved a preferable way to discuss program code. Another remotely-based student echoed this point, saying, *I would have otherwise had to write to my tutor and then wait a week at the minimum for a reply. With M205-STILE I got answers to my questions very promptly - very important if you are stuck and time is short.* These remotely-based students found that the speed of response from their tutor in M205-STILE was good. All of these issues are discussed further in chapter 8.

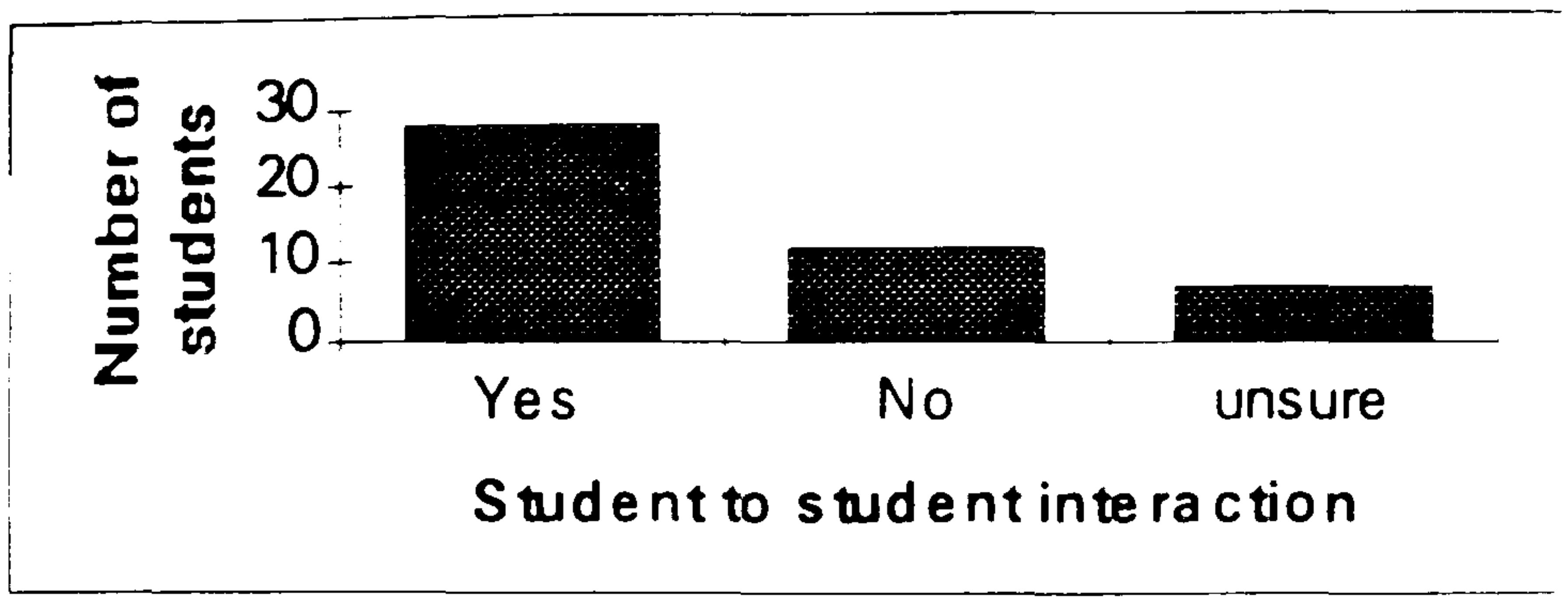
However some remotely-based students were unsure whether interaction with their tutor had helped their learning at all, and others were unsure how beneficial it was to have online interactions with their tutor. Remote students in a tutorial group different to that mentioned above felt that they did not interact with their tutor at all. They felt that the tutor *is still a very abstract person who marks my TMAs*. Another student stated that *interactions between our tutor and ... us ... don't exist!! We are on our own*. A third remote student echoed this point, saying *there were a couple of occasions when I initiated questions to my tutor. On the first occasion there was no answer for more than two weeks, when another student trivialised the subject. The second question had not been answered by the time the exam came, so its point was lost.'* These comments appear to explain why some students did not know or were unsure if their tutor had helped with their learning. These comments show that the students find the tutors' speed of response important and this should be emphasised in training sessions with tutors.

These reactions from students who did not have face-to-face tutorials highlight the importance of the tutors' online relationship with their students. How crucial their input and presence on the system needs to be to assist with student learning. This also suggests that tutors of remote students in particular need to convey a warm approachable personality and need to be available and able to respond quickly to problems and queries.

7.5.2 Students seeking help from other students

In traditional distance teaching at the OU, the student has been directed to contact their tutor for help. With the provision of online facilities, students could also seek help from each other. To ascertain if they approached other students, they were asked in a questionnaire if their interactions with their fellow students in the M205-STILE conference had helped their learning. The questionnaires were sent out online to the fifty-eight students who were still online; 81% of these students responded, see figure 7.28.

Figure 7.28 The student-to-student interaction and effect on learning



Sixty per cent of students who responded felt that their online interactions with other students had an impact on their learning. A comparison of the results in figures 7.27 and 7.28 shows that 13% more students felt their interactions with their fellow students helped their learning as compared to their interactions with their tutor. This suggests that the student-to-student relationship is very important. The students reported that their interactions with fellow students assisted their understanding of the course because they proceeded through the course at a similar rate and approached problems from a similar point of view, that is, the novice. They could appreciate each other's difficulties and hence felt comfortable asking each other for help. Naidu et al. (1995) suggested that CMC environments shift the responsibility for learning onto the students and that they must learn to drive it for themselves rather than depend on the instructor. The findings in this thesis suggest that many of these students have already come to this conclusion, especially if they felt their tutor did not meet their expectations with regard to speed of response.

Students benefited from being able to select like-minded peers without the usual geographic limitations of their own tutorial group. This meant that they were not restricted in terms of who they could work with and they could set up small groups online which spanned the United Kingdom and Europe. For example, an urban-based student made the following comment: *one thing it does do is to improve the quality of life and certainly has helped me 'meet' other kindred brethren. For me the programme has been an unqualified success.* This point was reiterated by a student who liked to be able *to have contact with students outside* [his] *group (even outside the country!).* One of the face-to-face tutorial groups was reported as not having been very active but the provision of the online facilities provided a source of support. *I've had more to do with others in the conference than with people I meet with every so* *often*. Another student appreciated help *on a number of occasions ... from people* [whom he] *would not have come into contact with otherwise*. A student who was house bound said *yes, it's good to read about the parts you understand and there is usually someone around to give a speedy reply to the parts you have problems with.*

Students mentioned meeting like-minded colleagues and seeking help but students also found *a perverse sort of pleasure from helping other people in trouble*. For example this latter student (based in an urban area) found the preparation of responses offline forced him to think the problem through before he could put his response into a message to help a fellow student. Answering these questions gave him time to reflect about his own understanding of the domain rather than just assuming he understood it. Mason (2001) would describe this activity as being 'related to deep-level learning and the development of critical thinking'.

Students based remotely were also able to make use of the facilities to find and work with other colleagues. For example, one student who lived in the Highlands and Islands of Scotland, said *thanks for putting me on your list. I've already chatted with someone in Cumbria. This is great!* The provision of the online facilities enabled remotely-based students to get in touch with other students on the mainland, which they would not have been able to do in previous presentations of the course. Comments from students suggested that this communication lessened their sense of isolation. The following two examples from two European students illustrate this point:

1. *Being in Austria this is about the only way to have contact with other students ... This year there is one other student in Austria and apart from talking to him on STILE, we will probably not meet until the exam ... I just do not have time to use a whole day 'travelling' to discuss two or three questions, and here it is possible in a few short correspondences.*

2. *The STILE project offers an invaluable chance for us to talk to each other, swap ideas, talk about problems and generally not feel isolated. This is certainly a great benefit for those of us who are studying from outside the UK. In fact all OU students in Europe should be able to use such a facility. TMAs get there on*

time instead of being at the mercy of a European postal system that is frequently on strike.

A student who never attended a face-to-face tutorial because she lived remotely, felt comfortable asking her tutor for help but found it more difficult to ask other students for help. However, she reported benefiting from shadowing the interactions of other students. She commented *I must confess that I hardly ever address other students. I do, however, do a considerable amount of "lurking" - I read the messages that other students put on M205-STILE, particularly those which might help solve problems I am having at the ... time. I have found this of great use.'* Another remote student enjoyed the social online interaction but felt that the course work was for her to deal with on her own. She said *I've enjoyed the contact with other students, but my character is such that my problems are my own, and not to be shared.* This is in contrast with most students who appeared to be reassured when their problems highlighted common difficulties. They could measure their understanding of the subject against other students through seeing what problems were being encountered. They were also able to overcome the feeling of isolation, and the remote students especially were able to feel part of a group. They were *able to discuss any problems or ask for assistance.*

Remotely-based students benefited from contact with their tutor through:

- a new means of communication,
- a better way to discuss program code than the telephone and ordinary mail,
- a quicker response from their tutor,
- a more tailored response from their tutor.

Urban-based students benefited from contact with their tutor through:

- online interaction in between face-to-face tutorials,
- substitution of face-to-face tutorials.

The students in general benefited from interaction with their peers through being able to understand explanations of the problems they encountered at the same time. Remotely-based students benefited from interaction with other students through:

- selecting like-minded colleagues,
- being less isolated,
- shadowing activity,
- measuring their understanding of the subject against other students.

Urban-based students benefited from interaction with other students through:

- selecting like-minded colleagues,
- getting help,
- a quick response from other students,
- helping other students and reflecting on their understanding.

It was interesting, however, that when the students were asked how they valued their interactions (see figure 7.26) with their tutor as against other students, they perceived the tutor as more important. Why this might be the case is followed up in interviews in the next section.

7.5.3 Indepth responses from students about their interactions with tutors and their peers

Some students were also contacted about these issues through indepth interviews, six-months into the course, and then again at the eight-month point. At the six-month interval, the five students in group two (see chapter 3) were asked whether they had enough course work support from their tutor within the M205-STILE conference. Four of the five students agreed that they had good support from their tutor within the M205-STILE conference, which is summarised in table 7.13. The remote student said *Oh yes, in fact it's better*. The type of support they received was reported as *very good, very proactive ... you get a reply within a week and really at the end of the day, ... it's not urgent questions that you need answering but information which you think might be useful.* This remote student is stressing the importance of the quality of the response rather than the need for a rapid response. The student who did not have good support online from her tutor could not say why but did emphasise that her tutor was excellent at face-to-face tutorials and when using the telephone. This highlights the need for tutors to have time to adjust to this online medium and the best way to use it for learning and teaching.

These students were also asked if they had much help with course work from other students. The five students agreed that other students helped them to varying degrees, see table 7.13. They reported that they were more likely to watch the question-and-answer sessions rather than ask directly for help. *What I have done is ... to browse through and very often there's been questions that other people have been stuck on and I've looked at how they've managed to get round the problems.* This appears to confirm that students benefited from shadowing other students.

Table 7.13 Course work support and the importance of contact with tutors or students

	Tutor	**Students**	**Both tutor and students**
At six-months	4/5 had good support from their tutor	5/5 had good support from students	
At eight-months	3/5 reported contact with the tutor was more important	1/5 reported contact with students was more important	1/5 reported contact with both was equally important

When the students were asked (at eight-months) which was more important, contact with students or with tutors, three of the five students responded that contact with the tutor was more important, see table 7.13. The remote student explained *it's contact with my tutor. ... When I started M205, I had terrible trouble trying to explain things to my tutor over the telephone. And very often I needed an answer to things within a day or two, it's not really any use to wait for four days for the post ... So to my mind it's better for me to have tutorial support and that's what M205-STILE has given me, because I can get that answer within a short space of time.* The M205 Help sub-conference was cited as a good place to post queries that other students would answer. The fourth student preferred contact with other students. He said *I think the contact with students is probably more important. ... Your primary help has got to be the tutor via the phone, you know, you get an instant answer when you're stuck ... I think the STILE project has been like a back-up, secondary help and sort of ... tends to spawn ideas a bit. You have a look at the way other people are doing it and you think, 'Yes, I'll have a go at that'. It's really ... virtually like, a ten-week summer school.* The fifth student rated contact with tutors or students of equal importance. Between the six- and eight-month points the importance of the tutors stayed fairly similar (four out of five as compared to three out of five), whereas the importance of the other students dropped in the same period from five out of five to one out of five. Perhaps the course became more difficult after the six-month point and students were unable to help each other.

7.5.3.1 Student-to-student interactions

In order to find out if help from other students was reciprocated, an investigation was undertaken to find out if these students perceived that they had helped other students. Three of the five students in group three were unsure whether they had been of help to other students. They felt that they had not helped other students because they had not asked questions themselves and received responses that would have helped other students. The fourth student was definite that she had not helped other students. However the fifth student was aware that he had helped other students. He said, *Yes ... I tend to put stuff on STILE that is of relevance to other people ... It sounds arrogant to say but I find I tend to be helping people more than they help me. Because I've done a fair bit of it before. It's good fun because even if you're helping other people you're still learning and even if you come across problems which you think "Oh, yeah, I remember that" and you have to jog your memory. So it is a form of revision for me, I suppose.* He had a chance to reflect and because of the nature of CMC and having to use text he was forced to focus his mind to really think through the problem rather than just believe he understood it. This finding provides further evidence for Naidu et al.'s (1995) assertion that learners were forced to think through their ideas and comments a lot more clearly before broadcasting these online This formulation of responses to one's peers are important cognitive skills (Harasim, 1989).

The four students in group three (see chapter 3) were consulted at the eight-month interval in the course about the type of interactions they had with other students on the course. Two students admitted to not having many interactions with other students: *I don't actually communicate that much with other students to be honest.* These two students appeared to be shadowing the interactions of other students. Meanwhile the other two students saw the interaction as *helping each other*. This involved *quite a lot* *of social chat ... as well as some serious stuff ... which has been interesting.* This latter comment reiterates the findings from the busiest tutorial where the social domain had almost equal importance with the knowledge domain. As mentioned earlier in this chapter, a critical mass of students is not the only factor that affects the number of messages posted to a conference. These comments suggest that in order for a sub-conference such as a tutorial to remain active, it needs a balance of different types of students. There should be enough students to post messages of interest to others, balanced with a small number of students who like to shadow the activity of their peers.

In an unsolicited comment, a student mentioned her difficulty acclimatising to the online culture in terms of both socialising and working. *Although I have indicated great interest in using STILE to help with my study. I find it quite easy to forget that the two are related! Perhaps this is just an early impression since I've only done one of the additional question sheets, and most of the chat so far seems to have been unrelated to M205 - anyway we shall see.* To see if this was the case for other students, the four students in group three still involved in the interviews at the seven-month point were consulted. They were asked if they had sent much email and whether the content of the email had been related to course work or socialising. Three of the students reported that they used email on M205-STILE for course work purposes. *If somebody has left a message in the conference, you can reply to them and the conference so that if somebody else is trying to follow the thread through, to look for an answer ... then it's there.* This student wanted to enable other students to shadow her interactions. The fourth student said he used it for both purposes. *Yes. Just look at the phone bill ... Goodness knows how many hours I've logged on now, I've sent a phenomenal amount. A lot of it's just fun. I've made a lot of friends ... with regard to other courses, I'm doing a ... course on 246 as well, so I've actually linked into people on there. ... It's pretty good. The work is perhaps about 50%, the rest is just general chat.* This latter comment again emphasises the equal importance of the social domain with the knowledge domain.

Three of the four students interviewed felt that the subject matter of their online interactions related to course work only and were not social to any degree. Only one student referred to both course-related and social interaction. In a follow-up interview, two of these students admitted that they did not interact much with other students but shadowed other students' activities, while two students reported being involved in both social and work-related activity.

The students interviewed felt that they got good support from their tutor and other students. The latter benefit was mainly reported as the ability to shadow other students. These students in the main did not feel that they had helped others, because they did not ask questions themselves and therefore other students were not able to benefit from shadowing responses to their questions. At six-months, four out of five students reported good support from their tutor while five out of five reported good support from other students. However at the eight-month point, three out of the five students interviewed felt that interactions with the tutor were more important when compared with interactions with students. This reiterates the questionnaire responses where contact with the tutor was rated more highly than contact with other students. The students' perception was that the tutor was more important, even though they gained more from contact with other students.

The person from whom the student seeks help appears to vary. For example, English and Yazdani (1999) found that students, when problem solving, first tried the problem on their own, and then sought help from a friend. This was followed by asking a more knowledgeable person before the tutor was approached for help. By contrast, Stansfield (2000), an OU student, said that when she hit a problem early in the course and her tutor was not available, she lacked confidence to phone a fellow student. She felt less anxious about posting a query in a FirstClass conference and received the assistance she needed within a few hours.

7.6 Tutors' perceptions of their online interactions with students

To complete the picture of the types of interaction taking place in the M205-STILE conference, the eight tutors who attended the debriefing meeting were asked about their perceptions of online interaction. Tutor 'A' felt *it was very successful because it meant that students had access to other people's expertise ... There was mutual support and access to other tutors.* Tutor 'D' said *I think overall it has been a very* *good experience for everyone*. (All tutors were in agreement). Tutor 'B' was *very keen on being able to talk to them online and getting them to throw bits of PASCAL that weren't working at me*. Tutor 'A' *found that where the project helped, was in things like those that come up at tutorial, like ambiguity and questions*. Tutor 'G' commented *all the students who continued with the course and were on M205-STILE did relatively well, they weren't my top students but they did relatively well. I'm not sure how much of that is due to self-selection, perhaps they were more capable students.* This issue relates to assessment, which is discussed as part of the next chapter.

Tutor 'D' commented on how a student's query could be posted to many students. *I had one student who posted a message to my mail box rather than the conference and I asked his permission to forward it to the tutorial conference because the interchange made a useful point, so if other students saw ... it, they might realise that other people have the same problems.*

The tutors generally agreed that *the students could send us more code, ... that was good because it meant you could actually check a program*. It was a convenient replacement for the telephone because it made program code more visible. It enabled students to express their difficulty at the time they experienced it and allowed the tutors to respond at a time convenient to them. Tutor 'D' said *for certain types of questions you don't want to bother the tutor, they don't want to phone in case it is an intrusion ... What I am saying is that, leaving a message for the student is much easier to do, because they feel they are not being so intrusive*. Tutor 'B' also commented on the asynchronous nature of the medium. *One of my students quite evidently works after midnight and I would be quite ratty if she rang me at two o'clock in the morning. She felt she could ask the question at the instant when it bothers her so that's the nice thing rather than waiting.*' Tutor 'C' however made the point that *if ... a cut-off date was looming then it is so much easier to pick up the phone ... They would have to be reasonably organised, far enough ahead to be able to wait for a reply*. This suggests that if students wanted an immediate response, they resorted to the telephone.

Tutor 'D' discussed how the medium allowed him to pause for reflection before responding to a query. *It also gives you time to actually think about the answer and maybe go and look it up ... It's a hassle-free way of performing. ... If I have to produce an answer to a question, then I might want to add a chunk of material, the general principle is that if you have a body of material there, then you can pick out a paragraph that answers the question.* This comment relates to that of the student who said that preparing responses offline encouraged him to reflect on his understanding.

Tutors expressed surprise at the apparent higher use of the system towards the end of the course and Tutor 'D' commented *I think the most interesting discussions I have seen have been the post-exam discussions where they are all hyped up and there are lots of interesting things flying backwards and forwards.*

The tutors' impression was that students based in urban regions who could attend face-to-face tutorials did benefit from CMC but they preferred face-to-face tutorials. Tutor 'A', most of whose students had both face-to-face tutorials and the CMC environment, commented *I have lots of face-to-face tutorials as well, so FirstClass was very much a back up as opposed to an instead of, and I think that makes a difference to the way my students used it ... I put a lot of extra work in the conference tutorial and it meant that they had a chance to look at it before they brought it along to the face-to-face tutorial ... I think that the students felt that the face-to-face contact was more important than FirstClass because there was always a reasonable attendance at the face-to-face tutorial.* This comment suggests that the tutors' impression was that students liked innovation but also liked to retain the traditional method of contact at face-to-face tutorials. The tutors' and students' opinions on online versus face-to-face tutorials is discussed in more detail in chapter 8.

Tutor 'G' felt that M205-STILE did not help one of his weaker students. *One student struggled a lot and I tried in face-to-face tutorials and even arranged an extra tutorial for him and another student who was having trouble and they both dropped out. The other student wasn't on STILE. Both were having a similar level of difficulty. M205-STILE certainly did not help this student in any way.* Tutor 'F' disagreed, saying *I have a strong feeling that the weaker students may have benefited from it.*

There were other students who were not part of the project group and the sort of questions ... from them could have been handled a lot better if they had been able to send them to me. Tutor 'G' responded *certainly I had problems with some students in particular that could have been solved better if those particular students had been on M205-STILE. Problems ... were difficult to solve over the telephone, for example dictating a computer program.*

Remote students benefited from CMC. For example, tutor 'B' commented *I only have one live tutorial in the course of the year; I tend not to see my students. So my main contact with some of them was via FirstClass and certainly in that sense I am very enthusiastic about it ... I had one student interested in taking part based in Orkney so I haven't seen her this year at all but I met her once last year. She dropped out last year and she's really come on wonderfully this year; she was struggling last year but it's difficult to say to what extent it's been because she was repeating the year and to what extent because of FirstClass. She was making very good use of FirstClass. When she was having problems she was sending a bit of code and saying what is wrong with this, so that was super.* This tutor was expressing the opinion that the way in which students learn is a complex issue and that it is difficult to be sure how the students benefit by FirstClass. However the above quote also illustrates how an email and conferencing system can act as a substitute form of tutorial for students in isolated areas where face-to-face tutorials are not available.

The tutors were very positive about the pedagogical possibilities presented by this medium. They sighted the support they could give to students and the help that students gave to each other. The tutors felt that:

- one message could be read by many students,
- ambiguity and questions could be dealt with online,
- the students could send program code electronically,
- the medium was time independent,
- the students could send a message when a problem arose,
- the tutors had time to reflect before making a response,
- students who used M205-STILE for the duration of their course did relatively well.

Students were keen to use a similar conference to the M205-STILE conference for their future courses. Indeed 85% of respondents wanted to continue using this medium and this is discussed in Wilson and Whitelock (1999).

7.7 Synopsis of the findings related to student and tutor perceptions of person-to-person online interaction

The students themselves rated the medium highly in pedagogical terms because of the quality of tutor responses and the amount of interaction with other students. Indeed Mason (1996), commenting on the M205-STILE conference, stated that she found in 'interviews with students ... that it was the opportunity to interact with tutors and other students which proved most valuable' about the project. A higher proportion of students rated their online interactions with their tutors as more important than with other students. However, when they were asked who helped them more with their learning, 13% more felt that their interactions with other students were more valuable than interactions with their tutor. The student responses in indepth interviews at six-months reconfirmed those from questionnaires. The students' perception was that the contact with their tutors was more important but in reality (five out of five) students felt they got good support from students as compared to (four out of five) confiming better support from their tutors. However, at the eight-month point the same five students rated contact with the tutor as still almost as important (3/5) as at the six-month point, while help from students was rated at much less (1/5). A factor related to the importance placed on interaction between tutors and students could have been how quickly the tutors responded to queries as compared to students. Indeed one group of remote students felt that their tutor was not really available to them, because they did not respond quickly enough. Also students were trying to understand the course materials from a similar stand point to their peers rather than the tutor who was an expert, and this could have had a bearing on this response. Perhaps those students who asked questions were those who rated the tutor's input as more important while those students who shadowed other students rated these interactions more highly because they could learn from their peers' interactions.

Some students had an expectation of using the system without having to communicate with others. This suggests that they need to be able to build up a rapport with other students before they are in a position to ask for help with their course work. The FirstClass system did not provide the facilities to allow aural or visual feedback. This raised important points about how one perceives oneself and how personality is conveyed in such circumstances. One student described her perception of herself online as follows: *I am surprised to find myself a bit shy and paranoid in fact. (Not being particularly so in real life.) Although it's true that I never provoke interactions with strangers (city life?).* To other people this student was a real live wire online, constantly trying to cajole her colleagues into participating more.

These findings do not support those of Nixon and Salmon (1995), whose premise was that without the usual non-verbal and face-to-face cues of speech, problems might arise when trying to keep the discussion going. In the M205-STILE conference students themselves initiated various activities online, such as offering each other the latest screen saver and offering the latest computer peripherals for sale. These types of interactions suggest that the students found online working fun.

This chapter highlights the need to get the students to take full advantage of the medium. The development of group activities and expert users drawing in the novices may help later in the year, to promote more activity in areas like the tutorial sub-conferences. The students who were reading messages just needed to be encouraged to join in.

The students found the online medium more beneficial than the telephone to sort out difficulties. They found that:

1. tutors could answer questions in their own time,
2. tutors could give a more considered response,
3. students didn't have to scribble down responses about their program code and could concentrate on the errors in their code,
4. remote students were put in better contact with their tutor and other students,
5. those who could not attend face-to-face tutorials were able to download their tutor's notes instead,
6. those who could attend tutorials were also able to find like-minded peers in other areas of the United Kingdom and in Europe,

7. students who chose to help others had time to reflect on their own understanding before making a response.

Students who did not have the confidence to post their own messages were able to use the system to aid their learning by following the interactions of other students who experienced similar difficulties. In effect, they were shadowing other students' questions and answers to guide their learning. CMC was good for remote students as a replacement for face-to-face tutorials. However, for students with less ability the added technology could have been an extra burden if they were not very computer literate.

The tutors were very positive about their online interactions with their students. They felt that remotely-based students benefited from improved communication with their tutor while students based in urban and rural areas could download notes in advance of a face-to-face tutorial. They saw the benefits of the system as:

1. only having to answer a question once,
2. having more time to respond,
3. responses being read by many students,
4. students interacting with each other,
5. students sending program code electronically.

The tutors commented that students benefited from M205-STILE but for different reasons, depending on their circumstances. The remote students had better contact with their tutor and other students through the M205-STILE conference, as it acted as a replacement for face-to-face tutorials. Students who could attend traditional face-to-face tutorials used M205-STILE as supplementary contact. Students who worked away from home or travelled with their job were able to download notes and catch up on what they had missed.

7.8 Conclusions

This chapter has continued to address the second research question, which investigates the benefits of CMC structure. The focus has again been on the main study (FirstClass). Three of the four categories identified in the first phase of the analysis in chapter 6 were examined in more depth in this chapter.

The three categories discussed here were:

A. Communicating with students and tutors,

C. Help with course work and problem solving,

D. Online course material.

An approach influenced by grounded theory was used in the first part of the chapter to undertake categorical analysis of naturally-occurring interactions in four sub-conference areas. This provided information on the actual interactions taking place online. It was important to identify who the students were talking to and the subject matter of their conversations. The second part of the chapter used the same approach but focused on user opinions to ascertain student and tutor perceptions of whom they were interacting with and whether contact with other students or tutors was more beneficial.

The results reported in this chapter cast light on how improved understanding of the domain is possible through interaction with tutors, other students and course materials, in a well-structured CMC environment. The CMC environment provided pedagogical advantages because of the interactivity it provided and the communication it afforded with other students, which helped with problem solving. Indeed both students and tutors reported that the preparation of responses offline gave them time to reflect about their own understanding of the domain. The fourth category, A preferable method of communication (F), identified in the first phase of the analysis refers to the methods of communication used. The next chapter looks at this fourth category identified in chapter 6, by investigating the benefits students gained from the CMC as compared to conventional methods of distance teaching.

Chapter 8: Comparing the CMC with conventional methods of teaching at a distance

8.1 Introduction

This chapter again explores the benefits of structure, in the context of conferences used for participant interaction. The fourth category identified in chapter 6, a preferable method of communication (F), is investigated in more depth here through a comparison with traditional forms of distance teaching. The comparison is between the use of FirstClass and the traditional methods of communication used, namely face-to-face tutorials, telephone and ordinary mail. The findings present instances where the online medium was preferred to the traditional presentation of the course and vice versa. This chapter again probes the second research question:

- What benefits do students accrue from a computer conferencing environment which is structured to provide access to 'online course-related content'?

In fact students were asked a series of questions related to how they used the M205-STILE conference as compared to the traditional distance learning methods available to them. A range of empirical findings are presented in order to discuss:

1. the benefits provided by the main study (FirstClass),
2. how the students perceived their tutorial sub-conferences as compared to their face-to-face tutorials.
3. a comparison of online study with conventional distance teaching methods, that is:
   - online conferencing versus face-to-face tutorials,
   - email versus telephone /ordinary mail,
   - the preferred method to discuss program code,
   - online versus conventional assignment and exam performance,
4. a comparison of the tutors' traditional teaching approaches with that adopted in the M205-STILE conference.

In the M205-STILE conference the tutorial groups included students who followed the online presentation in addition to taking the traditional version of the course. The tutors' too had more experience of teaching this course in the traditional distance learning mode rather than communicating with students via a CMC system. The tutors' full tutorial groups contained both students participating in the project and students taking the conventional version of the course. Both the students and the tutors involved in the M205-STILE conference were probed about their feelings with respect to the differences between online and face-to-face teaching. The following data collection methods were employed:

(i) indepth interviews were undertaken with the students to ascertain the overall benefits of using the FirstClass CMC and their opinions on the valuable aspects of the M205-STILE conference,

(ii) three questionnaires were sent to students to ascertain what benefits each medium provided to student study. They achieved response rates of between 73% and 83%.

(iii) the tutors' perspectives were assessed through two online questionnaires which were completed after the tutors' 'online experiences'. The same types of questions were asked in different ways to encourage the tutors to think more deeply about these issues,

(iv) the tutors' opinions were also gathered from the debriefing meeting held at the end of the project.

The findings are discussed in the following way:

- the benefits gained from the main study (FirstClass),
- student attendance online as compared to face-to-face tutorials,
- student appreciation of online methods of communication as compared to traditional methods,
- tutor teaching methods in the M205-STILE conference as compared to the traditional methods they used.

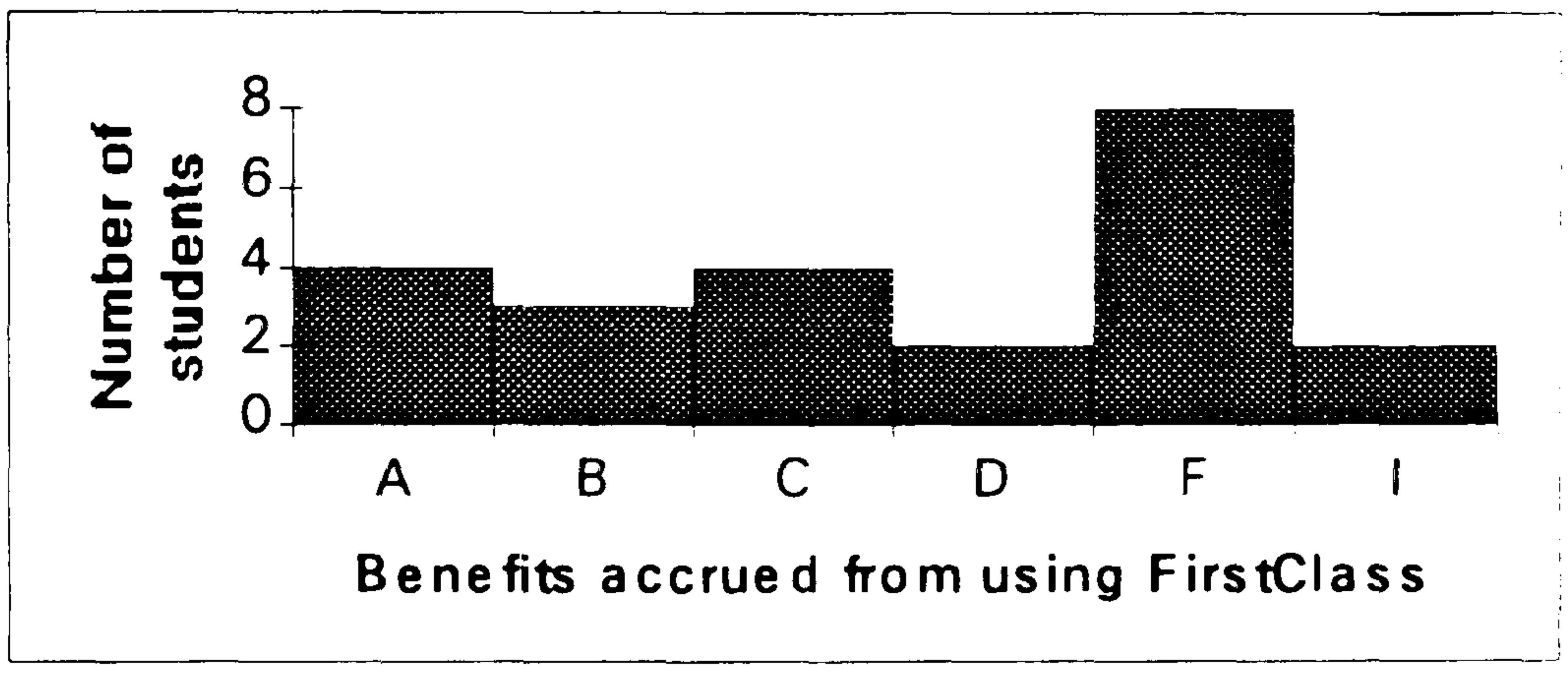
8.2 Benefits gained by the students in the main study (FirstClass)

Student comments suggested that the use of the structure in the main study (FirstClass) assisted with their studies. To further clarify why FirstClass was beneficial, the twelve students in group one (described in chapter 3), were consulted at the three-month point in the course. The student responses were distilled into six categories, see key 8.1 and figure 8.1.

Key 8.1 Categories related to the benefits of using CMC systems

A. Communicating with students and tutors
B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
D. Online course material
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
I. Social interaction

Figure 8.1 Benefits from using FirstClass reported by the students



Communicating with students and tutors (A) rated as less important in this analysis. It was only rated beneficial by four students. These students said that they felt less isolated. This was especially true of those who lived in remote areas because it was easy to make contact with other students. FirstClass provided access to the M205-STILE conference community, which was a big improvement over traditional methods. This issue is discussed further in section 8.4.1.

The category 'Hands-on systems' learning (B) was found in three students' responses. Two of these students enjoyed the experience of using the online system. *I think the main thing I found is experience of using an online system, using a modem and all that sort of thing. I think that's very useful.* However one student's response from this category expressed an anxiety about a lack of experience with the online culture and their fear of actively participating by sending messages. *I should think it's probably more beneficial to those who use this type of thing in their business and work because they seem to have a more easy attitude to it ... In my circumstances I'm not using this in my work and I think that if there's any sort of doubt in one's mind about doing it, if there's any feelings that you're going to look an idiot or do the wrong thing, then you're not tempted to* *take part.* This student's comment confirms the tutors' suspicion that some students did not send messages for fear of making mistakes; see earlier analysis in Wilson and Whitelock (1997b).

Help with course work and problem solving (C) was seen to be a major benefit by four students. They could appreciate that other students were experiencing similar problems to themselves and hence shadowed their colleagues' activities. *I think being able to see other people having difficulties with particular questions in the TMA is quite comforting, quite useful.* The students were able to measure their progress against their peers more easily in FirstClass than through the traditional distance teaching methods.

Two students reported that the online course material (D) provided something extra which was not available in the traditional version of the course. One said it *has given me an extra resource I haven't had before I think I might well have stopped if I had not had the support from the M205-STILE conference.*

The category (F) a preferable method of communication rated highest in this analysis. This confirms the importance of this category, which is the focus of discussion in this chapter. Three of these eight students referred to the instant communication and the subsequent reassurance FirstClass provided: *There was a benefit the other night,* [my tutor] *asked me to send him two files. If I'd have known how to send them, he would have got them instantly, I could have sent them straight away and that would have been it. It's a lot quicker than me sending them in the post ... take two days to get there and then he's got to reply to me after he's read them, so it takes even longer. It could be done quite quickly, I think that's where the benefits are.* Two students stated that they could see the potential of FirstClass to submit their assignments electronically. *I was just thinking how easy it would be if we could email our assignments. It's just we've had a postal strike in Newcastle the past couple of weeks and there's an assignment due, and I was really panicking about it. So I got in touch with [my tutor] through the email and he said don't worry about it, just bring it to the tutorial. But I thought to myself, this is ridiculous; we've got a computer and a modem here, why can't we just send* *it down the line?* The fact that the tutor or the student could deal with problems at a time that suited them was important to one of these students. She said *I can log in whenever I want to log in, so if I have a specific problem, I can just leave it on the system for my tutor and she very often gets back to me within a day or two, and it's good from that point of view ... The benefit I feel is that I don't feel I'm interrupting her time, so that she can answer me at her leisure and I know I'll still get an answer at some point.*

These students see FirstClass as making a big improvement over the traditional methods of contact through ordinary mail, the telephone and face-to-face tutorials. The M205-STILE conference made code more visible, and this was beneficial to two students. *I've tried explaining a program over the telephone and it really is impossible, for both the tutor and myself to get over a complicated point and have her be able to comment. I mean, half your time is taken up with trying to explain your program. So at least I could send her a piece of a program ... I have been in contact with her and she's helped me ... it's actually in written form, so it's there to keep or to print, whereas a telephone call isn't, ... you don't have a permanent copy of the conversation, whereas I can have a permanent copy of what she says to me on the system.* This is an important issue since the course in the main was about Pascal programming. The ways in which the M205-STILE conference was a better way to discuss program code and course-related issues than the mediums of the telephone, face-to-face tutorials and surface mail are discussed in section 8.4.1.

The social interaction category (I) provided by the chat facility was reported as *very good* by two students. *I keep seeming to spend all my time on that type of thing, using the phone a lot, you could have people logging in from Torquay saying "Hello, how's your weather?". I think that's quite nice.* This student went on to say how it was unfortunate that other students lacked the confidence to take part. *But I think I'd just be a bit concerned about people who haven't had a chance, ... they're a bit too scared to do anything. But what you do about that I don't know really.* This latter comment reiterates that made by the student in the 'Hands-on systems' learning category above, where they mentioned their fear of using the online system.

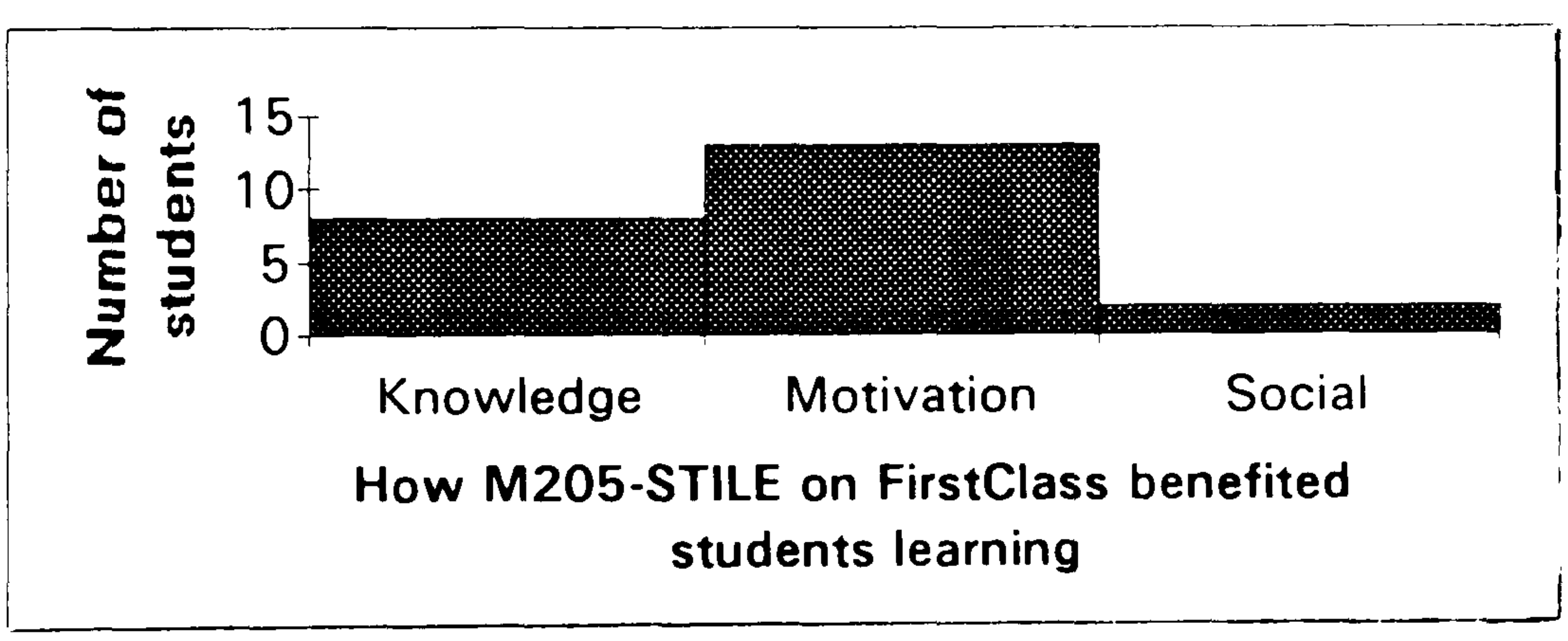
The students reported in interviews that the three main benefits afforded by FirstClass were related to more contact with students and tutors (A), the availability of help with course work and problem solving (C) and a better method of communication (F). These were three of the four categories first identified in chapter 6, which is a reassuring finding. Category F, A preferable method of communication, contained the most responses and is discussed in more depth in section 8.4.1.

The six categories in key 8.1 were further analysed to see how they related to the 'domain of discussion' (see chapter 6).

Table 8.1 The 'domain of discussion' analysis of the benefits accrued from using FirstClass

Knowledge	Motivation	Socialisation
Communicating with students and tutors	'Hands-on systems' learning	Social interaction
Help with course work /problem solving	Online course material	
	A preferable method of communication	

Figure 8.2 The benefits provided by the M205-STILE conference on FirstClass



The findings in figure 8.2 illustrate that the knowledge domain is rated at two-thirds the importance of the motivation domain. This is an interesting finding at this point three-months into the course. It is a reversal of the trend in figure 6.3 and table 6.3 of chapter 6, where the motivation domain appeared to be two-thirds the importance of the knowledge domain, in terms of students expectations at one-month into the course. However the number of responses analysed here is only one-quarter of those analysed in chapter 6. The social domain did not feature highly but students appeared to enjoy their interactions. One wonders if perhaps these students felt they should not be engaging in social interaction or, even though they were, they should not admit to it.

However one of the students interviewed emphasised on a number of occasions that she used the online system mainly to help with her course work. Indeed she contacted her tutor and shadowed other students but said that she did not interact with other students.

8.3 Comparing student attendance on the online system with their attendance at face-to-face tutorials

One way to ascertain how the students valued the M205-STILE conference as compared to face-to-face tutorials was to make a comparison between students' perceptions of their attendance in each of these teaching mediums. All of the students reported that they used the M205-STILE conference but not all of these students attended face-to-face tutorials. In fact, most students reported being active every week on the M205-STILE conference. Those who were online 'more than once per week', or on a 'once per week' basis (see (x) and (xi) in table 8.2), accounted for 84% of the participants. By contrast, students who attended some or every tutorial ((i), (ii), (iv), (v), (vii) and (viii) in table 8.2) only accounted for 63% of the subjects. In fact, the general figure at the Open University for attendance at face-to-face tutorials is 75%. The fact that more students attended online on the M205-STILE conference than at face-to-face tutorials is an interesting finding in itself but what is highlighted is the fact that 84% of the students made high usage of the M205-STILE conference. It offered much more tutor contact than would normally be possible and students used it every week. The traditional version of the course usually had seven two-hour face-to-face tutorials and these were usually timed to occur just before TMA cut-off dates. Surprisingly the majority of students (69% (i) in table 8.2) who attended every tutorial were still very keen to access the M205-STILE conference on a more than once-a-week basis. This suggested that these students wanted to take advantage of both face-to-face and online tuition. Of those students who only attended some tutorials, the majority (78% (v) in table 8.2) used the M205-STILE conference once a week. Those students, who only attend some tutorials, were able to make up lost ground with the M205-STILE conference. Therefore, the environment was of value to remote, rural- and urban-based students.

Table 8.2 Attendance at face-to-face tutorials as compared to attendance in the M205-STILE conference.

	online > once per week	online, once per week	online once per month	total
every f-to-f tutorial	(i) 9	(iv) 2	(vii) 2	13
only some f-to-f tutorials	(ii) 2	(v) 4	(viii) 2	18
no f-to-f tutorials	(iii) 4	(vi) 10	(ix) 4	18
total	(x) 15	(xi) 26	(xii) 8	

Of those who did not attend or did not have tutorials at all ((iii), (vi) and (ix), in table 8.2), 56% reported using the CMC facility once a week; 22% more than once per week ((iii) in table 8.2); and 22% once per month ((ix) in table 8.2). These students not having face-to-face tutorials may not have realised how best to use the M205-STILE conference as a replacement. Indeed eighteen out of the forty-nine respondents (37%) did not attend any tutorials. Some of these students would have been based in the Highlands and Islands of Scotland, and in Europe. Other students may have been prevented from attending because of the nature of their occupation, for example being in the Navy or travelling with their work.

8.4 The students' view on the value of computer conferencing as compared to traditional methods of teaching

This section investigates how the students rated one medium over the other when comparing conferencing with face-to-face tutorials; and email with the telephone and ordinary mail. The discussion includes a comparison of the latter methods to send program code. Although students used the CMC facility more than face-to-face tutorials, was the contact valuable to their study? A questionnaire was used to find out if in fact students found the availability of the M205-STILE conference mode of computer conferencing actually valuable to their study or whether it was of no benefit in this respect. For example they may have just been using it to socialise. Thirty-three out of the 48 students who had responded (69%) to the questionnaire, reported that the M205-STILE conferences had been valuable to their study. This was an encouraging finding for the project since only 2% answered that it was not valuable while 29% were undecided. This meant that more than two-thirds of the students found that the M205-STILE conference was valuable while only a small minority (2%) felt it was not valuable at all. To take these analysis further, substantial comments made by thirty-four of these forty-eight students were analysed to find out what was valuable and what was not valuable. Examples are discussed below. Thirty-one of the thirty-four comments were made by students who felt that the M205-STILE conference was valuable to their study. The fact that the majority of comments were from the latter grouping rather than from those who were undecided lends a bias to the results. Their responses were coded. The coding was shown to two independent researchers (see chapter 3) and an inter-rater reliability of 89% was achieved, see table 8.3.

Table 8.3 How valuable was the M205-STILE conference as compared to face-to-face tutorials?

	M205-STILE conference	Face-to-face tutorials
More valuable	(i) 8 students	(iv) 6 students
Valuable	(ii) 8 students	(vi) 1 student
Equally valuable	(iii) 8 students said both were of equal value	
Unable to make a comparison	(v) 2 students could not make a comparison	
Not valuable	(vii) 1 student	

Taking (i) and (ii) in table 8.3 together, it appears that 47% (or 16) of the students (who made additional comments) found that the M205-STILE conference was valuable or more valuable to student study when compared with face-to-face tutorials. This compares very favourably with 21% (or seven) of the students who felt that face-to-face tutorials were 'valuable' or 'more valuable' than their use of the M205-STILE conference ((iv) and (vi) in table 8.3 taken together). Twenty-three per cent (or eight) of the students who could attend face-to-face tutorials and also use the M205-STILE conference reported that it was important to have both face-to-face tutorials and computer conferencing ((iii) in table 8.3) to enhance study at a distance. Comments have been selected from these 34 student responses to illustrate where one medium was preferred over the other and how each was beneficial to student study.

The eight respondents for group (i) (the M205-STILE conference was more valuable than face-to-face tutorials) were very keen to use the M205-STILE conference to help with their study. The majority of students in this group lived remotely (five out of eight) and one student was house bound. Not having face-to-face tutorials, these students found the M205-STILE conference 'vital' to their study. They *would have found it all much harder without STILE*. The two students who were able to attend face-to-face tutorials found the M205-STILE conference more valuable because *it does show that what you thought of as a silly question is asked by others, more readily in the conference than at the tutorials. I find the conferences more helpful as the discussion seemed wider reaching and more accessible*. Three-quarters of these students were not able to attend face-to-face tutorials and their responses highlight the importance of conferencing for remote groups. This supports the tutors' opinion that conferencing was *essential for areas where face-to-face tutorials are difficult*, see section 8.5. What is also intriguing is that the two students who could use both mediums felt that the M205-STILE conference was more valuable than face-to-face tutorials. The M205-STILE conference appeared to be valuable to these two students because the discussion could take place over a longer time and discussion could be related to deeper course issues within the M205-STILE conference, than at face-to-face tutorials. These latter comments indicate the importance of the knowledge domain of the online environment for indepth discussions. These findings support those of Tonnesen et al. (1995), who reported that 64% of remote students found online discussion beneficial.

The group who felt that the M205-STILE conference was valuable, group (ii) (but not necessarily more valuable than face-to-face tutorials), cited the availability of:

- other students,
- tutors,
- online course materials, and
- dialogue about course work.

Only one out of eight student in this group lived remotely. Seven of the eight students found they could use the M205-STILE conference when it was most convenient for them and it enabled them to catch up on what they had missed at face-to-face tutorials. Two of these latter students did not attend any tutorials and one worked away from home. This finding, together with the analysis of attendance in both mediums, suggests that the M205-STILE conference was also valuable to those who were not based remotely. The availability of the electronic material was an asset, as was the ability to access the views of many more students and tutors other than just one's own tutorial group. *I must admit to mainly accessing the general thoughts of other students to see how they are finding the course, although I have tried some of the additional material provided.* This comment, echoes those of other students, who indicated that they shadowed their peers' question and answer sessions, see chapters 6 and 7. The provision of the M205-STILE conference appeared to add value and may explain why those students who could attend face-to-face tutorials were also actively making good use of the M205-STILE conference.

It was difficult for the eight students in group (iii) who valued both face-to-face tutorials and the M205-STILE conference as 'equally valuable' to rank one medium over the other. The main plus point for face-to-face tutorials and use of the telephone were the immediacy of response from these mediums. However the M205-STILE conference enabled students to share misunderstandings and find solutions to general problems with the course materials. The latter point is important as the value was seen as equivalent to face-to-face tutorials. They found 24-hours-a-day access very convenient and could catch up on what they had missed at face-to-face tutorials. As one student put it, *both have their part to play. It was encouraging to see that others were having problems. The conferencing could take a long time for replies whereas the telephone is very quick. On the other hand sharing problems and ideas is great.* The students in this group used the strengths of each medium to guide their own learning. This supports the argument of Soloway and Norris (1998) that the availability of different technologies addresses 'the enormous diversity in learners'. In confirmation of previous work (Alexander and Mason, 1994; Selinger, 1998; Naidu et al., 1995), students found it beneficial to have access to both face-to-face tutorials and online contact.

The six students who thought face-to-face tutorials were more valuable than the M205-STILE conference (iv) found it difficult to quantify why this was the case. One of the six students referred to the immediate response to a question at a face-to-face tutorial and a second student felt that face-to-face tutorials were a better forum in which to *get the message over*. One interpretation could be that gesture and tone of voice were being considered. These two students were emphasising the importance of more tailored feedback and the immediacy of response, which they felt were more available at face-to-face tutorials. This finding supports Naidu et al.'s (1995) report that some participants felt that the online system did not provide the immediacy of face-to-face interaction when they had to wait perhaps 24-hours for a response. However this finding is in contrast with researchers who reported that CMC did in fact provide an immediate response (Selinger, 1998; Tonnesen, et al., 1995).

Two students in group (v), 'Unable to make a comparison', mentioned that they did not have face-to-face tutorials. One could not make a comparison and the other student *would prefer face-to-face tutorials but ... in a rural area this is not always possible and computer conferencing is a good substitute.*

Only one student responded in category (vi), face-to-face tutorials were valuable (but not necessarily more valuable than the M205-STILE conference). This student preferred face-to-face tutorials and felt that the M205-STILE conference was not needed as an additional support. This student did not in fact have much opportunity to use the M205-STILE conference because he worked away from home on a frequent basis.

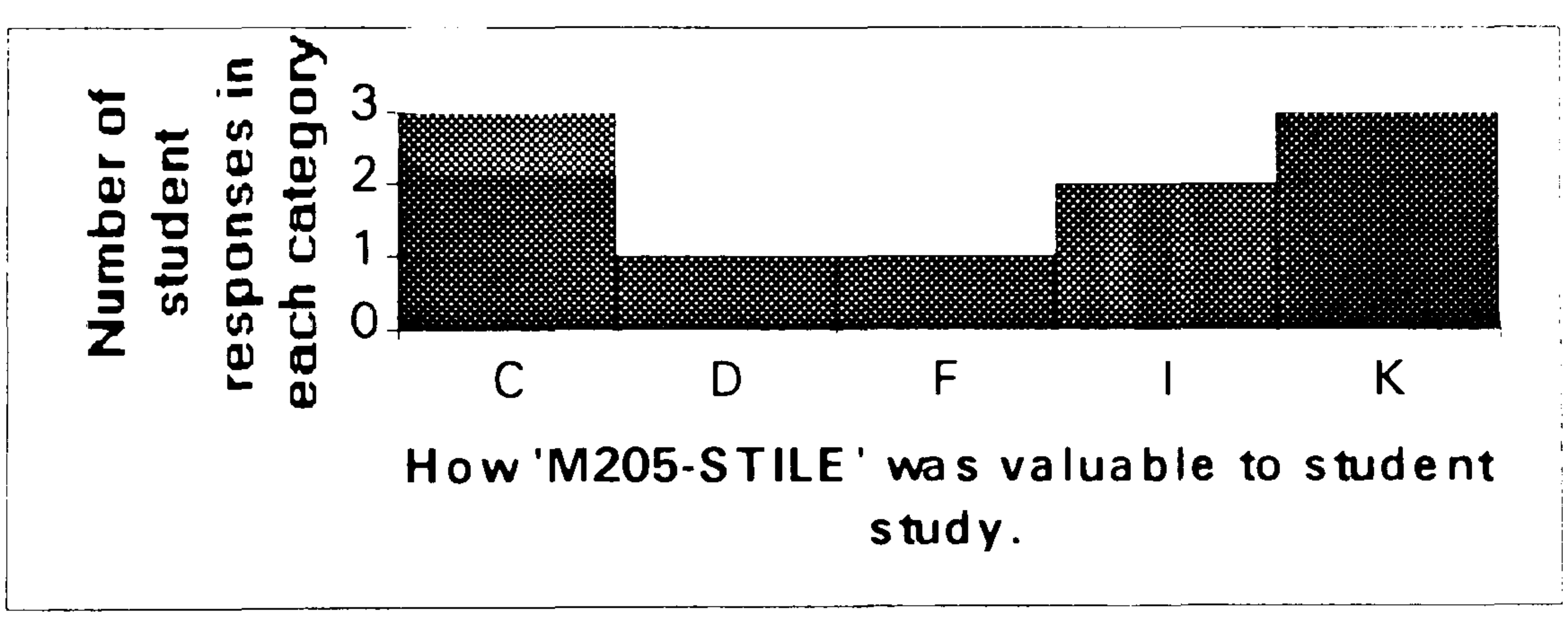
Just one student commented that the M205-STILE conference was 'not valuable' (vii) *with the actual studying* of the course. In another survey about expectations this student had in fact indicated unrealistic expectations from the system. It was not surprising, therefore, that he did not find the M205-STILE conference valuable to his study. He had hoped to become familiar with computer networks just from his use of the FirstClass conferencing system.

To investigate this issue of value further, the four students in group three (described in chapter 3) were interviewed indepth at the end of the course. This provided useful comparative data with student responses at the one-month and six-month points in the course. The students gave different reasons why they found the M205-STILE conference valuable to their study but it was clear that all four students valued being able to shadow what was going on in the various conferences. Whether it was in the tutorials, the M205 Help conference or the Meeting Place sub-conference. Their substantial comments were analysed and corresponded to five of the six categories first identified in chapter 6. The five categories are listed in key 8.2 and represented graphically in figure 8.3. This end-of-course analysis showed that the category Help with course work and problem solving (C) was still important. However, category A Communicating with students and tutors, has disappeared in this analysis, while the importance of category K The M205 Help and Tutorial conferences has increased. This suggests that the students were in fact communicating about their course work C, in these sub-conference areas, which had been the IMF's intention in setting up these areas.

Key 8.2 value categories

C. Help with course work and problem solving
D. Online course material
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
I. Social interaction
K. The M205 Help and Tutorial conferences

Figure 8.3 What was valuable about the M205-STILE conference to the group three students?



The following comments are examples for each of the categories. Two of the three students in category C, Help with the course work and problem solving, reported activity, which could be described as shadowing other students; they did not post messages themselves. However the other student in this category contributed messages in addition to following what was happening. This student referred to this form of watching as a form of self-help. He said *you can see you're not the only one with problems. It's also reading through the way people have solved problems, it's always* *been very interesting. I think it's really a self-help thing and knowing other people have got similar problems as yourself.*

A remotely-based student found *the extra course material ... invaluable, it really was ... excellent.* This corresponds to category D, Online course material.

A student who appreciated the immediacy of response when using the telephone also realised that the 24-hour availability of the M205-STILE conference enabled him to post his query at the time that it occurred to him especially if it was an inappropriate time to use the telephone. *I thought the concept of it was very good ... I don't think it will ever replace the idea of a tutor on the other end of a telephone because sometimes you need help instantly ... Sometimes if the tutor's not there you can put it down in writing and leave it for him. Which is a far better thing because you can't expect the tutors to be on the phone all the time. Sometimes you feel a bit guilty about ringing them up late at night, so you just bung it on the email and let them sort it out. Must help them in some respects.* These comments relate to category F, A preferable method of communication. The tutors, too, refer to their preference for email, rather than late-night telephone calls, see section 8.5.

Two students responded about Social interaction, I. A remotely-based student *liked in particular the Meeting Place, ... liked reading the messages.* This student valued the social contact as well as the help provided by the online system. These same features were also appreciated by an urban-based student who really liked *all of it ... it's been pretty good. Not only with the work, but stopping you from feeling isolated.*

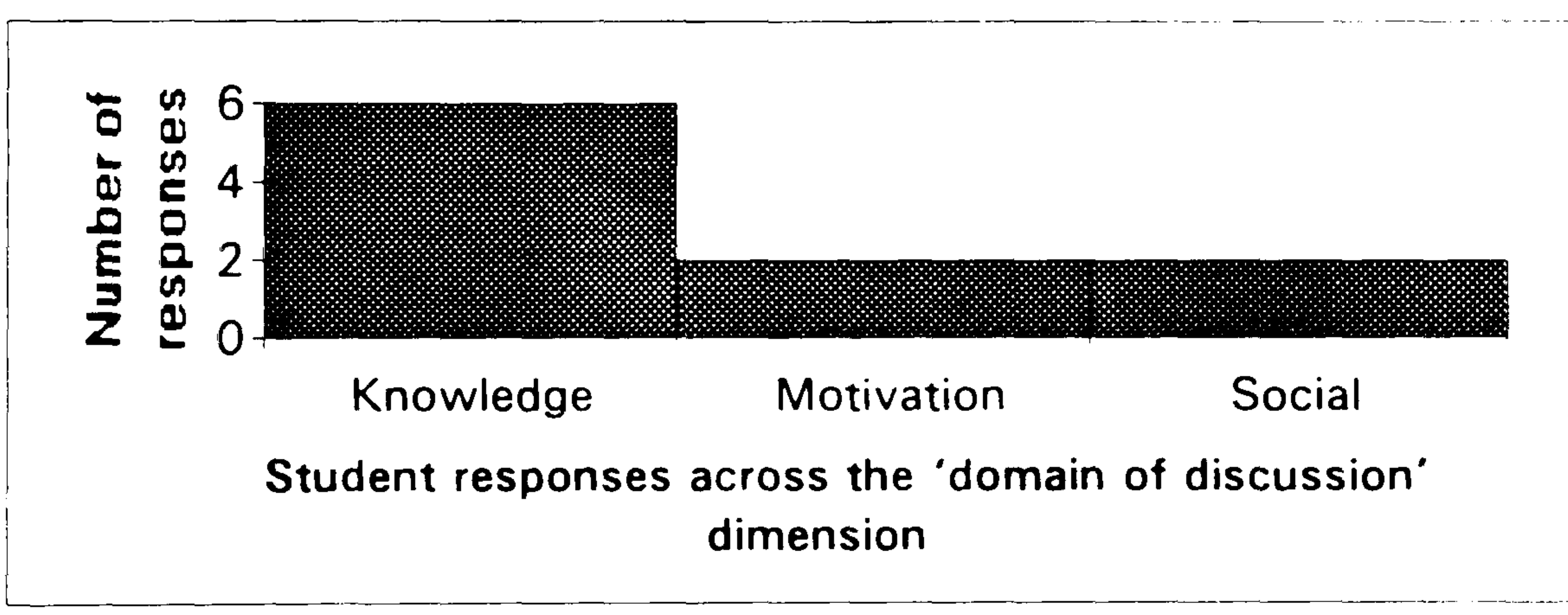
Three student responses referred to category K, The M205 Help and Tutorial conferences. One of the students described this in more detail. He said, *I think really the ability to go into other conferences and see what's going on, and see other tutor groups. You get an idea and think "Oh, yes that would be a way of doing it", rather than just using one tutor. It's really giving you access to twenty tutors. I've never sent any emails to other tutors, but I've read their replies to other people.* It had been the IMF's intention to utilise this type of functionality by making all of the tutorials read-only. Hence students could learn by following the interaction in tutorial groups without increasing the burden on a tutor other than their own. In keeping overload to a minimum in this way, one outcome was that tutors reported their workload was not too high.

The five categories of value in key 8.2 were investigated further to see how they corresponded to the social, motivation and knowledge 'domains of discussion'. Student responses were classified as in previous analysis (in chapter 6), see table 8.4. The importance of each of the domains in terms of value is illustrated graphically in figure 8.4.

Table 8.4 The 'domain of discussion' analysis of the group one students' value categories

Knowledge	Motivation	Socialisation
Help with course work /problem solving	Online course material	Social interaction
The M205 Help and Tutorial conferences	A preferable method of communication	

Figure 8.4 How the group one students valued the M205-STILE conference within the 'domain of discussion'



This investigation, undertaken at the end of the course, provides comparative findings with earlier analysis. For example, the motivation and social domains rate equally at one-third the importance of the knowledge domain. This corresponded to student expectations at six-months for the motivation domain which had dropped from two-thirds to one-third of the importance of the knowledge domain. The conceptual framework had been used to guide the design of the online structure and focus different types of discussion in different areas. This appears to have happened and been valuable to student study.

The advantages and disadvantages of computer conferencing as compared to face-to-face tutorials were identified by three students in unsolicited comments, see tables 8.5 and 8.6. These advantages were described as the opportunity for group problem solving and the opportunity for students to reflect on other students' responses. *Sometimes expressing your problems ... helps you to think them through and getting a variety of replies back broadens your understanding.* This student is reiterating the earlier comments that the M205-STILE conference created an environment where it was possible to gain a deeper understanding of the domain. This student also mentioned the benefit of being able to raise problems when they occurred. *I have no worries disturbing my tutor using the M205-STILE conference, she can answer when she has got time.* This student went on to say that the disadvantage of computer conferencing was the lack of an immediate response from a tutor as compared to asking a question at a face-to-face tutorial, which reiterates the comments made on this issue earlier in the chapter. To overcome the problems of a lack of immediacy, this student suggested that more synchronous activities should be adopted. *Perhaps the M205-STILE conference could have tutors who for, say, Wednesday evenings between 7 and 8 were online and ... you could post queries to them and get a response back there and then and perhaps other students chipping in, could be similar to a class room setting without needing to get out of your house.*

Table 8.5 The advantages and disadvantages of M205- STILE from the perspective of three students

Advantages of the M205-STILE conference	Nos	Disadvantages of the M205-STILE conference	Nos
Helps one to reflect	1	Interaction was not immediate	1
Group problem solving	2		
Students could raise problems when they occurred	1		
More exchange of documents and notes	1		
As good as face-to-face for understanding the domain	1		
Total	6		1

Table 8.6 The advantages and disadvantages of face-to-face tutorials from the perspective of three students

Advantages of face-to-face tutorials	Nos	Disadvantages of face-to-face tutorials	Nos
More immediate feedback	1		

Both delivery mediums were appreciated by a student who said *conferencing and face-to-face tutorials have been very useful to me.* This student reiterated the point that group problem solving was very supportive. *The advantages of conferencing are that often you share a misunderstanding or block with a number of other students and can work it through together.* The ability to exchange electronic documents was seen to be very beneficial. *It allows more scope for exchange of documents and notes than face-to-face tutorials.*

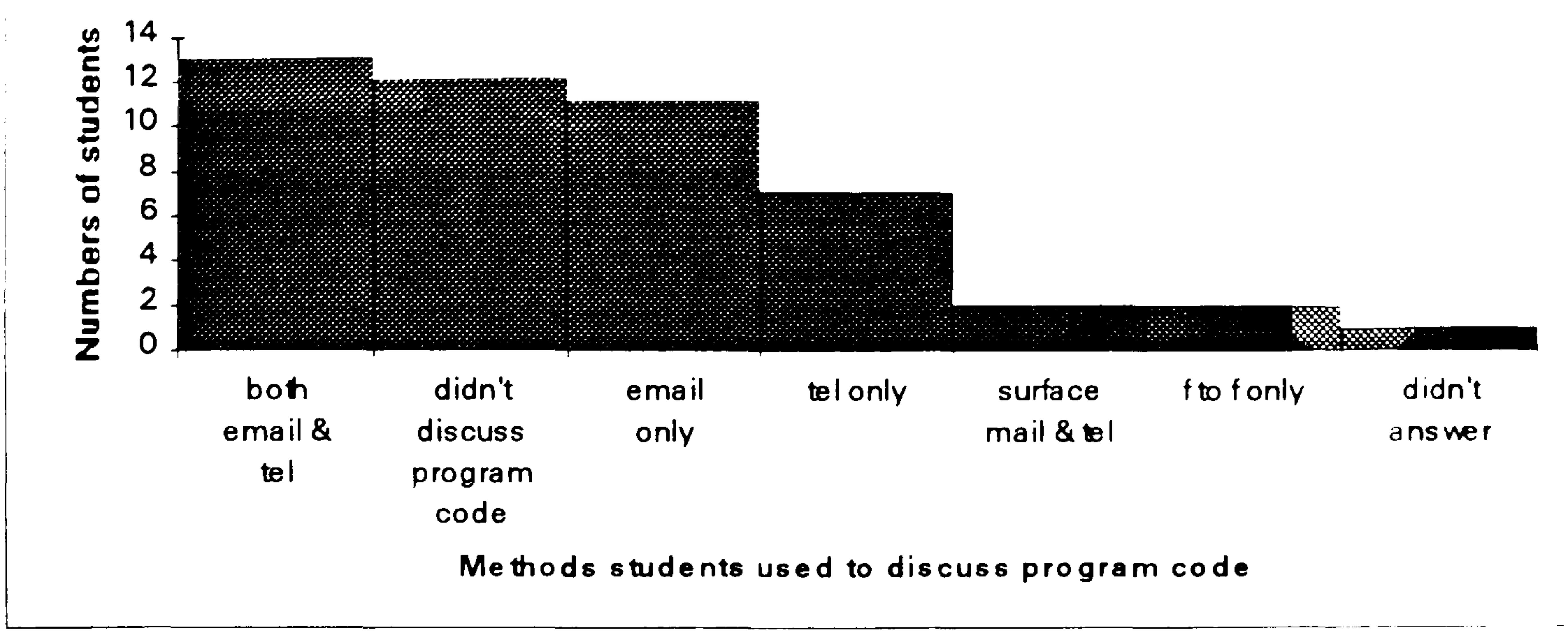
The M205-STILE conference offered flexibility to students who worked away from home. *I would like to say that personal contact is always preferable to remote working but the nature of the Open University lends itself to email. My job keeps me away from home for four weeks at a time so my usage of the M205-STILE conference has been somewhat disjointed. Having to travel 25 miles to tutorials is a good excuse not to go, and I find that using STILE can, with care, fulfil the same function.* This student appeared to find the M205-STILE conference as valuable as face-to-face tutorials for the understanding of the domain. Indeed Mason (1989a) found that 43% of students were of the opinion that conferencing was as good or a better medium for intellectual exchange as face-to-face tutorials. Table 8.5 and the associated comments above were made by just three students. Therefore further investigations were required to see why the M205-STILE conference had advantages over the other available methods.

8.4.1 The methods students used to discuss program code

In order to find out if students did indeed contact their tutor to discuss course work via email, telephone or ordinary mail, the four students in group three were interviewed at the eight-month point in the course. All four students reported that they had emailed their tutor about their course work. This corresponds to categories A, Communicating with students and tutors, and C, Help with course work and problem solving. Three of these students had contacted their tutor occasionally while one student reported sending 20 messages. The tutors were contacted via email by these students for news and information (category J) or if a student had *a real problem* that the other students hadn't helped them to solve. These students were also asked if they used the other traditional methods of communication of the telephone or ordinary mail to discuss their course with their tutor. None of the students had used ordinary mail but two students did report using the telephone occasionally. One student said *usually it's sort of one clarification I need over a question on a TMA or something, So generally speaking once a TMA ... I think anything you need urgently, then you've got to get on the phone, but if you can wait two or three days for the information or wait till the weekend then it's not a problem, just stick it on the email.* This suggested that email was better for a more tailored response while the telephone was better for a more immediate response. These two mediums appeared to be complementary. The tutors' opinions on how much email they received are discussed in section 8.5.

These comments (taken at eight-months) suggested that ordinary mail was not really used by students to discuss course work but that the telephone still provided an advantage over the M205-STILE conference for a more immediate response. As the M205 course involved a lot of programming, it was important to find out if students found that FirstClass provided a preferable way to discuss program code. Therefore the fifty-eight students still online at the eight-month point were asked in a questionnaire how they had discussed their program code, whether it was via email, over the telephone, or via surface mail. Eighty-three per cent of the students responded. Students chose one or more of the three categories offered. The combination of email and telephone was the preferred way to discuss program code for 27% of the students, see figure 8.5. This suggested that these students could see the advantages of using more than one medium for this activity. Thirty-eight per cent of the students used just one method to discuss program code and this was either email (only 23%) or the telephone (only 15%), see figure 8.5. Surprisingly 25% of students admitted to not discussing program code using the three methods suggested, see figure 8.5. Perhaps these latter students could cope on their own and did not need support for their programming on the course. Alternatively these students may have found it difficult to send program code in the M205-STILE conference. This issue is discussed later in this chapter.

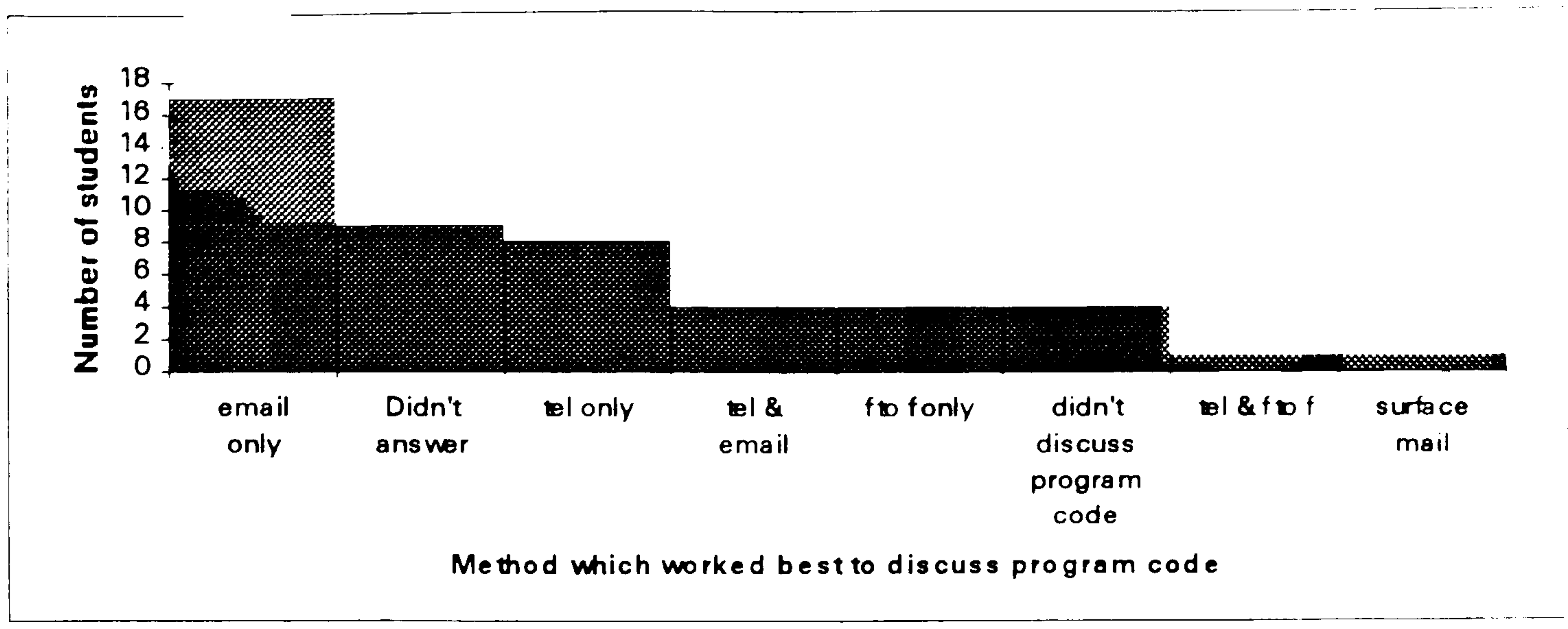
Figure 8.5 Conventional and electronic methods used by students to discuss their program code



A small number of students suggested two other methods to discuss their program code. These were the combinations of surface mail and the telephone or face-to-face tutorials, as summarised in figure 8.5. Email and /or the telephone were used most. Taken together, the categories: both email and telephone; email only and telephone only, accounted for 65% of the student responses. Although email was available to discuss program code, students still made use of the traditional method of the telephone. This outcome corresponds with the comments made by the students who were interviewed that both methods had their advantages. That is, the telephone for an immediate response or email for a more considered response. Perhaps tutors and students should have used the synchronous chat facility provided by FirstClass as an alternative to the telephone, for queries requiring a quick response.

A follow-up question was used to gauge which of the three methods (email, telephone, or surface mail) provided the most preferable form of communication. An apparent preference for email seemed much more obvious here. Thirty-five per cent of the students stated that email worked best for discussing program code while the telephone worked best for 17% of the students, as summarised in figure 8.6. Email appeared to be twice as popular as the telephone.

Figure 8.6 The method that worked best when students wanted to discuss program code



Four students 'didn't discuss program code'. Two of these students said that this was because they felt that they did not need any help. For example *I used none of the above, since I believe if you work out your own problems it sticks better in your mind. Resorting to others to 'help out' is my last resort and thankfully I am not in that position yet!* One student worked away from home and could not use these facilities. The fourth student, although he did not use the facilities, could see that email would probably be *the best method as your code can be included in the body of the message and is a more convenient method than ordinary mail.*

Students made comments about which method or combination of methods worked best. These will be discussed in turn: email; email and the telephone; and surface mail. Eight students found email A preferable method of communication category (F). They stated how the 24-hour availability of the M205-STILE conference meant they could send an email message to their tutor at the time it occurred to them. They found the M205-STILE conference very accessible, quick, efficient and easy to use to discuss program code as compared to the effort of posting surface mail. Email also worked very efficiently for more complex programming problems. These findings confirm Riedl's (1989) assertion that computer-mediated discussion provides a degree of depth and diversity, though it is not as immediate as in the face-to-face setting.

The telephone meant that the tutor was available to give *instant feedback* and solutions to students' programming problems. For example, one student who had a telephone near the computer mentioned how they *could run code, describe outcomes at the same time* while they were talking to their tutor.

For some students, it was essential to have *a combination of both email and the telephone*. They felt that this worked best as *each complements the other*. The telephone was seen as a more immediate form of communication *when expressing subtle details*, while email gave more *time flexibility* for the more difficult programming problems. The combination of both mediums allowed immediate clarification and re-expression of the problem.

The one student in the group 'Telephone and face-to-face', *preferred the telephone ... but face-to-face* was also a very good medium. Familiarity was the reason that one student found surface mail preferable to the other methods.

Though email and the telephone were complementary methods of communication, this analysis appears to establish that email was the preferred method of communication (F) to discuss program code. In fact students in the email-only grouping, commented that email had advantages over the telephone and surface mail for more involved programming problems. The students could dispatch their programming problem by email at the time that it occurred to them. They appreciated the 24-hours-a-day access to the M205-STILE conference for this type of activity. They did not expect an immediate response as, for example, they may have sent it *late at night*. They appreciated the advantage of immediate dispatch as compared to the need to have *first-class stamps to hand* or to *post letters in a post box miles away*. The real advantage of email as compared to the telephone was the ability for *both parties to see the exact code*. The advantage over surface mail was the speed of dispatch. Students could paste their program code into a message or attach a file to an email message. These findings confirm those of Mason (1989a) who found that 40% of students reported that conferencing was as good or a better means of getting help or moral support as telephoning their tutor. However, these findings are in contrast with Murphy (1994, p.1) who reported that 'CMC is used less often and deemed less valuable than other more conventional media, such as paper documents, group meetings, telephone and face-to-face conversations.

8.5 Sending program code via email

The students were asked explicitly if they sent their program code via email. Forty-eight per cent of respondents had been able to use electronic methods while 52% had not. A higher percentage of students might have used email or sub-conference areas if they had been given a formal set of instructions on how to transfer code from their DOS-based compiler to FirstClass in the Windows environment. Indeed a student expressed her difficulty with her transfer of code. She said *it would have been easier if everything had been on the one system. I've found it frustrating to go in and dig out Pascal, then come out of that to go in and look at STILE and all that business. It would have been a lot easier if they were all accessible from one another ... you've either got to print everything off or have a good memory ... or actually come out and log in again ... It would be useful if it could be combined in some way*. The students who were successful may have used the ad hoc instructions posted by a student who explained how to start the compiler from Windows. This had been posted to the Students common room sub-conference just three weeks after the project started. Indeed one student mentioned how valuable these instructions had been. She said *I've found a couple of things that have been useful ... one chap had put on ... a file about how you could start the P system from Windows without actually having to come out of Windows and go into the DOS prompt, which was wonderful, because I just downloaded that, ... set it up and it was brilliant, I just click on Windows and away it goes, ... Things like that, to me, are a great boon, helping one another like that is wonderful.*

8.5.1 Discussing program code with tutors or students

Communicating with students and tutors (A) was an important category through chapters 6 and 7. Therefore it was important to establish with whom the students were discussing their program code: whether it was with their tutor or other students. The fifty-eight students, who were still online, were asked (in a questionnaire) how many times they had sent their program code via email to their tutor, to fellow students, or to one of the conferences. A response rate of 83% was achieved.

Forty-six per cent of the respondents had sent their code to individuals - either their tutor or to other students. Six per cent sent their code to a conference area. Table 8.7 suggests that the number of times help was sought from either group was fairly similar. This suggests that the students rated the tutors' or students' ability to help with their programming problem on an equal basis.

Table 8.7 Number of times students sent program code to either tutor or other students

Discussed program code with either tutor only or student only	**To tutor**	**To student**
	1	1
	2	2
	1	4
	4	2 or 3
	3	

Students also sought help from both their tutor and other students as shown in table 8.8. It seems that the students sought help from other students in preference to their tutor on a more frequent basis. Students appeared to rate the ability of other students to help with their programming problems more highly than the tutors.

Table 8.8 Number of times students sent program code to both tutor and other students

Discussed program code with both their tutor and students	**To tutor**	**To student**
	< 5	< 10
	2	3
	2	1
	1	8
	1	many times

In the case where students used their tutor, other students and a conference, they perceived that they contacted their tutor slightly more than other students or one of the conferences, as shown in table 8.9.

Table 8.9 Number of times students sent program code to their tutor, other students and to a conference

Discussed code with tutor, students and in a conference	To tutor	To student	To a conference
	1 or 2	1 or 2	1 or 2
	1	3	> 3
	5 to 10	> 5	> 5
	7	5	5

A factor, which could be affecting whom the students contacted could be the availability of other students as compared to a student's individual tutor. For example, students could seek help in the M205 Help conference, which contained all available student participants.

8.6 Online versus conventional assignment and exam performance

The purpose of this section is to assess the M205-STILE students' perceptions of their assignment performance and to compare their average exam and assignment scores with those students taking the conventional version of the course.

8.6.1 Student perceptions of assignment and exam performance

A finding from the indepth interviews suggested that the M205-STILE conference had helped a remotely-based student to gain a deeper understanding of the course concepts and improve her assessment scores. To see if this was the case among the larger body of students, they were asked in a questionnaire at the seven-month point in the course if their Tutor Marked Assignment (TMA) results had improved because of their use of M205-STILE. Of the forty-eight students who responded, twelve (or 25%) said yes, six (or 12.5%) said no, and thirty (or 62.5%) did not know. Although a high proportion could not make a judgment about any improvement in assignment scores, one student in this category remarked *cannot really say whether FirstClass has improved the marks ... One thing it does do is to improve the quality of life and has certainly helped me meet other kindred brethren. For me the programme has been an unqualified success.*

Of the twelve students (25%) who perceived that they performed better in their assignments as a result of using M205-STILE, six felt that there was a definite improvement while three felt that there was a fractional improvement. An additional three students could not measure the improvement in their marks. The six students who saw a definite improvement made comments to substantiate their views, and these will now be discussed. One student said that their TMA marks were *better than they would have been without M205-STILE*. The remotely-based student whose interview had originally sparked this line of enquiry, as mentioned above, also answered the questionnaire. She reaffirmed that her TMA marks had improved dramatically in 1995 when she was taking the M205-STILE presentation of the course. She said *my TMA results have been excellent this year - from grade 2 to grade 1 in my degree*. Two of these six students cited the benefits of M205-STILE as communicating with students and tutors. *My TMA results are better because it is much easier to communicate with others and clear up any misunderstandings I had with some questions.* The other two students in this group of six students mentioned that the online course material had been beneficial. One of these students who was housebound said *I am certain that the additional material provided by M205-STILE improved my TMAs.*

8.6.2 Comparing average exam and assignment scores for M205-STILE students with those taking the conventional version of the course.

In order to find out if it was the general case that most M205-STILE students' exam and TMA scores were improved, existing systems were used to ascertain average exam and TMA scores for those students taking part in M205-STILE and for those taking the conventional version of the course. Restrictions in the form of privacy regulations were in place to protect students' personal information and therefore it was not possible to probe further into individual student scores. On the basis of this averaged data, M205-STILE students performed slightly better than students taking only the conventional version of the course. In fact, this improvement was evident in all eight assignments and in the exam. A comparison of average assignment scores for the TMAs submitted shows that the M205-STILE students gained up to 2.6% more marks than those students taking the conventional version of the course, as summarised in table 8.10.

Table 8.10 Average assignment scores for M205 students in 1995

Students	TMA 1	TMA 2	TMA 3	TMA 4	TMA 5	TMA 6	TMA 7	TMA 8
M205-STILE pres ...	90.87	84.17	83.96	84.28	83.23	81.21	90.54	85.05
Traditional Pres ...	90.07	82.93	81.72	83.81	81.6	80.8	87.95	84.41
All students	90.1	82.97	81.79	83.82	81.65	80.81	88.03	84.43

In the case of the exam, the average score achieved by the M205-STILE students (for those with a mark other than zero) was 2.8% better than their counterparts taking only the conventional version of the course, as summarised in table 8.11.

Table 8.11 Average exam scores for M205 students in 1995

Students	**Exam**
M205-STILE presentation	65.05
Conventional M205 presentation	62.99
All students	63.05

These results show a slight improvement for the M205-STILE students who were taking the online presentation of the course in addition to the conventional version of the course. They appear to have benefited from the combination of both modes of teaching. Carswell (1997) reports on the use of the Internet as the sole mode of teaching for thirty students taking the same course (M205). In contrast with the results reported here, Carswell found that students taking the Internet version of the course scored slightly less in both their assignments and exam when their average scores were compared with the students taking the conventional version of the course. The findings from this thesis suggest that it is beneficial for students to have both face-to-face and online support. However, the balance between how much face-to-face and online support is required needs further investigation.

Students at the Open University often take more than one course in a year, even though they are part-time students. Although information on this issue was not available for all students, seven of the M205-STILE students studied two courses. The additional courses taken were either in the domain of maths/computing or technology. It is interesting to note that although one student scored the same in both exams and one student just one more mark in M205, in three out of the six cases students scored between 17% and 28% (rows A, C and E in table 8.12) better in the M205 exam when compared to the exam taken in the other course. This differential in marks is consistent with the remote student's original perception that her marks had improved by about 20%. In order to make a stronger claim than this, more information would be required about the differential between the two exams in general. These findings suggest that some students achieved better marks with the combination of the M205-STILE and conventional versions of the course. This ties in with what the students themselves perceived, as noted above: that is, a feeling by some that they had achieved a fractional improvement in marks while others saw a marked improvement in their scores. These findings are also supported by the tutors responses which are discussed in section 8.8. However, further investigations would need to be undertaken to find out if the same differential in marks appeared when students taking the conventional version of M205 were also taking additional courses.

Table 8.12 Exam scores for students who took more than one course in addition to M205-STILE

	M205-STILE	TM282	T223	M246	T264	M261
A	72				44	
B	66			66		
C	66		49			
D	84	83				
E	88					70
F	85					no exam taken
G	51					73

Although Bosworth (1991, p.49) suggests that testing is 'the lowest level of evaluation', the results here have been used to reinforce what the students themselves have reported.

8.7 The tutors' view of the value of computer conferencing as compared to conventional methods of teaching

The students recognised the value of the M205-STILE conference and the advantages it could bring to their studies. To obtain a fuller picture, the tutors' opinions were also elicited. The nine tutors involved were sent two questionnaires. Eight of the nine tutors responded. The tutors were asked to compare their face-to-face tutorial with their use of the M205-STILE conference. Five of the eight tutors were of the opinion that face-to-face tutorials were more valuable than the M205-STILE conference (see (iv) in table 8.13). Two tutors thought that the two mediums were equally valuable (see (iii) in table 8.13) while one tutor felt the M205-STILE conference was valuable (see (ii) in table 8.13). To investigate where one medium was more valuable than another, comments made by the eight tutors were further analysed. The fact that the majority of the tutors were in favour of face-to-face tutorials could lend a bias to these results. Their comments were coded in a similar way to those of the students.

Table 8.13 How valuable was the M205-STILE conference as compared to face-to-face tutorials?

	M205-STILE conference	Face-to-face tutorials
More valuable	(i)	(iv) 5 tutors
Valuable	(ii) 1 tutor	
Equally valuable	(iii) 2 tutors	

Three of the five tutors reported that face-to-face tutorials were more valuable (see (iv) in table 8.13). One of these three tutors commented that *face-to-face, in general is better but it's a close run thing* when compared with online teaching. The fourth tutor referred to face-to-face tutorials as being valuable because students could *see and talk to other students*. The fifth tutor referred to the importance of *the give and take of a live tutorial*.

The M205-STILE conference was considered equally valuable to face-to-face tutorials by two of the tutors (see (iii) in table 8.13). They could see that both mediums complemented each other. One suggested that face-to-face tutorials were better for *more general teaching*. The second tutor mentioned *using sample problems prepared for the students to work on, in cooperation with each other*, while the M205-STILE conference was described as being very good for responding *to specific questions raised by students*. This suggested that the onus was much more on the students to request help in the M205-STILE conference rather than the tutors being proactive. Indeed another tutor who used *past TMA questions to illustrate points* said *I was waiting for students to contact me with their difficulties*. The online medium appears to have changed the tutors' role from having the autonomy in the face-to-face situation to waiting for requests for help in the M205-STILE conference.

The tutor who said that the M205-STILE conference was valuable (see (ii) in table 8.13) said that this was the case because he could post his tutorial notes, and students could download them. The tutors were paid to give face-to-face tutorials, and this could have influenced their responses in favour of face-to-face tutorials, as it would be understandable that they would not wish to see them abandoned. The tutors' opinion on the value of the two mediums is in contrast with that of the students, the majority of whom valued the M205-STILE conference in preference to face-to-face tutorials.

In order to understand why one medium was considered better than the other, the tutors were asked for their opinions on the advantages and disadvantages of the M205-STILE conference and face-to-face tutorials. The tutors' comments distilled into six groups of advantages as compared to three types of disadvantages. However the number of tutors who agreed on the same advantages as against disadvantages was 6:8, see table 8.14.

Table 8.14 The advantages and disadvantages of M205- STILE from the tutors perspective

Advantages of the M205-STILE conference	**Nos**	**Disadvantages of the M205-STILE conference**	**Nos**
Possibility of a near immediate response to a problem	1	Lack of visual and aural cues	3
No student should feel disadvantaged	1	Interaction was not immediate, follow-up questions needed to be asked	3
Those unable to attend f-to-f can receive tutorial support	1	Seemed to be low take up from student group	2
Students could raise problems when they occurred	1		
Ability to shadow other students	1		
Fully prepared answers rather than off-the-cuff responses	1		
Total	6		8

Two tutors made detailed comments about a number of the six advantages. One of the tutors appreciated the fact that their students could raise problems at a time that suited them, *even if the problem was not urgent enough for them to feel they should bother me on the phone. (For example one of my students seems to work in the small hours, when I would not have appreciated a phone call), but could leave problems for me to pick up in the next day or two.* This corresponds with one of the advantages cited by the students. The second tutor suggested that such responses in the M205-STILE conference would be more detailed. He said *one can present fully prepared answers to queries rather than off-the-cuff responses which one hopes are correct.*

Three tutors mentioned the disadvantage of a lack of visual and aural cues and less immediate interaction in the M205-STILE conference. *The interaction is not as immediate as a phone call or a face-to-face discussion where, if a reply is not clear enough, another question can be asked straight away. I also feel that at times students don't know what they don't know and therefore don't know what questions to ask. The look on a student's face or the tone of the voice is often a good indication as to whether more explanation is required and this is missing in something like STILE.* This corresponds with one of the disadvantages of the M205-STILE conference reported by one of the students.

The number of advantages of face-to-face tutorials outweighed the disadvantages on a ratio of 5:1 from the tutors' perspective, see table 8.15. However more of the tutors cited the same advantages and therefore the total number of advantages to disadvantages was 10:1. One of the tutors saw the advantage of face-to-face tutorials as enabling students to work through sample problems prepared in advance. Academic discussion could take place with a presentation of argument in the 'live' situation. The second tutor confirmed that face-to-face tutorials allowed her *to see who understands and who doesn't, also different levels of understanding. I can change my approach immediately in a F-to-F and respond to body language, include reticent students and ensure participation by work in groups.* The third tutor stated that *at a live tutorial, the tutor (or often another student) may be able quickly to understand what is really troubling a student, and get it sorted out. This can take about three days via FC (assuming tutor and student are not online at the same time).* She suggested that perhaps one way to overcome the lack of immediacy in a CMC environment would be to use the synchronous chat facility.

Table 8.15 The advantages and disadvantages of face-to-face tutorials

Advantages of face-to-face tutorials	Nos	Disadvantages of face-to-face tutorials	Nos
More visual and aural feedback	3	Too tutor led	1
Tutors could ensure concepts were understood	3		
More immediate interaction	1		
Group work with input from the tutor	2		
Students are more involved	1		
Total	10		1

The advantages of face-to-face tutorials were echoed by one of the nine tutors (at the debriefing meeting), who said *with something like recursion, I find it very difficult to explain to students without using my hands ... I find with the face-to-face tutorials,* [that] *it's the students, it's what they give each other, when one says well, and another one says well I know, explain it like this. If we could bring that into the M205-STILE conference we could actually get the students to be able to help each other.* One tutor felt that face-to-face tutorials and the M205-STILE conference medium could be complementary.

As they had not used the medium before, these tutors did not know how to compensate in the online environment for the usual cues they received about a student's understanding in the face-to-face sessions. They were not sure if the answer they had given was appropriate, understood or what affect this had on the student's perception of the original problem. This has implications for the motivation domain of the online environment, since a student may feel misunderstood or more seriously feel they are not up to the course and could become demotivated and give up. As the tutors were not verbose about the advantages of the M205-STILE conference they were asked a more focused question on what was good and bad about the online medium. The outcome in this analysis was more favourable, with the good points about M205-STILE outweighing the bad. The tutors' responses distilled into eleven good points versus five bad points. Just two tutors agreed on the same bad point and therefore the total good points to bad points was on a ratio of 11:6, as shown in table 8.16. It is heartening to find that the M205-STILE conference was seen as beneficial when the issue of face-to-face tutorials was not mentioned in this question.

Table 8.16 The upside and downside of the M205-STILE conference

Upside of the M205-STILE conference	**Nos**	**Downside of the M205-STILE conference**	**Nos**
Being part of a community as against being solitary	1	Not as beneficial as expected	1
Opportunity for a quick fix	1	Cost	1
A feeling of using a modern medium	1	Contact seemed impersonal	1
A particular question need only be answered once	1	Steep learning curve	2
Information is sent quickly to everyone	1	Lack of time	1
Availability of self-help groups	1		
As good as face-to-face for an understanding of the subject domain	1		
Sharing of experience and expertise	1		
More access to tutorial help	1		
Students could raise problems when they occurred	1		
Program code was more visible	1		
Total	11		6

Two tutors made detailed comments. One tutor felt that the M205-STILE conference could be equally as good as face-to-face teaching, saying *I believe thats in the same way that tutorials provide supplementary teaching by providing an alternative way of looking at things and highlighting particular difficult areas, STILE can and did do the same.*

The second tutor felt that *in many ways, contact seems impersonal, no matter how many smiley icons are used or how much care is taken with how things are phrased.* This view is in contrast with that of some of the students who appreciated the use of icons rather than command-line driven software.

8.7.1 Tutor email interactions with their students

Students had reported that they sent email to their tutor. In order to find out what sort of private interactions tutors engaged in with their students, they were asked in a questionnaire if any of their students had sent messages. Eight of the nine tutors or 89% responded and reported that there was some degree of interaction via email. Five tutors were not contacted very often via email while three tutors were contacted frequently. Six tutors indicated that these emails usually related to TMA questions and submitting late. The seventh tutor said *I have had a number of email conversations including passing program code. Also social exchange and a couple of CHATs.* ' The eighth tutor reported that she had *some requests for help with specific problems in the course work, which the students felt too embarrassed to ask in the tutorial conference. Trial runs of sending messages with files attached - ... I think to avoid looking foolish in front of other students. Early on, checking which conference should be used for which kind of message*. In general, though, the lack of private email between students and tutors suggests that most students who posted messages were very comfortable using the M205 Help and Tutorial conference areas where all participants could see their messages.

8.7.2 Tutors discussing program code with their students

The nine tutors were asked how their students discussed their program code: whether it was via email, over the telephone, or via ordinary mail. Eight tutors or 89% responded. Six tutors (75%) reported that their students used both email and the telephone, the seventh tutor said surface mail and the eighth tutor did not know. The tutors' perceptions of usage of email and the telephone corresponds with the 65% of students who used either one or both of these methods, see figure 8.5. They were asked a separate question related to which of the three methods they found worked best. Three tutors (38%) voted for email as the preferable method of communication (F). Two tutors (25%) felt that the combination of email and the telephone was essential. For example, one of the tutors said *depends on the problem. If a quick reply to a single query was required, often the phone was preferred, and only if I couldn't solve it there and then would I ask for it to be emailed. For more complex problems requiring detailed explanation, or actual sight of code to find an error, email is definitely best*. This corresponds with the students' view that the telephone was a very responsive medium for more minor problems, but that email worked much better for the more involved programming problems. The combination of email, telephone and face-to-face tutorials was important to the sixth tutor: *I have a number of tutorials and day schools and they often ask me questions then. Occasionally over the telephone, a couple of times by email*. Two tutors did not answer this question.

In order to further clarify whether program code was being discussed and if tutors were consulted, they were asked how many times their students sent program code to their personal mailbox, or to their tutorial conference. Again eight of the nine tutors responded. The numbers of messages were small. This corresponded with the tutors' view, that they were not overloaded with messages from their students, although one tutor did mention that it could be time consuming for more involved problems such as non-working program code, see chapter 5. However, it appears from table 8.17 that tutors were getting almost twice as many messages about program code in their personal mailbox as compared to their tutorial conference.

Table 8.17 Number of occasions students contacted their tutor about programming code

	Personal mailbox	Tutorial conference
Tutor 1	0	0
Tutor 2	4	2
Tutor 3	2	0
Tutor 4	3	0
Tutor 5	2	2
Tutor 6	0	2
Tutor 7	2	1
Tutor 8	Didn't answer	Didn't answer
Total	13	7

At the debriefing meeting, Tutor 'B' suggested that students may have used conferencing more to send program code if they had been given instructions on how to send it via conferencing. This tutor had posted instructions in the STILE conference on CoSy (pilot study) but had not received any comments from the other tutors on the usefulness of these instructions. She said *one thing that should have been taken on board was a simple technique for getting bits of code across from the P-system into a message. It dawned on me at one point that one of my students was retyping her program, which was obviously not the best way of identifying bugs in it. It is possible if you get the P-system up in a Windows window, you can cut and paste it across or if they can send it as a file ... It was not well enough explained to students how they could export code from the p-system and send it as an attached file ... the fact that this was difficult, would be one of my criticisms of the system; it could be truly excellent.* Tutor 'G' agreed, saying *in particular with this set up there was the lack of integration between the P-system and the FirstClass system* (a number of tutors agreed with this). Tutor 'C' commented *That's what I didn't get, I was expecting to get code coming over the wire.* Tutor 'D' commented *it was difficult to get code out from the P-system.* The tutors, not having access to the Students common room did not realise that one of the students had posted ad hoc instructions. They also did not know, that students were seeking help with their program code from other students, see section 8.4.1.

8.8 The tutors' perceptions of their students' use of M205-STILE to help with their course work and assessment

This section discusses the tutors' perceptions of their students' use of M205-STILE to help with their course work and assessment. Twelve students reported that their TMA marks had improved to some degree as a result of using M205-STILE, (See section 8.6.1 for averaged data on actual improvements.). To substantiate this, it was important to ascertain the tutors' perceptions about their students' use of M205-STILE and their TMA performance.

The tutors were asked if those of their students who had used M205-STILE had performed any better in their TMAs than the students taking the conventional version of the course. Half of the eight tutors who responded felt that their M205-STILE students had performed better in their assignments than their other students who took the conventional version of the course. Three of these tutors made comments to substantiate their views.

- *Considerably better. It was noticeable that the students who dropped out hardly made any use of M205-STILE.* All of this tutors' students were urban-based.
- *They were not top of the group but those who stayed* online *did well.* This tutor's students, although not based in a totally remote area, lived long-distances from each other.
- *I think generally yes ... I also think I had one student who did less well but contributed quite a bit to M205-STILE.*

Three of the tutors felt that they could not make a judgment, one of these tutors' students was based remotely. The eighth tutor felt that she could not *tell from the marks who was on M205-STILE and who wasn't.* She also could not tell whether being on M205-STILE had made their marks better than they would have been without it.

8.9 Comparing the tutors' views on their usual methods of teaching with those they adopted in the M205-STILE conference

In order to understand what impact the M205-STILE conference had on their teaching style, the tutors were asked if they presented tutorial material any differently online than at a face-to-face tutorial. Although the eight out of nine tutors who responded to the questionnaire agreed that their use of FirstClass did not impinge on their normal face-to-face tutorial. It did however change their style of presentation. Three tutors agreed that they did teach 'tutorial-type' information differently in the M205-STILE conference than at a face-to-face session. One of these tutors suggested that she had to bear in mind in her face-to-face session that she would also be presenting the material online. She reflected more on the material before she presented it. She said that *the information would have to be presented differently in that it would have to be a lot more structured than at a face-to-face tutorial, which I tend to play by ear, relying on input from the students as to how long to spend on any topic.* This suggests that it is difficult to know how long to spend on a particular issue online because of the lack of feedback provided by the facilities available. This tutor also suggested, however, that the M205-STILE conference did illicit a more considered response. She said *if answering questions is considered tutorial-type information, then I don't think there is too much difference, except that in STILE the answer will be more thorough because you are not sure just how much the student needs and you will tend to give more than is perhaps necessary, to be on the safe side.*

Three tutors felt that they *did not really use STILE to present tutorial-type information* except in the case of the extra online course material they had developed. The tutors were actually learning on the job because in retrospect they wished they had presented tutorial-type information online but reported that they were not sufficiently prepared for this type of approach. In fact, two of the latter three tutors suggested that they were not given sufficient time to prepare for this activity because too much emphasis had been placed on preparing the online course material. *I haven't really attempted to "give a tutorial" via FC. Perhaps this is a failure on my part. I personally think that far too much emphasis in the run-up was given to the additional material we were preparing and far too little to how we were going to work.* Therefore it was not surprising that they were not quite sure how to adapt the material they used at face-to-face sessions for this new medium. A seventh tutor referred to the difference in interaction online and how it was more difficult to engage students in the M205-STILE conference. He suggested that *with some more thought we would have been able to facilitate more interaction on the M205-STILE conference.* The eighth tutor agreed that he *thought about questions of style.* The success of the online interaction depended not only on the system itself but also on the tutors' ability to teach in this very different social arena. These comments suggest an interesting phenomenon of over tutoring in the online environment, that is, supplying more information as there is no immediate feedback shaping the interaction.

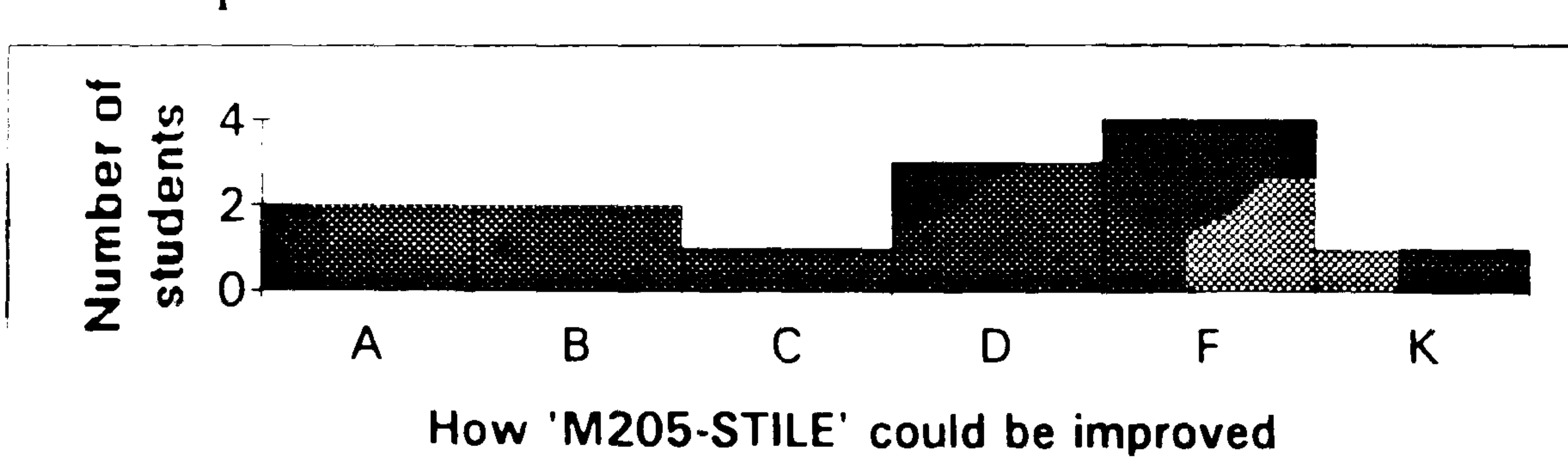
8.10 Improving the online environment

This section includes both the students' and tutors' views on ways in which the online environment could be changed for the future. As users of this type of learning system they were in a position to make comments which would be beneficial to other researchers tackling similar issues. The twelve group one students (see chapter 3) were interviewed at the three-month point in the course. They were asked what they would find helpful to their learning experience on M205 or what they felt was missing from the M205-STILE conference. The six categories corresponded with those found in the analysis of student responses in chapter 6 and are shown in key 8.3 and graphically displayed in figure 8.7.

Key 8.3 Categories for improvement for future courses

A. Communicating with students and tutors
B. 'Hands-on systems' learning (practical experience of online systems, indepth knowledge about networks and general computing)
C. Help with course work and problem solving
D. Online course material
F. A preferable method of communication (for delivery of program code and for discussion of problems on the course)
K. The M205 Help and Tutorial conferences

Figure 8.7 The improvements students would like to see to M205-STILE on FirstClass



Two student responses corresponded to category (A) Communicating with students and tutors. One of these students perceived that a lot of students were lurking and that this was offputting to others. Although it was understandable that some less confident students would feel alienated by technical discussions, it was suggested that the tutors could take more of a lead to encourage students to participate. This student said, *I feel that perhaps people, ... have never sent any messages to the conferences ... I don't think people know what to do to be honest initially, and I think maybe there needs to be some sort of direction from tutors ... I went to university years and years ago when I lived in Shetland and we used to have conference calls, lots of people dialling in together and I'd perhaps anticipated with STILE that you'd have a few people doing the same course but logging in to discuss ... a particular course-related issue. I think that might be helpful. ... There seems to be certain people, as I say, logging in all the time ... I think once you have people getting into very specialised conversations, I don't think people are going to reply, they're too scared to write in [about] something quite basic perhaps.* This comment agrees with the remote student who described herself as a lurker, and suggests that it would be better if lurkers contributed more.

Two students suggested more help with 'Hands-on systems' learning (B) and more time to become familiar with the online system. For example, one student wanted more help with navigation and methods to filter messages: *Possibly the organisation of the messages on the screen and just a little bit of information about what they were. ... whether it actually registers that you've read something already, because sometimes the title looks very similar and you go back to it and you find that you've already read that.*

One student wanted more Help with course work and problem solving (C). He suggested having more information related to each block as one proceeds through the course. *Well I had a bit of difficulty on procedures and things like that, which I'm still having difficulty with now actually.*

Two students requested online course materials (D) which were more related to problems with the TMA questions they had been set, *some program examples would*

help with TMA questions. The second of the two students wanted a range of exercises from easy to difficult. *My feeling is it might be possible to do two levels [of extra materials. If it] ... is not really pointing to my next TMA, it doesn't really interest me ... Information on Booleans was supplied by one of the student's messages. That simple sort of information is useful for me and ... simple ... exercises with the solutions would also give me a starting place.*

Not surprisingly, two of the four students who responded about the preferable method of communication (F) commented that future environments should improve the speed of response. One of the students wanted a vast improvement in local call access which was not good enough. He said *I think really the local contact number ... is a real pain.* Another student suggested that the introduction of one or two face-to-face meetings and photographs of individuals would be beneficial. This students' comment requesting a face-to-face meeting supports Steeples et al.'s (1993) suspicion that an early face-to-face meeting was essential for participants to get to know each other.

The M205 Help and Tutorial conferences category (K) was valued by one student who said *you've got like the sort of extra materials and then there's the tutorials and then there's the sort of general help thing.*

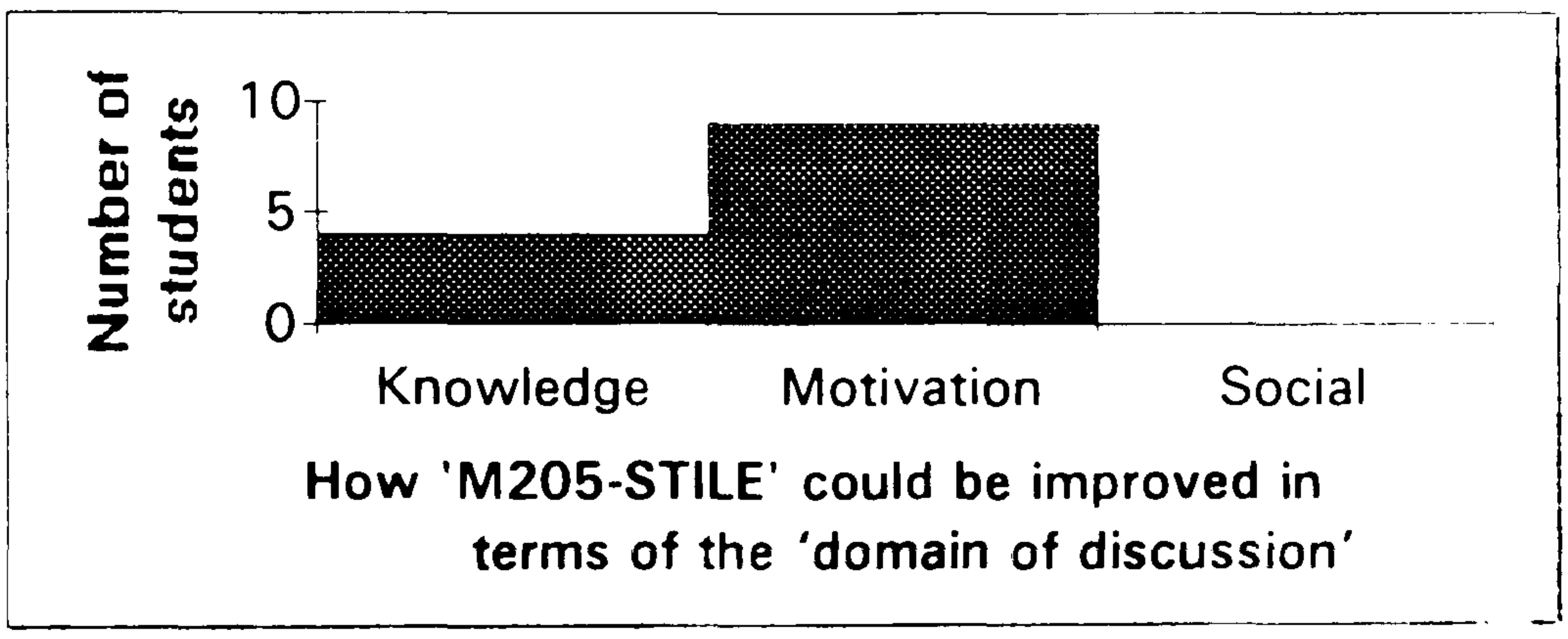
Two students reported that no improvement was required because the combination of the extra materials, the tutorial conferences and the M205 Help conference worked well. *I mean it seems to be set up pretty well ... It's really all there. I've never thought, "I wish they had such and such".* This suggested that the structure was good. However one of these students agreed that more people making contributions would be advantageous. *I actually think it caters pretty well for what I want. Perhaps a lot of people are like me and won't contribute and tend to browse round the system. Perhaps it would be better if people put more questions into the system. No I don't think there's anything terribly missing.*

The six categories in key 8.3 were further analysed to ascertain how they corresponded to the 'domain of discussion'. The categories corresponded to the 'domain of discussion' in the same way as in the previous analysis, but to different extents, see table 8.18 and figure 8.8.

Table 8.18 How improvements to the M205-STILE conference environment corresponded to the 'domain of discussion'

Knowledge	Motivation	Socialisation
Communicating with students and tutors.	'Hands-on systems' learning	Social interaction
Help with course work /problem solving	Online course material	
The M205 Help and Tutorial conferences	A preferable method of communication	

Figure 8.8 How the M205-STILE conference could be improved in terms of the 'domain of discussion'



The knowledge domain rated at half the importance of the motivation domain in this analysis of data collected at the three-month interval. This suggests that provision for the Knowledge domain could be improved but the motivation domain needs to be more prevalent in future online environments. The lack of the social domain appears to indicate that it has been catered for adequately by the Meeting Place conference and sub-conferences. This suggests that improvements do not need to be made to the social domain.

The tutors were also asked for their independent opinions in questionnaires about how they would improve on the M205-STILE conference model on FirstClass, having the IMF, separate tutorials, a free-for-all Help conference and course materials online. Three tutors felt that the balance was about right. *I think the STILE model is fine for supplementing existing teaching.* Two tutors mentioned the need for critical mass in all areas to encourage interaction. Other points raised were:

- the need *to make the whole involvement integral to the course and award marks,*
- having *a means of getting more participation by the students,*

- having *all course documentation such as stop press ... online,*
- supplying *initial help in getting started with the software.*

The tutors' opinions on the issue of critical mass were sought at the end of project debriefing. It was suggested that a critical mass of students was very important to sustain a tutorial conference. Tutor 'D' commented *I think you need a critical mass for a discussion* [general agreement among the tutors that you need a critical mass]. Tutor 'F' responded *I'm slightly heartened by that actually.* Tutor 'G' commented *I think you do need a critical mass of students in a tutorial conference to get it moving and I had seven students and later another one was added and it just wasn't enough ... the lack of numbers online made the tutorial conference dead.* Tutor 'D' said *I think this point about the critical mass is quite important. You need a large enough body of students contributing to a conference to make it work ... they are communicating and that is the important thing. But that's taken all year so how do we get them to that state earlier so we can make a genuine educational use of the facility earlier on? A year is not a long time.* This tutor agreed that after this first experience his students would probably make more use of a similar facility if it were available on their next course. Most tutors were in agreement. These comments were related to the need for a critical mass of students and support the suggestion made by Hiltz (1995) that a conference needs at least ten active participants to sustain a lively debate.

The tutors remarked on the need for a critical mass of students in the tutorial conferences. They generally agreed that one tutor to approximately twenty-five students worked well with face-to-face tutorials but this was not necessarily the optimum for electronic tutorials. Tutors felt that it would have been helpful to start the students even earlier, as one of the tutors put it *how do you get the students familiar with the culture before they actually start using it in earnest?* They agreed in future that it would be more beneficial to have two or more tutors per conference and include all of their students to give the critical mass necessary. All nine tutors had been given time to become familiar with the facilities and were given a briefing and training session before the students came online. Perhaps, though, they did not give their students enough guidance and support to facilitate collaborative activity. The training had included examples of how to use the medium for learning and teaching. It may have worked better if the tutors had been given ongoing support or a longer training session in advance of working online.

The tutors were asked at the debriefing meeting, 'if you were taking part in a follow-on year with similar numbers, would two or three tutors per tutorial group be a better solution than individual tutorials?' Most tutors agreed that this seemed like a good way forward and tutor 'G' suggested that it might be beneficial to introduce the different conferences more gradually. This suggests that the role of the IMF in gradually building up the environment and revealing sub-conferences would be crucial here. The IMF had been able to carry out this function in a number of ways.

1. By making the extra online material available in a staged approach, i.e. making the material for each block of study available at the relevant time.
2. By responding to student feedback and allowing read-only access to all tutorials.
3. By taking message approval away from conferences at an appropriate time.
4. By being available and approachable to implement considerable changes.
5. By being technically skilled and familiar with FirstClass and so able to use a subset of the administrator's tools to design and improve the M205-STILE conference environment throughout the course presentation.

8.11 A synopsis of the findings relating to a comparison between CMC and conventional methods of teaching at a distance

Attendance on the M205-STILE conference compared very favourably with attendance at face-to-face tutorials. The availability of FirstClass on a 24-hour-a-day basis encouraged most students (84%) to be active every week on the online system as compared to 63% attendance at some or all tutorials. Sixty-nine per cent of the students who attended every tutorial were still avidly using the M205-STILE conference on a more than once-a-week basis. This finding supports Hiltz (1995) who found that students who used CMC participated more in the course and their ability to express their opinions on the course improved, and Mason (1990) who said some students spent more time studying when they used CMC. More than two-thirds of the students reported that the computer conferencing provided by the M205-STILE conference was valuable to their study. These students' opinions, on the value of the online environment, are in contrast with those reported by students taking an arts course in the previous year. The arts students were using a different conferencing system but in terms of value, only one-third of the respondents said that conferencing provided enormous benefit while two-thirds had medium to strong reservations, see Mason (1995b). The apparent increase of 36% reported here, over Mason's (1995b) finding is encouraging. Also in contrast with the findings in this chapter, Matthews (1999, p.3) reported on a survey carried out with School of Education students, that 'only about one-third said they would welcome electronic conferencing for tutorial support while nearly half felt uncertain'. The report concludes (p.3) that students 'do not want more electronic contact at the expense of face-to-face tutorial contact'. However the students in this research took advantage of both the M205-STILE conference and face-to-face tutorials. Forty-seven per cent valued the M205-STILE conference to assist with their study while 21% valued face-to-face tutorials. Students said that computer conferencing allowed them to engage in group problem solving over a longer time period than could be achieved at face-to-face tutorials. They could consult their peers and tutors on a more regular basis than by the traditional methods. The online medium appeared to be causing the students to raise deep issues related to the computer science course. This is appropriate since the medium of CMC encouraged participants to give a more considered response. Therefore it seems that the CMC is suitable for the domain of computer science for more involved questions which take more time to answer than for shorter questions which require an immediate response, where the telephone or face-to-face tutorials are more appropriate. A more immediate response could be introduced using the synchronous chat facility. Students and tutors could meet at particular set times and use newly available facilities such as a white board and voice conferencing. This suggests that M205-STILE on FirstClass did provide support for distance learning computer science students.

The provision of the M205-STILE conference was reported as 'vital' for remote groups. However remote, rural- and urban-based students found the M205-STILE conference valuable and were good attendees online. The four group three students valued being able to watch what was taking place online. The most important benefit categories present in the analysis of the group one students were:

A. Communicating with students and tutors,

C. Help with course work and problem solving,

F. A preferable method of communication,

It is heartening to find that these are three of the four original categories identified in chapter 6. In terms of benefits, the knowledge domain rated at two-thirds the importance of the motivation domain.

In terms of the value of the M205-STILE conference, the indepth interviews with the students indicated that the motivation domain rated at one-third the importance of the knowledge domain. This analysis of the motivation domain, taken at nine-months with the group three students, agreed with that collected at six-months in terms of the students' expectations. The social domain had not really featured in chapter 6, but seemed slightly more prevalent in the indepth interviews analysed here. The social domain was more evident in chapter 7 where interpretation of the naturally-occurring online interactions was the analysis method used rather than analysis of user opinions.

Email and the telephone were complementary methods of communication. Little use was made of ordinary mail or face-to-face tutorials. Email was better for a more tailored response while the telephone was preferred for a more immediate response. Email made program code more visible and facilitated dialogue better than the telephone or ordinary mail. However students felt that the telephone dealt with the nuances of program code better and this needs further investigation. Email was available 24-hours-a-day as compared to having to post a letter or wait for a convenient time to use the telephone. The ability to attend every week online appeared to motivate students to be more active and sustain their participation. Although they were not given formal instructions, 48% of student respondents used of the online environment to send their program code. Students appeared to contact other students about their program code in preference to contacting their tutor. This could have been as a result of the perceived availability of their tutor as compared to other students. Face-to-face tutorials were valuable for an immediate response to a question where aural and visual cues added to the dialogue.

M205-STILE afforded a support structure for students who would otherwise have been studying alone. Twelve M205-STILE students, a quarter of the respondents, perceived that they performed better in their assignments as a result of using M205-STILE. Six of these latter students felt that there was a marked improvement while three felt that there was a fractional improvement. An additional three students could not measure the improvement. M205-STILE students performed slightly better on average in their assignments and exams than their counterparts taking the conventional version of the course. Also four of the eight tutors perceived that their M205-STILE students achieved higher grades in their assignments and their exam, than their students taking the conventional version of the course.

The tutors valued face-to-face tutorials to enhance their teaching more than the M205-STILE conference as this was the method they were used to. Visual and aural feedback were important indicators of their students' level of understanding. They felt that it was valuable for students to meet other students and participate in group work. However M205-STILE was reported as good for responding to specific questions. The tutor responses appeared to indicate that they were waiting for the students to be proactive rather than they themselves taking the initiative. Tutor training needs to highlight this issue and guide the tutors to be more proactive facilitators.

The tutors were very much in favour of face-to-face tutorials and rated the advantages against the disadvantages on a ratio of 5:1. In the case of the M205-STILE conference they seemed less decided with advantages versus disadvantages on a ratio of 6:3. The advantages of face-to-face tutorials which rated most highly were:

- more visual and aural feedback,
- tutors could ensure concepts were understood,
- interaction was more immediate.

One tutor remarked *conferencing is a big step forward in distance learning and definitely has a place in student support, but from my experience, most students need a prop, the tutor, and that tutor needs to be seen! ... I feel students still need to be offered face-to-face support as distance learning involves more than just delivering facts over the network.* Another tutor mentioned that *the students need to see more* *positive advantage (or compulsion?) to get them started.* The tutors believed in the need for face-to-face teaching.

The one disadvantage mentioned by the tutors was that face-to-face tutorials tended to be too tutor led. Although the tutors cited six advantages to the M205-STILE conference, two of the main disadvantages confirmed what they found good about face-to-face tutorials:

- a lack of aural and visual cues, and
- interaction was not immediate, follow-up questions needed to be asked.

When asked about the good and bad points about the M205-STILE conference in isolation (that is, without a comparison with face-to-face tutorials), the tutors rated the good points almost twice as much as the bad points. This suggests that when the issue of face-to-face tutorials is taken out of the equation, the tutors are more favourable about the M205-STILE conference's advantages to teaching.

The tutors would have liked more time to adapt to teaching in the online medium and felt that too much time had been concentrated on preparation of the online course material. With regard to private email interaction with students, three of the tutors were contacted very frequently while five received occasional emails. The majority of email messages were related to TMAs and late submissions. (Electronic submission of TMAs now occurs at the OU.) This lack of email messages to tutors is not surprising as the students appeared to be asking other students for help in the M205 Help and tutorial conferences. The tutors saw the combination of email and the telephone as complementary methods to discuss program code; this corresponded with the students' opinions.

The main findings reported here are related to how the M205-STILE conference provided A preferable method of communication. (F). This use of new technology provided a better way to discuss program code and course-related problems. In contrast with these findings, Soloway and Norris (1998) reported that 'it is not obvious how technology can be used in new ways to address age-old problems'. Indeed FirstClass provided a preferable method of communication to the telephone and ordinary mail for describing more involved programming problems. Students appeared to value the M205-STILE conference to help them with their study more than the traditional methods available to them. By contrast, the tutors valued face-to-face tutorials in preference to the M205-STILE conference for their teaching. Perhaps the tutors felt more confident in the face-to-face situation.

The findings in this chapter related to improved communication are in contrast with Mason (1989b) who found that students taking the DT200 course reported midway through that conferencing was less effective than the traditional methods for contacting their tutor (48-53%), getting help (60-66%), and socialising (72-79%). However the findings complement Hiltz's (1995) finding that students had a 'better' experience, and learned more about the course in the virtual classroom, as compared to those students in the traditional classroom.

Mason (1995) proposes that 60% of students using computer conferencing should be considered a high take up. Therefore the M205-STILE conference, with fifty-three per cent of the students still active at the end of the M205-STILE conference presentation, could be considered successful.

Chapter 9: Conclusions

9.1 Overview of contribution

This chapter brings together the most important conclusions from the thesis. The aim of the thesis is to investigate the use of structure in CMC environments for learning, in particular CMC systems, which include 'online course-related content'. To this end, the thesis used two studies of an undergraduate computer science distance course to investigate in detail the use of structured CMC environments by both students and tutors. The first theme of the thesis concerned the structuring of online environments and an investigation of the possibilities of using conference structures to improve navigation and organisation. The second theme of the thesis investigated the likely benefits of such structuring. Categorical analysis was used to see whether this structure was beneficial to students. The contributions of the thesis (which will be considered in detail in a moment) relate to the following areas.

- Issues and problems that arise when CMC is adopted for distance learning were identified.
- The effects of various types of structure on the identified problems were investigated.
- A new support role was identified which allowed tutors to focus on tutoring.
- This new support role was introduced and investigated.
- Qualitative analysis was undertaken to explore the effectiveness of the structures in the two studies.
- Revised structures were devised and their effects investigated.
- An interpretive approach influenced by grounded theory was adopted for deeper analysis of one of the studies. This was undertaken to understand the benefits gained for learning from such structuring and supplementary support for a CMC environment.

In order to discuss the contributions, they have been divided up under three headings.

- Contributions to the practicalities of CMC research.
- Contributions to educational CMC research.
- Contributions to evaluation research.

9.2 Contributions to the practicalities of CMC research

This section will consider the contribution of the thesis in the area of practicalities of CMC research. These cover two principal areas, navigation and support.

9.2.1 Navigation within CMC structures

Practical navigation problems were identified in the pilot study. Analysis showed these problems to arise principally from the flat limited-level structure imposed by the software and demonstrated that this structure was unsuitable for most CMC purposes. However, it was demonstrated that a suitable naming convention could render such structuring usable for small conference structures. In the main study, it was shown that five measures taken together were sufficient to alleviate most of the navigational problems identified in the pilot study. These measures were: moving to a more flexible, hierarchical structure; careful consideration of naming conventions; use of iconic metaphors; practical exercises to introduce the students to the structure; and provision of appropriate supporting documentation. Participants actively reported finding the documentation of areas of the conference structure and practical activities helpful. These findings gave concrete evidence for unsupported suggestions made by Velayo (1994) that it is important to indicate the appearance of the structure, how it will work and its purpose. Given these structuring methods, it was found that, in general, students could:

1. navigate through conferences and sub-conferences to the information they needed,
2. visualise the structure, reducing the need for reliance on memory,
3. quickly adapt to the structure, irrespective of technical or non-technical background,
4. acquire information-handling skills to filter information, using message title, message content or by shadowing individuals.

There was suggestive evidence that the structuring methods itemised above eased navigation and helped students to avoid a variety of problems reported elsewhere. For example, in the main study messages did not appear to be posted in the wrong conferences except on initial usage of the system. Interestingly, this finding runs counter to those reported by others, using a wide variety of systems, who found messages in the wrong place (Alexander and Lincoln, 1989; Grint, 1989; Owen, 2000; Okamura et al., 1994; Thomas, 1989; Mason, 1989a).

However, when students ventured outside the structure devised on First Class they became confused and soon lost their orientation. This finding related to areas outside the adopted structure provides evidence to support similar findings related to the use of the Web by Langenbach and Bodendorf (1997).

From a practical point of view, the use of flexible software, a suitable conference structure and an accompanying handbook appeared to solve difficulties with navigation and the occurrence of messages appearing in the wrong conference. This thesis has shown that the use of structuring in CMC environments can help to reduce these problems. Generic guides are now supplied by the OU to its students and these have built on the handbooks supplied by the IMF to the M205-STILE participants.

9.2.2 Support within CMC structures

This section considers the identification of the need for, and creation of, the IMF role to support educational CMCs. This role was defined clearly for the first time in this thesis. In the past, researchers and practitioners tended to allocate too many roles to the tutor. Tutors tended to become confused about their role and overloaded with work. To overcome the confusion about the tutors' role and to provide them with adequate support the Interactive Media Facilitator (IMF) role was identified and developed. The tutors reported that the IMF's role in the M205-STILE conference was crucial for their own and their students' successful use of FirstClass. They the tutors were able to concentrate on the teaching of the course. Indeed the tutors' workload was less than they had expected and this was attributed to the role of the IMF and the IMF's structuring of the M205-STILE conference. The IMF was only dealing with one course, but was a forerunner to Seufert's (2000) 'host' who dealt with a number of courses. The role of the IMF was particularly valuable in the first three-months of the course. This suggests that in the future the IMF could support three to four courses if each course started at three or four-month intervals.

The role of the IMF has been adopted in the OU in various forms to support the use of FirstClass since 1996. Since that time, the software has become less technically demanding from a support perspective. This change, together with the adoption of the generic guides mentioned above, has meant that the IMF role has changed. The role has become less technical and concerned with the design of the conference area and the provision of ongoing support during the presentation of the course. In this new form the role has been carried out by:

- subject specialists in the OU library, and
- course managers in various faculties, especially in the Institute of Educational Technology and the Science faculty.

Indeed, Seufert (2000) refers to the role of a Content Manager/ 'Librarian' in her 'Campus Community'.

At the present time (mid-way through 2002) the Open University is investigating a possible replacement for the FirstClass system. When new software is adopted the IMF's role could revert back to being more of a technical role and include the development of generic guides. This latter description is more in keeping but not wholly related to Seufert's (2000) host rather than Seufert's (2000) Content Manager/ 'Librarian'.

9.3 Contributions to educational CMC research

9.3.1 The conceptual framework

Researchers have not previously defined a generalisable framework to guide the design of conference structures for education. One goal of this research was to contribute to an empirically grounded basis for understanding the effects and benefits of structuring educational CMCs. A taxonomy of classifications was developed, taking into account the variety of elements found in the CMC literature. The three broad dimensions of this taxonomy identified and proposed for classifying interaction types are as follows: participants (understood to mean participant pairs), relationships and 'domain of discussion'. These three dimensions of online interaction can be decomposed as follows:

Participant pairs

learner-and-tutor

learner-and-course team member

learner-and-learner

tutor-and-tutor

Relationships

one-to-one

one-to-many

many-to-many

Domain of discussion

Knowledge

Socialisation

Motivation

This conceptual framework has been put to two practical purposes in the main study. Firstly, it was used to guide the IMF in the development of the broad conference structure in the main study. Secondly, it was used to organise the fine detail of the different discussion areas within the CMC structure. The conceptual framework is a generic approach which only becomes course specific in the final stages of planning when the types of discussion area are being selected for a particular course. The structuring of the M205-STILE conference in FirstClass, which resulted from the application of the conceptual framework, was perceived by participants to have various positive effects. For example, one of the outcomes of using the conceptual framework for the M205-STILE conference was that the tutors and students in the main study (FirstClass) did not feel overloaded with messages and felt that the conference structure contributed to this eventuality. A strategy that appeared to be particularly effective for reducing overload was the use of the structure to separate course-related dialogue (knowledge) from social chat (socialisation) in the main study. Students and tutors appeared to become conscious of the varying relevance of messages to the online group: i.e. to the group as a whole, or to specific individuals.

9.3.2 Qualitative findings relating to the 'domain of discussion' dimension

In this section, various qualitative findings related to the main study on FirstClass, are considered. These have been organised according to the 'domain of discussion' dimension of the theoretical framework. In particular this section considers the extent to which students benefited or failed to benefit from different structuring measures in various expected and unexpected ways. Practical conclusions are drawn for the future development of educational CMCs.

9.3.2.1 Social domain

In accordance with the theoretical framework, the social aspect of the 'domain of discussion' was catered for by the Meeting Place sub-conference, and its sub-conferences aimed at specific groups of participants. The Meeting Place was used, as expected, as an area designated to support social activity for all participants. It appeared to sustain participation, being especially important at the beginning and at the end of the presentation. Students first got to know each other in the Meeting Place sub-conference. Only after this initial bonding did they engage in course-related interactions in the tutorial and M205 Help sub-conferences. Playful banter in the Meeting Place also appeared to help sustain the students during their revision period.

9.3.2.2 Knowledge domain

In line with the conceptual framework, the knowledge 'domain of discussion' was represented by the tutorials and the separate free-for-all M205 Help sub-conference. Both the tutors and the students reported that these two areas were well balanced. The small private tutorial groups were familiar to students and were tutor led. These were supplemented with the M205 Help area which contained the whole cohort of students and some members of the course team. This was an area where the students had autonomy and could organise their own interaction. The M205 Help repository could be improved if the students all contributed to it and treated it as a group asset. In this way it would reflect the group as a whole. The findings suggest that there is a need to accommodate both small and large group formation within a CMC structure.

A critical mass of participants in the tutorial sub-conferences did not necessarily mean more interaction. However read-only access to the tutorial sub-conferences in M205-

STILE appeared to give a feeling of critical mass, though contributions were made within small tutorial groupings. This change to the environment is similar to Okamura et al.'s (1994) local news groups. These gave the impression of small group discussion areas, though in Okamura et al.'s (1994) environment the news groups were not in fact private areas, as all of the participants could read and contribute to them. The author suggests that the strategy adopted for M205-STILE was more appropriate as otherwise the tutors' workload would have been increased.

It proved helpful to allow all of the students' read-only access to all of the tutorials, something that had been requested by two students. Instead of solely interacting with their own tutorial group, students could watch the interactions of other students and tutors. One outcome was an opportunity for some students to shadow the activities of other students. Another outcome was the opportunity to experience different teaching perspectives on the course, which supports the findings of Wegerif (1998). Having the tutorial sub-conferences open for reading appeared to add to the feeling of critical mass, but as tutors could not be contacted by students other than their own, this approach did not overburden them. The identification, trialing and success of this approach (Wilson 1995a), which combines the benefits of small groups without losing the advantages of access to the whole cohort of students, has subsequently been independently noted by McConnell (2000).

There appeared to be a number of reasons why the busiest tutorial remained active throughout the year, while the quietest tutorial became inactive approximately one-third of the way through the course. Firstly, in the busiest tutorial, students sent equal numbers of messages to their tutor and to other students. By contrast, the students in the quietest tutorial only directed their messages to their tutor, not to other students. Secondly, social messages were very prevalent at the start of the year in the busiest tutorial. However at the end of the presentation, the messages in this tutorial were divided in equal proportion between the knowledge, motivation and socialisation aspects of the environment. By contrast, the student messages in the quietest tutorial were only related to the knowledge aspect of the environment. Thirdly, from the outset, the students in the busiest tutorial appeared to be a more cohesive group than those in the quietest tutorial. There was a smaller number of students in the quietest tutorial, but looking at the tutorial sub-conferences overall, the number of students in a tutorial group was not the only factor which affected activity, as discussed in chapter 5. The lack of activity in the quietest tutorial was more likely to be a result of the absence of any social interaction between the students in this group. The busiest tutorial appeared more successful than the other tutorials, even though message approval was in use, because the tutor was online frequently enough to approve conference messages. The use of message approval in other areas appeared to stilt activity as students could not read messages until they were approved. It appeared to be important from the students' point of view to have equal proportions of the knowledge, motivation and socialisation aspects of the environment for a tutorial sub-conference to remain active. Analysis of tutors' behaviour showed that interactions in all three domains of discussion again featured in the busiest tutorial, but with less emphasis on the social domain.

The M205 Help sub-conference was devised as part of the support for knowledge building. As intended, dialogue related to course work started in earnest in the M205 Help sub-conference in the second-month of the course presentation. This area remained active and was more important after three-months when the tutorials became less active. Socialisation only featured to a small degree in this area.

9.3.2.3 Motivation domain

The final 'domain of discussion' for consideration of the qualitative findings is the motivation domain. The motivational aspect of the 'domain of discussion' dimension was supplied in the M205-STILE conference by the course materials area. Students were expected to discuss the course materials in their Tutorial sub-conference. There was a lack of discussion about the online course materials. This finding suggests that a suitable discussion area for the course material was lacking in the design of the online structure. A change that could be made to the structure is the inclusion of a discussion area which is attached to each block of course material on the bulletin board.

9.3.3 Qualitative findings relating to the 'participant pair' dimension

In this section, various qualitative findings relevant to the 'participant pair' dimension of the theoretical framework are considered. The 'participant pair' dimension of the structure used for the M205-STILE conference appeared to allow students to benefit from interacting with other students rather than just their tutor and their own tutorial group. Remote, rural- and urban-based students benefited from contact with other students and tutors. The tutor-tutor participant pair interactions were not well focused either in the initial structure, or in the subsequent restructure of the STILE conference in the pilot study. It was only when a small conference structure focusing specifically on the course materials was devised, that the tutor-tutor relationship started to become productive. Most of the significant qualitative findings relevant to the participant pair dimension relate to the learner-learner and learner-tutor interactions (rather than to the tutor-tutor interactions). Therefore the findings from these two particular classes of interaction will now be compared.

9.3.3.1 Learner-and-learner versus learner-and-tutor interaction

Students rated their contact with their tutor as more important than their contact with other students. However they rated interactions with other students as more helpful to their learning. For example, in questionnaire responses thirteen per cent more students rated their interactions with other students as more important than interactions with their tutor. Also in indepth interviews, twenty per cent more of the students felt that they got good support from other students rather than their tutor. Indeed students also appeared to contact other students about their program code in preference to contacting their tutor. The tutors did not receive many emails from their students and this appears to confirm the impression that students were contacting other students rather than their tutor.

The learner-and-learner interaction involved:

- a small amount of collaboration about course material,
- interaction about course issues, for example problem solving,
- discussion of Tutor Marked Assignments (TMAs),
- discussion of program code,
- dialogue with students on other courses, and
- socialisation.

The learner-and-tutor interaction involved:

- collaboration about course material,
- interaction about course issues, for example problem solving,
- discussion of (TMAs), and
- discussion of program code.

9.3.3.2 Learner-alone

An unexpected finding was that self-learning was taking place in the M205-STILE conference. For example, students who used the structure to shadow the activities of other students found an improvement in their understanding that had previously alluded them. They could follow activity in the M205 Help sub-conference, but the addition of read-only access to all tutorials also allowed students to shadow other students through watching the question-and-answer sessions taking place. For example, one student mentioned how she filtered messages by shadowing another student. Also, in indepth interviews, two out of four students admitted that they shadowed other students' activities but did not interact with other students. This suggests that certain students have an expectation of not having to communicate with other participants. These findings build on the suggestions by Berge (1995 and 1996) that students do learn as a result of lurking. These comments on shadowing suggest that further research should be undertaken into how such shadowing is taking place and how beneficial it is.

The structure of the conferences facilitated singular study with the course materials rather than collaborative study. Perhaps this should not have been surprising as students had only been expected to collaborate informally about the online course material in their tutorial sub-conference and the traditional version of the course promoted independent study. The learner-alone interaction involved:

- shadowing the interactions of other students,
- using the course material supplied on FirstClass for singular study rather than involving interactions with other students.

The new online interaction type of 'learner-alone' thus needs to be added to the 'participant pair' dimension of the conceptual framework. In one clear sense the 'learner-alone' is not a participant pair, but the 'learner-alone' in the cases being considered is either shadowing the activities of other students or interacting with online course materials. Hence, depending on the view taken of this proposed extension of the taxonomy, the name of the dimension might need revision.

Participant pairs

learner-and-tutor

learner-and-course team member

learner-and-learner

learner-alone

tutor-and-tutor

9.3.4 Qualitative findings relating to the 'relationships' dimension

The 'relationships' dimension did not emerge to any great extent in the analysis. Indeed there appeared to be a gap between the students' expectations of group work (many-to-many) and their actions. Fifty per cent of the students reported an interest in group work, but there was little evidence of group work taking place in the tutorial sub-conferences. A small number, however, did indeed initiate collaborative work via email (one-to-one and one-to-many) and therefore there is an opportunity to find ways to encourage more participation of this sort. Certainly there has been a tendency in computer science courses in recent years for online group interaction of diverse kinds to be required of students, so that the dimension appears to have a useful role to play in characterising and analysing such activities in the future. This concludes the discussion of contributions relating to the conceptual framework.

9.3.5 CMC versus conventional distance teaching approaches

In this section, consideration is given to the qualitative findings relating to the differences and similarities between educational CMC and conventional distance teaching approaches. Tutors and students agreed that email and the telephone were complementary rather than competing mediums. However, FirstClass provided a better method of communication than the telephone or ordinary mail to discuss problems and program listings. Email was available 24-hours-a-day as compared to posting a letter or waiting for a convenient time to use the telephone. In areas where face-to-face tutorials were not available or students could not attend tutorials regularly because of their occupation, these facilities were essential. There were four main benefits of structured conferencing as compared with conventional distance learning practices

1. The M205-STILE conference on FirstClass was good for problem solving. Students could raise problems when they occurred and had a longer timeframe in which to solve their problems as compared to traditional methods. They reported that the M205-STILE conference allowed them to participate in group problem solving which could not be achieved at face-to-face tutorials. This runs counter to the findings of Davies (1989) who reported that structured communication tasks such as problem solving were not wholly effective in computer conferencing.
2. FirstClass provided considerable added value for learners to discuss program code by making the code more visible. Although they weren't given formal instructions, 48 per cent of students made use of the online environment to send program code electronically. Email was better for facilitating dialogue about program code than the telephone or ordinary mail. For example, students didn't have to scribble down responses about their program code but instead could concentrate on the errors in their code.
3. Students could raise and exchange complex and deep issues related to their computer science course using the M205-STILE conference. The CMC medium was better for a more tailored response to queries than the telephone. For example, students who chose to help other students had time to reflect on their own understanding before making a response.
4. The M205-STILE conference made it easier for remote students to learn from interactions with their peers, as in normal circumstances they would not have such access.

It had been anticipated that students would receive rapid feedback from tutors. Unfortunately this was one area where the M205-STILE conference on FirstClass did not work as well as expected. In fact the telephone worked much better for rapid feedback.

The three principal benefits that structured conferencing provided for the tutors, in comparison with conventional distance learning practice, emerged.

1. M205-STILE allowed the tutors to expand their range of teaching styles for the benefit of the students. They presented tutorial-type information differently than at face-to-face sessions.
2. The tutors as a group particularly valued M205-STILE, because they had better contact with, and could give extra support to, their remote students. They also appreciated the benefits that the CMC brought to their students' understanding, even when they were based in urban or rural areas, and could also attend face-to-face tutorials.
3. The tutors had more time to reflect before they responded to student queries and could give a more considered response.

The tutors also reported a number of smaller benefits.

1. Tutors only had to answer a question once, as the response was read by many students.
2. Students could interact with each other.
3. Students were part of a community rather than working in isolation.
4. There was an opportunity for students to receive a quick fix solution.
5. There was a feeling of using a modern medium.
6. Self-help groups were readily available.
7. CMC was as good as face-to-face for understanding of the subject domain.
8. Students could share experience and expertise.
9. Students had more access to tutorial help.

However, from the tutors' point of view, FirstClass was not good for easily ascertaining if a tutor's response to a student query had been appropriate or not. Nevertheless, the findings confirmed the value of better access to both other students and tutors. This parallels the findings of Hiltz (1995) who said that students who used CMC found it easy to access educational experiences and reported improved access to their tutor, although Hiltz did not address improved access to other students. An additional finding from the research reported here was that, given the structures and support of the IMF, there were no outbursts of flaming. Work elsewhere, for example by Davie (1989) suggests that this is unusual for conferences of a broadly similar type.

9.4 Contributions to evaluation research

Formative evaluation was used for the development of the structures in the two studies. Qualitative analysis was used for the evaluation of the effects of the structures on individuals, and an interpretive approach influenced by grounded theory was used for deeper analysis into the benefits of conference structure for student learning. The research instruments were iteratively refined throughout the main study. To the author's knowledge, previous research in the area of CMC has not used an approach influenced by grounded theory to compare actual activity in conferences with participants' perceptions of activity.

The findings in the main study indicated that, when an approach influenced by grounded theory is used, it is possible to make use of the rich data available in online conferences in its own right, and to compare findings from this source with student perceptions. Comparisons have been made between diverse aspects of the data using the same categorical analysis. The categories used provide useful and important baseline information for future research. The following categories first emerged in chapter 6 and remained important even though the overall number of categories increased from nine initial categories to sixteen categories in chapter 7:

A. Communicating with students and tutors,

C. Help with course work and problem solving, and

F. A preferable method of communication.

These most dominant categories, which emerged from grounded theorising, should be tested further using more formal methods.

The a priori category based on the 'domain of discussion' dimension of the conceptual framework was used for analytical purposes to supplement the categories that emerged from the grounded theory approach. Data analysed in this way were used to supplement qualitative data gathered from questionnaires and analysis of students' actual behaviour. One finding of methodological interest was that significantly contrasting but complementary pictures emerged from these different data collection instruments, to such an extent that a combination of such different instruments appears to be essential to ensure adequate triangulation of data in studies of this sort. Below, examples are given which illustrate the need for this kind of triangulation.

Social interaction was not reported as prevalent when the students' own opinions were sought, which was in contradiction to actual activity. It appears that students were reluctant to admit how beneficial they found the social aspects of the environment. Indeed, when the students' opinions as self-reported in questionnaires were analysed according to the categories emerging from the grounded theorising and then mapped into the 'domain of discussion' dimension (knowledge, motivation and socialisation) using the mapping discussed in chapter 6, the knowledge domain appeared to be the most important, rating between 46% and 73%, with the motivation aspect between 26% and 54% and the social aspect between 0 and 2%. By contrast, when students' opinions from indepth interviews were analysed and *allocated to the 'domain of discussion' dimension* the knowledge and the motivation domains rated on an almost equal footing. This suggests that the indepth interviews were able to tease out different information compared with the questionnaires, and supports the need for the use of different techniques.

These two contrasting measures of students' perceptions (from questionnaires and interviews) are contrasted yet again with students' actual behaviour. For example, the categorisation of naturally-occurring interactions in the four sub-conferences suggested that the knowledge aspects comprised between 8% and 100%, motivation between 0 and 33% and socialisation between 0 and 80%.

9.5 Limitations of the research undertaken

Computer science students and tutors were involved in the main study rather than students and tutors from different disciplines. The students actively involved in the study collectively accounted for only 3% of the target population. Qualitative research including grounded theory is often criticised for providing data that are very detailed and not easily generalisable: in this work, the categories were peer reviewed in publications and then refined over time through comparison with data collected with different instruments. This thesis has generated theory rather than tested theory. The validity of the important categories that have emerged could be tested using more formal approaches in further research, as indicated in the section above.

9.5.1 Limitations of the two studies

The participants involved in the two studies were a non-random sample because of certain constraints on the project, detailed below. These self-selecting volunteers were keen to be involved and therefore there is bound to be some sample bias. The pilot only involved tutors not students. Staff tutor approval had to be sought prior to contacting possible tutors and at that point students were half way through their course. This study, therefore, only involved interactions between tutor-and-tutor. The study focused on the usability of the CMC software and the structure adopted.

The main study involved both tutors and students. Therefore, the learner-to-learner relationship and the learner-to-tutor relationship could both be investigated. The students had to be allocated to the tutors within a regional area in the usual way. The students were also required to have a computer, which would accommodate the CMC software selected, a telephone line and be willing to pay their telephone bill. The numbers involved were restricted by the limitation on the amount of modems that could be supplied. However supplying the students with a modem ensured that the selection was not merely those computing students who already owned a modem and had experience in its use. Temporal analysis, which involved 'interpreting naturally-occurring interactions', was carried out in the main conference areas in M205-STILE on FirstClass. However some sub-conferences may merit comparison with those investigated using the same categorical analysis.

The main aims of the thesis were to look at the effects of structuring CMC environments with complementary support and the benefits to learning, which resulted from such structuring. In fact concentrating on the outcomes from the main study (FirstClass) highlighted aspects of the structure, which would be beneficial if adopted in a Web environment.

The first strand of research was related to the effects of structuring CMC environments and involved both students and tutors. However the second strand of research concentrated on the students' impressions of the benefits to their learning. As tutors' opinions were secondary, they were not sent questionnaires until near the end of the course. The design of the online questionnaires was limited by the need to supply them in Windows Write format to ensure that all participants could respond. using the same software.

Although the two studies included both genders, this thesis did not investigate gender issues. The studies did not include detailed work in the area of online group collaboration as students were only expected to collaborate informally.

9.6 Suggestions for future research

Suggestions for future research are ordered according to the amount of resources that would be required to pursue them, beginning with an investigation that could be pursued as a masters degree project.

An investigation of about the scale of a masters degree project could combine a practical effort to address the problem of a lack of critical mass in some tutor groups with a deeper investigation of some of the lesser analysed types of interaction in the conceptual framework. This could be achieved by studying the consequences of combining two or three tutorial groups, as opposed to the usual situation of each tutor hosting an individual tutorial sub-conference. The 'participant pairs' and 'relationships' elements of the three-dimensional taxonomy could be investigated further with this increased critical mass of students. For example, interactions between the learner-and-expert 'participant pairs' could be analysed, and the one-to-one, one-to-many, and many-to-many 'relationship' dimension could be investigated in more depth.

The present research could be said to have evaluated a structure which contained elements similar to two of Seufert's (2000) 'Learning Methods', namely 'Online Teaching' and 'Online Tutorials'. A useful follow-up medium-sized project would involve replicating Seufert's two learning methods above and evaluating them in a similar way to that conducted in this thesis. This would allow a direct comparison of results and would be addressing the following research question.

- What benefits do students accrue from Seufert's learning methods 'Online Teaching' and 'Online Tutorials' as compared to the findings related to the benefits of structured CMCs as discussed in this thesis?

Another useful medium-sized project would involve setting up an environment to evaluate Seufert's (2000) other two learning methods, namely 'Online Assignments' and 'Online Discussions' These are learner centred and team centred respectively. The research question that this project would be addressing would be as follows.

- What benefits do students accrue from Seufert's more open and flexible learning methods 'On-line Assignments' and 'Online Discussions' when studying at a more advanced level?

9.6.1 Using the conceptual framework throughout students' university study

The research reported here investigated a single presentation of a second-level computer science course. The taxonomy is a generalisable framework, which could be applied in a distance learning context for the organisation or analysis of interactions in any Electronically Supplemented Course (ESC). A major funded project would involve monitoring students' use of a structure devised using the conceptual framework (preferably using the same CMC software each year) throughout the students' Open University study. The structure devised should take into account the emergence of more integrated CMC packages, such as the Web interface to FirstClass which includes communications facilities. The students under scrutiny would be studying a variety of different courses including arts and languages. This longer-term project would facilitate an investigation into whether the structure could progressively provide less scaffolding as the students proceeded from year to year and how this might vary from subject domain to subject domain. Both Wegerif (1998) and Seufert (2000) have suggested that less scaffolding may be needed, but have not evaluated whether this is true. This structure includes access permissions, read-write restrictions, and use of message approval. However its operation would involve lessening the use of these facilities each year as the students progressed through their university study. The analysis would be based on the use of more formal methods to investigate the three dominant categories, which emerged from the sixteen established in key 7.7 in chapter 7.

A. Communicating with students and tutors.

C. Help with course work and problem solving.

F. A preferable method of communication (for delivery of program code and for discussion of problems on the course).

The research question that this project would be addressing would be as follows.

- What effects do progressively less structured CMCs have on users as they move from year to year during their undergraduate study?

The author has devised, analysed and presented a number of different types of structure to improve navigation and interaction in educational CMCs. It has been argued that the conceptual framework devised for the CMC literature can be applied in a distance learning context to any Electronically Supplemented Course (ESC). The role of the IMF in supporting the structure devised from the conceptual framework has been defined, created and investigated. It is hoped that the data that have emerged from the use of an interpretive approach influenced by grounded theory will provide baseline data that can be taken forward using more structured methods.

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Appendix A: 'Rooms or Spaces' identified in the literature

Researchers have identified many different 'rooms' or 'spaces'. These are listed in the table below, starting with the most popular 'room' or 'space' and ending with the least popular 'room' or 'space'.

Table A.1 The most popular 'room' or 'space' naming conventions adopted by different researchers

a tutoring area	(Derycke and D'Halluin, 1995; Mason, 1989a and 1989b; Selinger, 1998; Naidu et al., 1995; Harrison and Bergen, 2000; Turoff, 1995; Schwen et al., 1993)
a course materials area	(Naidu et al., 1995; Harrison and Bergen, 2000; Whittington and Sclater, 1998; Owen, 2000; Berge, 1995; Harrison and Bergen, 2000; Seufert, 2000; Maher, 1999)
an asynchronous forum	(Derycke and D'Halluin, 1995; Mason, 1989a and 1989b; Seufert, 2000; Whittington and Sclater, 1998; Maher, 1999; Harrison and Bergen, 2000)
lecture sessions	(Naidu et al., 1995; Turoff, 1995; Whittington and Sclater, 1998; Maher, 1999)
an administrative office	(Whittington and Sclater, 1998; Davie, 1989; Schwen et al., 1993; Gurwitz, 1998)
a chat room	(Seufert, 2000; Selinger, 1998; Rohfeld and Hiemstra, 1995; Berge, 1995)
a seminar room	(Davie, 1989; Maher, 1999; McConnell, 2000)
a workshop/problem-solving area	(Derycke and D'Halluin, 1995; Davie, 1989; McConnell, 2000)
a collaboration area	(Schwen et al., 1993; McConnell, 2000; Rohfeld and Hiemstra, 1995)
a lounge	(Mason, 1989a and 1989b; Turoff, 1995)
a library	(Derycke and D'Halluin, 1995; Seufert, 2000; Whittington and Sclater, 1998)
a news room	(Seufert, 2000; Rohfeld and Hiemstra, 1995; Harrison and Bergen, 2000)
projects	(Berge, 1995; Davie, 1989; English and Yazdani, 1999)
a lobby	(Mason, 1989a; Selinger, 1998)
individual and group support	(Naidu et al., 1995; Maher, 1999)
a homework / assignment area	(Gurwitz, 1998; Sloane, 1997)
a shared reading area	(McConnell, 2000; Rohfeld and Hiemstra, 1995)
a meeting room for small groups	(Turoff, 1995; Berge, 1995)
a subject conference	(Selinger, 1998)
a career centre	(Seufert, 2000)
an assessment hall	(Whittington and Sclater, 1998)
learning activities area	(Naidu et al., 1995)
an exam reviews area	(Gurwitz, 1998)
a bibliographic area	(Gurwitz, 1998)

Not all of the rooms listed above would be appropriate for all courses.

Appendix B: Data collection instruments

The Open University

Faculty of Mathematics and Computing

Computing Department

Faculty of Mathematics and Computing
The Open University
Walton Hall
Milton Keynes
MK7 6AA UK

Telephone: +44 (0)908 654026
Fax: +44 (0)908 652140
E Mail: m.e.wilson@open.ac.uk

To prospective M205 students,

We are setting up a project involving email, conferencing and modems with approximately one hundred M205 students. Four to six tutors will be taking part in this project and those students, from the tutors locality who express an interest, will be allocated to these tutors. As a consequence the number of students who will be able to take part will be limited. We will be loaning modems and conferencing software to these 100 students taking part in the '95 presentation of the course. There is also a possibility of providing access to selected material on the Internet. It is hoped that local call access will be available. Students should be aware that local calls (ie up to 30 miles) are charged at approximately 80 pence per hour by British Telecom after 6pm. It is easy to be online on such a system for an hour but we will do our best to ensure you find such expenditure worthwhile. The idea of the project, is to give extra support to students by providing extra course material via this medium and to see how beneficial it is to students studying M205. This extra course work would probably involve both individual and collaborative work ie a facility to exchange emails and join conferences with tutors and fellow students. As a result of the different tutorial groups interacting via conferencing software, we hope to build up information that would include things such as revision material. In order to participate, students will be required to have a telephone (and pay their own telephone bill) and have the correct hardware and software to support the modem and conferencing software. The minimum hardware and software specification is as follows :

- 386SX processor
- 4MB RAM
- 40MB Hard Disk
- WINDOWS compatible graphics hardware, VGA or better, with compatible COLOUR monitor.
- High Density floppy disk drive (which : 5.25" 1.2mb or 3.5" 1.44mb)
- WINDOWS compatible mouse or other pointing device.
- a Serial port in addition to any presently occupied by the mouse
- Parallel port
- WINDOWS compatible printer
- MS-DOS 5.0 or later
- Microsoft WINDOWS 3.1 or later

To take part, early registration for the course is advised. We would also require participants to answer short questionnaires etc during the presentation of the course. All questionnaires etc will be treated in the strictest confidence.

Acceptance on the scheme will depend on the numbers who reply in the selected regions. Students will be selected for the project on a first come first served basis. If you are interested in taking part, please fill in and date the attached questionnaire in the first instance and return it as soon as possible in the prepaid envelope provided.

Tina Wilson

Tina Wilson,
Research Assistant, the STILE Project.

To Prospective M205 students **please date: /94**

We are planning an experiment using modems with a small number of students and you may be asked if you would like to join in. The outcome of the experiment will enable us to do some planning for future computing courses. We are doing a small survey to see what hardware and software prospective M205 students already have or intend to buy for the 1995 presentation of the course. It would help me greatly if you would fill in this one page questionnaire and return to me in the pre paid envelope provided. Please circle the appropriate answer and give more detail where specified. Thanks for your help, Tina Wilson.

1. Do you have access to a microcomputer that you use (or could use) for study purposes, which meets the following specification?

- 386SX processor
- 4MB RAM
- 40MB Hard Disk
- WINDOWS compatible graphics hardware, VGA or better, with compatible COLOUR monitor.
- High Density floppy disk drive (which : **5.25" 1.2mb** or **3.5" 1.44mb**)
- WINDOWS compatible mouse or other pointing device.
- a Serial port in addition to any presently occupied by the mouse
- Parallel port
- WINDOWS compatible printer
- MS-DOS 5.0 or later
- Microsoft WINDOWS 3.1 or later

Yes No

If no, please indicate beside each of the items above how the machine you use or intend to buy is different.

2. Will your machine be used at home?

Yes No

3. If yes, is it near enough to a modern British Telecom telephone socket so that it could be connected to the OU's computer system using a modem?

Yes No

4. Have you any experience of using a modem?

Yes No

5. Have you any experience of using conferencing software?

Yes No

6. Have you any experience of using the Internet?

Yes No

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Dear M205 student,

Thank you for your interest in taking part in the M205 STILE project. If you have indicated on our questionnaire that you have your own modem, then you will be sent the necessary software soon. Otherwise, shortly after returning your accept/decline form for M205, you will receive a home kit. The home kit will contain a modem and instructions on how to connect the modem to your computer. Shortly after receiving your modem, you will receive a disk containing the conferencing software, called First Class, together with a user ID and password. You will also receive the documentation that will enable you to connect your computer to the computer that runs the First Class software. This is called the First Class server and is managed by the Open University's Academic Computing Service.

We hope you will be able to access the First Class server at least two weeks before the course officially starts. In this two week period, we would like you to familiarise yourself with the use of the modem and the conferencing software, using the instructions given. When you first log-in, we would like you to respond to the message in your MailBox. Although it may not be clear what this means at the moment, we think it will be after you have logged in to the conference and followed the instructions given. We would like to know that you can log-in to the system successfully and by responding to the message in your MailBox we will know that you can. It is important to know if you are experiencing any difficulties with the system so if you have any problems then please use the telephone numbers on the attached sheet.

You will see various named icons on your desktop. Each icon denotes a conference. Please feel free to look at these conferences and perhaps introduce yourself by leaving a message in 'The Meeting Place' conference. To do this, double click on the 'M205 - STILE' icon, then double click on 'The M205 Meeting Place' icon. You then have a choice, of either leaving a message in this main conference for both tutors and students or you can double click on the 'Students common room' icon and leave a message just for your fellow students. Instructions on how to do this will be given in the documentation with your software.

This familiarisation will be very valuable when you start your course. The intention is to use conferencing throughout the presentation of the course to provide additional teaching material with tutor support and guidance. You will also be able to contact fellow students. It is hoped that your tutor will access your tutorial conference twice a week. We also hope to provide a 'M205 Help' conference for you to use for queries that require a quick response, such as those concerned with the current TMA. This conference would be open to all students, with members of the M205 course team providing answers to queries that might otherwise be asked frequently.

We would just like to remind you that you will be required to pay your own phone bill. Presently we only have access through regional numbers but we hope very soon to have additional numbers which we hope will provide you with local call access (ie up to 30 miles) for which British Telecom charge approximately 80 pence per hour, after 6pm.

We look forward to seeing you on-line and hope that you find this type of experience very helpful to your study on M205.

Tina Wilson,
Research Assistant on The STILE project.

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- 386SX processor
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- High Density floppy disk drive (which : 5.25" 1.2mb or 3.5" 1.44mb)
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- WINDOWS compatible printer
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- Microsoft WINDOWS 3.1 or later

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Tina Wilson

Tina Wilson,
Research Assistant, the STILE Project.

Appendix 1: Useful telephone numbers

NB Contact the Help Desk when you have software problems or problems connecting to the Open University network. Contact Wellingborough Warehouse when you have hardware problems with the modem.

Help Desk telephone numbers between 9am and 5.15pm Monday to Thursday, or 9am to 5pm Friday.

- dial either 0171 435 9624 or 01908 653972.

Wellingborough Warehouse telephone number between 8.30am and 4.30pm Monday to Friday.

- dial 01933 224911 and ask the switchboard operator for the technical section.

First Questionnaire for Tina wilson. Please put an **X** either beside or under the relevant answer in the multiple choice questions.

Name:

Age: under 25 26-35 36-45 46-55 over 55

How often do you use computers normally?

A.More than once a week B.once a week C.once a month

Have you taken any home computing courses? yes no

If yes which course/courses?

If you use a computer at work, put an X beside the statement which best describes your work?

I use computer controlled equipment
My work is data entry / form filling
I do word processing
I use general application packages eg spreadsheets
I use CAD / CAM packages
I program in one language, excluding programming at home
I program in several languages
Programming is a major part of my job
I work in systems software or computer operations

Do you have a computer at home? yes no

If yes which of the following activities have you used it for?

Programming in one or various languages
Using wordprocessing or graphics
Running games packages
Not used much at all

What are you expectations of M205 - STILE?

How are you finding your study of M205 at present ? Easy Moderate Difficult

Have you asked your tutor for help in your Tutorial conference? Yes No

How interested are you in using M205 - STILE to help with your study of M205?
(1=not interested, 5=very interested)

1 2 3 4 5

Thankyou for completing the questionnaire. Tina
(if you have anything to add please add it below)

Second Questionnaire for Tina wilson. Please put an **X** either beside or under the relevant answer in the multiple choice questions.

Name:

How often are you able to attend normal tutorials?

A.every one B.only some C.none at all

How often have you accessed M205 - STILE?

A.More than once a week B.once a week C.once a month

What do you use M205 -STILE for ?

What are you expectations of M205 - STILE now that you have been using it?

How are you finding your study of M205 at present ? Easy Moderate Difficult

What commitments make it difficult to use M205 - STILE ?

work family away from home lack of spare time

Have you used the extra course material provided online? Yes No

How interested are you in using the extra course material to help with your learning?
(1=not interested, 5=very interested)

1 2 3 4 5

Did you work on the extra course material with other students via email ? Yes No

Would you have welcomed exercises that required group work ? Yes No

Thankyou for completing the questionnaire. Tina

(if you have anything to add please add it below)

Third Questionnaire for Tina wilson. Please put an **X** either beside or under the relevant answer in the multiple choice questions.

Name:

At what times did you use FirstClass ?

A.Daytime B.Evening C.Night time D.Weekends

How valuable would you say computing conferencing was to your studies as compared to face to face tutorials?

Have your TMA results improved with STILE?

How did you value the interactions with other students and your tutor ?

A.On an equal footing B.Students more important C.Tutor more important

Have your interactions with your tutor in M205 - STILE, helped your learning?

Have your interactions with your fellow students in M205 - STILE, helped your learning?

How interested are you in the Block 5 Web pages to help with your study of M205?
(1=not interested, 5=very interested)

1 2 3 4 5

Which delivery of course material did you prefer ?

A. FC Blocks 1 to 4 (exercises) B. Netscape Block 5 (tutorial) C. Don't Know

Thankyou for completing the questionnaire. Tina

(if you have anything to add please add it below)

Fourth Questionnaire for Tina wilson. Please put an **X** either beside or under the relevant answer in the multiple choice questions.

Name:

How have you discussed your program code?

via email over the telephone via royal mail

Which of the above methods have you found worked best for you and why?

How many times did you send program code via email?

to your tutor to fellow students to one of the conferences

Did you find it beneficial to have access to both FirstClass and Netscape?

Which interface do you prefer ? First Class Netscape

Did you access the other STILE sites? Yes No

How often did you access each site?

Would you like to see STILE adopted for other courses ?

How are you finding your study of M205 at present ? Easy Moderate Difficult

How interested are you in using M205 - STILE to help with revision for M205?
(1=not interested, 5=very interested)

1 2 3 4 5 Thankyou for completing the questionnaire. Tina

(if you have anything to add please add it below)

First Questionnaire for Tutors. Please put an **X** either beside or under the relevant answer in the multiple choice questions.

Name:

Prior to the students coming on-line, what where your expectations of M205 - STILE? How did you think it would be useful?

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Now coming to the end of the Presentation, how useful do you think M205-STILE has been in both FC and Web formats?

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Which interface do you prefer? First Class Netscape

How have your students discussed their program code?

via email over the telephone via royal mail

Which of the above methods have you found worked best?

____

____

____

How many times did your students send you program code via email?

to your personal mailbox to your tutorial conference

Did any of your students send messages to your mailbox but not to your tutorial conference? If so how often did this happen?

Have you ever felt overloaded with messages? If so when?

____

M205 - STILE was set up with the course team monitoring the M205 Help conference. How has this affected your perceived workload?

1 2 3 4 5 Thankyou for completing the questionnaire. Tina

(if you have anything to add please add it below)

Second Questionnaire for Tutors.

Name: ---------------------------------------

What type of private interactions have you had with students?

How would you compare your face to face tutorial with your use of M205-STILE?

Have you presented 'tutorial type' information differently with M205 - STILE than at a f to f tutorial?

What are the advantages and disadvantages of you interactions at f to f tutorials as compared to M205 - STILE?

After using conferencing, how would you see it incorporated in future courses?

Was attendance at your f to f tutorial similar to other years? Did M205 - STILE affect attendance?

Where any of your students able to use M205 - STILE when they could not attend tutorials ?

Has the use of FirstClass impinged on your normal f to f tutorial session? If so in what way?

How have your other students not involved in the project reacted?

What where the main problems encountered by your on-line students?

Did the students use the system to ask you for help more frequently near a TMA due date or the exams?

Does the on-line course material need to be modified to be more effective?

From your perspective what do you think FC has been used for most?

What are the benefits and the downside of M205 - STILE to teaching and learning?

What are your feelings about costs and access with FC and the Web?

How helpful was it to have a mediator (me) taking overall responsibility?

How would you improve on the M205 - STILE model ie having a mediator, separate tutorials, a free for all Help conference and course material on-line?

If you were using FC again would you want to use message approval in your tutorial conference?

Have your students who have used M205 - STILE performed any better in their TMA's than your other students?

Thankyou for completing the questionnaire. Tina

In-depth telephone interviews with students

Questions for first phone calls

Q1 (1)How easy or difficult did you find it to:
Q1 (1a) set up the modem?
Q1 (1b) set up the software?
Q1 (1c) access FirstClass?

Q1 (2a) What were your first impressions when you saw the FC desktop?
Q1 (2b) did you find the software instinctive to use?
Q1 (2c) did you find it fun to use?
Q1 (2d) was the conference layout helpful (easy to navigate)?

Q1 (3) On your first login did you immediately log out again or did you do some exploration of the system?

Q1 (4) Had you read the handbook before you logged on?

Q1 (5) Does the FC software seem stable?

Q1 (6) Have you had any trouble with access?

Questions for second phone calls

Q2 (1) What have you used the FC system for so far?
Q2 (1a) for socialising with fellow M205 students
Q2 (1b) for socialising with others on the system
Q2 (1c) for learning

Q2 (2) Did you have enough time to learn to use the system before the course started?

Q2 (3) What sort of activities have you tried so far?
Q2 (3a) reading messages
Q2 (3b) writing messages
Q2 (3c) sending messages by e-mail
Q2 (3d) sending messages to conferences
Q2 (3e) did you find these activities easy or difficult

Q2 (4) Have you found most messages in the conferences
Q2 (4a) interesting to read?
Q2 (4b) dull or a waste of time?

Q2 (5) Have you decided upon a strategy for what to read and what not to read?

Q2 (6a) What would you find helpful to your learning experience on M205?
what is missing?
Q2 (6b) do you feel like you've used the system to help with your study of M205?
Q2 (6c) what benefits do you see in using a system like this?

Questions for third phone calls

Q3 (1) Which extra course material have you felt most helpful...
Q3 (1a) the exercises on FC?
Q3 (1b) the tutorial on the Web?

Q3 (2) Do you feel you have had enough coursework support from your tutor within STILE?

Q3 (3) Do you feel you have had much help with your coursework from other students?

Q3 (4) Do you feel you have helped other students?

Q3 (5) What three things would you say you have gained out of using M205-STILE?

Q3 (6a) How do you feel the present set-up of STILE works with M205 Help and Tutorials -
Q3 (6b) does it work?

Q3 (7) Would M205 Help work on its own or are the tutorials necessary?

Q3 (8) Which do you feel is most important - contact with students or tutors?

Questions for fourth phone calls

Q4 (1)Thinking back over your experiences with the M205-STILE system, how frequently have you felt overloaded with information...
Q4 (1a) on FC?
Q4 (1b) on the Web?

Q4 (2a) Have you had time to explore the block 5 material on the Web?
Q4 (2b) Have you had time to explore the other STILE sites on the Web?

Q4 (3) Have you explored the Web outside the various STILE sites?

Q4 (4a) Overall did you feel you had ever wasted time or got lost on the Web or on FC?
Q4 (4b) on the Web?

Q4 (5) Has M205-STILE helped your understanding of the course material?

Q4 (6) Would you say M205-STILE has affected you TMA marks - for better or worse?

Q4 (7) Which have you found helped more with your understanding - STILE in its present form
Q4 (7a) on FC?
Q4 (7b) on the Web?

Q4 (8) Have you sent much e-mail?
Q4 (8a) work or social?

Q4 (9) On a scale of 1 - 5, how helpful did you find the following resources:
Q4 (9a) access to your tutor through STILE
Q4 (9b) access to fellow students
Q4 (9c) the extra teaching materials

Questions for fifth phone calls

Q5 (1a) Have you used the telephone or Royal Mail to discuss the course with your tutor?

Q5 (1b) How much did you use these methods?

Q5 (2a) Have you emailed your tutor personally to discuss your coursework?

Q5 (2b) How often did you do this?

Q5 (3) Apart from the extra material, some of the tutors have put up their own teaching material. Have you found this helpful?

Q5 (4a) What type of interactions have you had with other students on the course?
Q5 (4b) Was it useful?

Q5 (5) What practical difficulties have you encountered using M205-STILE?
Q5 (5a) eg downloading course material
Q5 (5b) contacting your tutor

Q5 (6a) Has M205-STILE added to your knowledge
Q5 (6b) increased your motivation at all?
Q5 (6c) added a social dimension?

Questions for sixth phone calls

Q6 (1) Had you used e-mail before using STILE?

Q6 (2) Had you used a conferencing system before using STILE?

Q6 (3) How do you feel about conferencing?

Q6 (4) Have you used online facilities more at any particular times?
Q6 (4a) eg near to a TMA submission
Q6 (4b) near to the exam

Q6 (5a) Did you use the online chat facility?

Q6 (5b) How often?

Q6 (6) Did you use M205-STILE to help with your coursework, to socialise or for both?

Q6 (7) Did you take part in a self-help group online?

Q6 (8) Did STILE meet your expectations?

Q6 (9) Which aspects of STILE have been valuable?

Group interview / debriefing meeting with the tutors

The questions at the debriefing meeting were guided by those asked on the questionnaires but aimed at gathering the tutors collective opinions.

Questions were related to:

the tutors own personal usage of M205-STILE,

how much they used it and what they used it for,

their perceptions of student usage, how much (number of messages via email, number of tel calls) and what students used M205-STILE for,

how much contact involved email, how much conferencing,

what the system was used for most: tutorial type work; extra on-line material; conventional course work; sending program code etc.

the benefits and the downside to teaching and learning,

the advantages and disadvantages of the system in terms of costs and access,

whether they the tutors experienced information overload,

whether the M205-STILE model worked, their reactions to it and how it could be improved.