A Shared Workspace for Text-based Teaching and Learning:
Design Requirements and Pedagogical Benefits

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ABSTRACT

Despite growing use of computer-based communication tools, and interest in their impact on language use, shared workspace tools are not being used regularly, to support text-based teaching and learning, in mainstream higher education. Such tools support interaction with learning material and with people, both of which can help learning. However, neither the design requirements nor the benefits of using shared workspace tools, in text-based disciplines, have been established. Both were investigated.

The starting point was the need to support teachers’ work. There is insufficient information in the CSCW literature about tasks, communication needs and the effects of using a shared workspace in text-based classes. Participatory methods and prototyping were considered to suit the problem, the technology, the kind of application and the potential users. Observation and document study were combined with focus groups, interviews and questionnaires, to study the use of two prototype shared workspace tools, in a programme of extended field trials.

Initial studies, with co-located classes, investigated learning activities around shared, printed materials and suggested similarities across subject boundaries. Field trials were conducted, in distributed foreign language classes, using a prototype desktop multimedia conferencing system. The main aim was to establish design requirements to support teaching and learning tasks. A two-year study, in undergraduate Russian classes, aimed to deepen understanding of how a shared workspace tool could contribute to teaching and learning.

The need for flexible control mechanisms and support for awareness and reference were confirmed. To support the range of tasks observed in face-to-face classes, flexible re-structuring of text objects and hiding, as well as sharing, of objects, are needed. Promoting active student participation and supporting teacher management of space are requirements particular to this application area.

The shared workspace tool excited teachers, who explored its use over a long period. The sharing of data, its persistence, the manipulation of on-screen objects and the accessibility of the shared space enabled the shared workspace to support lesson attributes that teachers and students valued. Sharing data caused a few students anxiety, however.

Shared workspace tools can enhance both distributed and face-to-face teaching and learning, in text-based disciplines. They offer something different from tools in current use. The research has generated a list of recommendations to designers of shared workspace tools and a list of recommendations to teachers wishing to use shared workspace tools in text-based subjects.
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Acronyms and Abbreviations used in the Thesis

AI Artificial Intelligence

CIF Common Intermediate Format (Interchange format for motion video)

C&IT Communications and Information Technology

CMC Computer-Mediated Conferencing

CSCL Computer-Supported Collaborative Learning

CSCW Computer-Supported Co-operative Work

EFL English as a Foreign Language

HCI Human-Computer Interaction

ICT Information & Communications Technology

ILEA Inner London Education Authority

mIRC An Internet Relay Chat client

NTE Network Text Editor

PAL Phase Alternating Line (Name of broadcast TV standard, 625 lines, 25 frames per second)

QCIF Quarter Common Intermediate Format

RAT Robust-Audio Tool

SDR Session Directory tool

SSEES School of Slavonic and European Studies

UCL University College London

vie VideoConferencing tool

wb WhiteBoard

Wbd Whiteboard
Chapter One - Introduction

This chapter introduces the shared workspace tools being investigated and explains key terms. It explains how shared workspace tools are used and gives a sketch of the application area considered in this research. It explains what motivated the research, summarises the achievements of the thesis and provides an overview of its structure.

1.1 Electronic Shared Workspaces

1.1.1 What is a shared workspace?

This thesis is about the design and use of shared workspace tools, for teaching and learning, in text-based disciplines. The term, shared workspace, is a broad one, so it is important to define the scope of the research. One might begin with situations in which people work together at the same time, more or less continuously interacting. There are many instances of this, from conversations in which one idea is discussed to team meetings for planning or the generation of new ideas.

In such situations, people often keep a shared record of their work. This may be written and subsequently circulated, like the minutes of a meeting, or a cumulative record of the process, like notes on a whiteboard or flip chart. During the meeting, such items provide a point of reference for the participants and may hold essential text or pictures.

Certain activities, such as brainstorming or early design meetings, require more than just shared visibility or a common point of reference. In such sessions, all participants will write or draw in the shared space. Group members may crowd round the workspace, making additions simultaneously, or more formal turn taking may be the practice.

![Figure 1.1: Shared Text Editor (nte) and Shared Whiteboard (MS NetMeeting), with text and shared pointers](image)

The “shared workspace” referred to in this thesis is the computer-based equivalent of this shared working area, a software environment in which objects can be viewed and manipulated by all group members. Shared editors and shared whiteboards are the most common examples. Figure 1.1 shows two typical shared workspace windows and illustrates what Fluckiger (1995) sees as two key features: “joint viewing” and “teleoperation” [p142].

From the above, it should be clear that shared workspace tools are intended to support groups working together, which means they are classified as groupware (Grudin, 1991b). When used interactively, shared workspaces are tools for small to medium sized groups, but shared whiteboards have also been used as
presentation tools, to show lecture slides to large numbers (Sasse and Bennett, 1995; Kies et al., 1996). This research considered the use of a shared workspace with groups of 2 to 10 people.

They are also tools to support synchronous, rather than asynchronous collaboration. For instance, in co-authoring, a shared workspace tool might be used for the times when a group focuses on a document together: initial planning or outlining; editing of a short but important component, such as the introduction. Fluckiger (1995) refers to a shared whiteboard as a "sketching tool" [p142], suited to the sharing of ephemeral information arising during a discussion or for sharing a permanent item which is displayed and annotated.

These are tools that offer the users a large (or apparently unlimited) working area, and the freedom to carry out actions anywhere in the space. They should therefore be distinguished from more specialised shared learning tools, such as simulations. Simulation tools are designed to support the investigation of a particular problem and the range of possible activities is therefore more constrained. The shared workspaces discussed here are, like pen and paper, adaptable to many purposes. To limit the scope still further, it should also be assumed that these are "flat" surfaces, suited to the display of text and two-dimensional graphical objects, not objects that need to be viewed and manipulated in three-dimensions.

1.1.2 Motivation for the development of shared workspace tools

The description in the previous section implies that a shared workspace tool is intended as a replacement for a physical object (paper, flip chart, overhead projector) and hence will be used by distributed groups who cannot share access to the physical equivalent. Whilst it is true that such tools are often used, alongside other conferencing tools, to support distributed group working (see section 1.2), this is only one strand in their development. Shared workspace tools stand out from other tools in a conferencing suite because they have always been viewed not just as replacements for physical shared workspaces, but also as enhancements — alternative and perhaps better work spaces for groups working face-to-face. The placing of shared workspace tools in the time-space matrix (Figure 1.2) shows this (see Dix et al., 1993, [p. 447]). Both of these strands, replacement and enhancement, have motivated the development of shared workspace tools.

![Figure 1.2: Groupware in the time/space matrix (Dix et al., 1993)](image)

This thesis also explores both strands. The research began by investigating the use of a shared workspace in distributed teaching and learning: its role as a replacement for face-to-face tools — classroom shared
spaces — and the design features needed to support the teaching and learning activities. However, the teachers and students involved reacted so positively to the shared workspace that, once the main design requirements had been established, interest shifted to accounting for the tool’s impact and understanding the intrinsic benefits of such tools, for text-based teaching and learning. In this phase, the shared workspace was investigated as a potential enhancement, rather than a replacement tool (see Figure 1.5). This second part of the research was carried out with co-located groups.

1.2 How Shared Workspace Tools are Used

People working co-operatively, using a shared workspace, usually need another channel of communication, in addition to the shared workspace tool (Fluckiger, 1995, [p. 46]). Whether a shared workspace tool is used to support face-to-face or distributed work, it will interact with the rest of the environment. Even in a face-to-face situation, where group members can converse without computer support, they must now interact with a computer as well as with one another. This can result in interference between channels of communication, which may affect the working process (Sasse et al., 1994). For distributed users, the shared workspace has been used (for example, by Dillenbourg and Traum, 1999) in conjunction with text-based communication, but it is more usually part of a multimedia conferencing environment.

1.2.1 The multimedia conferencing environment

A multimedia conferencing environment typically includes tools to support audio and perhaps video communication, together with some kind of shared workspace tool. Figure 1.3 shows a typical set-up. Figure 1.4 gives a user’s view of a set of conferencing tools, including audio, video and shared workspace.

![Figure 1.3: Typical desktop multimedia conferencing setup](image)

A number of things have already been established about such environments. First, even with the highest possible video and audio quality, this is less rich, less expressive, than a face-to-face environment. The video offers a limited field of vision and one which, usually, is selected by the sender, not the recipient of the view. The resolution will typically be much lower even than for broadcast television (for example CIF, a video conferencing standard, defines a resolution of 352 x 288, as compared with the 864 x 625 of the UK broadcast television standard, PAL). Movement will appear significantly less smooth than in broadcast TV, typically 4-8 frames per second compared with the 25 or 30 of the PAL and NTSC standards (Fluckiger, 1995, [p. 362-3]).

The audio, too, is far from “natural” since it uses a narrower bandwidth than human speech (Hardman et al., 1998). The effect of this is that, whilst the meaning of the speech is entirely intelligible, certain characteristics, including some of those which allow us to identify individuals, are lost. This may have
implications for group work in the shared workspace; awareness of other people and what they are doing helps group collaboration (Gutwin & Greenberg, 1999).

Apart from the impoverished quality of the sound, there is usually a slight time lag between the arrival of audio and video signals, so that speech and lip movement are not synchronised. Lastly, if transmission is over a shared computer network, the audio and video signals can be affected by network congestion, causing rapid and dramatic fluctuations in quality. Quality levels should be more stable if the conference is taking place over dedicated lines.

The need for additional communication channels poses a potential problem. If findings are to be interpreted reliably, it is necessary to take account both of the inter-working of the different communications channels in supporting the group interactions and of any impact the other channels may have on the use of the shared workspace. Perhaps the best example of this is the impact that varying audio quality may have on a user's ability to perform a task, enjoyment of the process, or level of stress (Watson & Sasse, 2000a; Wilson & Sasse, 2000b).

1.2.2 The relationship between shared and individual tools

Another factor that may complicate the design problem is the relationship between shared and individual tools. For instance, a shared whiteboard window looks superficially like that of a drawing package, as Figure 1.1 shows, but shared tools tend to be simpler, with fewer features and functions than their individual equivalents.

The relationship between individual and shared applications is important, however, precisely because of their superficial similarity. New users may be confused by expectations that the shared tool will behave as its individual equivalent does. Some degree of consistency between the two may be needed in order to combat this and to make new shared tools easier to learn. Secondly, tools to support individual work should interact easily with those for collaborative work, since people in all work situations switch frequently between the two and collaboration is only one part of working life.

1.3 The Nature of the Application Area

The application area, teaching and learning in Arts and Humanities disciplines, is examined in greater detail in Chapter Two. This introductory section presents five key points which are brought out in the next chapter and were important considerations in the research.
1.3.1 Computer communication tools in higher education

E-mail discussions and bulletin boards are used by many major distance education providers (e.g. Wilson & Whitelock, 1997). An interview with a student, discussed in Chapter Two (section 2.4.3) suggests that broadcast radio and television are also key media for the Open University and that audio and videotapes are distributed, with printed texts, as course materials. Computer-based, multimedia study materials may also be made available to students, on CD-ROM or via the World Wide Web (Hearnshaw, 1999a). Video conferencing has been in use for some time, although not always successfully (Shale and Kirek, 1997; Baggaley, 2001). In the last few years, desktop multimedia conferencing has begun to be used (e.g. Issroff & Eisenstadt, 1997), although there are some concerns about quality and reliability (Kies et al. 1996; Hearnshaw, 2000). The telephone and intermittent face-to-face events, such as tutorials and summer schools, are other means of providing synchronous interpersonal communication in distance education.

In campus-based universities, computer communication tools are not widely used in Arts and Humanities teaching, although another example given in Chapter Two, section 2.4.2, shows that enthusiasts are exploring the possibilities. Tools supporting synchronous interactions are especially rare, although the use of synchronous, text-based discussion has been explored (e.g. LaGrandeur, 1996). It is quite possible to argue that this is because such tools are not needed, since students and staff meet each other face-to-face. However, many universities have split sites, which could create a need. It has also been stated already, in section 1.1.2, that shared workspace tools can support co-located groups.

1.3.2 Interest in computer-mediated communication

There is a strong and increasing interest in the relationship between new technologies and communication. Internet technologies are of particular interest. This interest in computer-mediated communication encompasses both the use of these technologies as tools to develop students' communicative ability and what is becoming known as electronic literacy: Shetzer and Warschauer (2000) suggest that,

"The spread of online communication is reshaping literacy today. [...] while previously educators considered how to use information technology in order to teach language, it is now incumbent to also consider how to teach language so that learners can make effective use of information technology" [p 1].

They suggest that,

"Teachers and students can work collaboratively to look at the types of language they use in different media, their attitudes toward communicating in a variety of media "[p 11].

One of the findings of this research was that shared workspace tools offer good support for this kind of enquiry into language use.

1.3.3 The need for interaction

There appears to be no single, agreed 'recipe' for successful learning (Hearnshaw, 1999a). There are far too many variations in student, subject, content and context for one answer to apply to all cases. Moore (1989), Laurillard (1993), Fulford & Zhang (1993b); Mayes et al. (1994), Stenning et al. (1999), Hearnshaw (1999a), Sharples, (forthcoming) suggest that some form of interaction is beneficial either for
learning outcomes or to increase student satisfaction with the learning experience. The term embraces interactions between students, students and tutor, students and content. Interaction need not involve two people; it may be purely internal, as when a student reflects on learning material.

It appears that the need for *interpersonal* interaction increases with the cognitive difficulty of the content, and the extent to which interpersonal communication is integral to the learning (Heamshaw, 1999a). Where speed, spontaneity and dynamic response are important, *synchronous* interpersonal interactions are more likely to be needed (Mayes *et al.*, 1994). The research concentrated on situations in which synchronous interpersonal interactions were likely to be useful.

### 1.3.4 The impact of technology on learning

No tools will guarantee specific learning outcomes. Warschauer (1996a) suggests that in language learning,

"The effectiveness [...] cannot reside in the medium itself but only in how it is put to use."

This creates a possible problem for this research, because it implies that manipulating the features of a computer tool will not necessarily affect learning outcomes in a reliable and repeatable way. The design and structuring of the course and learning activities is a major responsibility of the teacher. Whatever medium is used, success depends on skilled use of it by the tutor, whose work was therefore considered central to this research.

### 1.3.5 Continuing change

Change is continuous in all sectors of education. One change seems likely to create new users of computer communication tools. For several reasons (the potential of new communications networks, institutional finance, government strategy, the need to improve teaching and learning), there is now a blurring of distinctions between campus-based and distance education. Methods and media previously associated only with distance education providers are now being integrated into campus-based courses. Examples are: use of e-mail discussions to augment face-to-face tutorials (See Chapter Two, section 2.4.2); use of virtual learning environments to enable students and staff to collaborate across institutions (e.g. Roed *et al.*, 2001); increased use of computer-based assessment (Hopkins, 1998; McKenna, 2000); use of videoconferencing to reduce travel between sites (e.g. Brown *et al.*, 1999; Parker *et al.*, 1999).

However, introducing further innovation into an environment of constant change is not easy. Students and staff are increasingly familiar with computers and the Internet, and most institutions are connected to computer networks, but lack of experience in network technologies, lack of confidence, training, money and time can still make staff reluctant to experiment with new computer applications (Bates, 1995). The research methods used here addressed this issue (see Chapter Four, sections 4.2.3, 4.3.1). It was considered particularly important in view of the significance of the teacher's role (section 1.3.4 and Chapter Two, section 2.6).
1.4 Motivation for Research

1.4.1 The motivation of missed opportunities

The research was motivated by what was perceived as a possible missed opportunity. As stated in section 1.3.5, external pressures are increasing the need for computer communication tools in Higher Education. These pressures are particularly strong in the Arts and Humanities, where small departments may need to collaborate across institutions in order to preserve or improve the quality of their offer to students. This implies a growth in distributed teaching and learning, so a good support tool would be useful. A shared workspace tool seems to have great potential in Arts and Humanities disciplines, even without the need for cross-institutional collaboration. Active exploration of texts, drafting and re-drafting, shared viewing and manipulation of images and documents would all be supported by such a tool (see section 2.3). It could support interaction with both people and learning materials. Viewed as a computer communication tool, it would be another medium for investigation of language use, which was stated in 1.3.2 to be of great interest in these disciplines.

However, although other networked communication tools are in use in Arts and Humanities courses, there is no regular mainstream use of a shared workspace tool. Shared workspace tools are available and accessible but the requirements of text-based teaching and learning have not been investigated and users do not know what shared workspace tools might have to offer. This is the problem the research addressed.

1.4.2 Personal motivation

Motivation for the research arose also from experience as a practitioner, teaching English language and literature. Within this was a strong interest in enabling students to understand difficult texts, particularly through being active (that is, by carrying out operations and enquiries on the text). A shared workspace tool is a promising vehicle for acting on texts.

In parallel, the experience of moving from the Arts to Computer Science generated an interest in how people from non-technical backgrounds interact with technology and in the many communications gaps and incorrect assumptions that exist about what technology is for and what it can do. This is linked with a concern that users should not simply accept that computers are complicated and mysterious but, instead, should insist that they be made usable and do what the user wants. This is a two-way process. For the user, it certainly means being able to communicate one's requirements but it also implies being able to understand what a particular software tool is, its nature and key attributes, how it can help with a task and when it can not. This implies a need to communicate in the other direction, from developer to user. This affected the choice of research method: user-centred methods from the Participatory Design movement (Muller et al., 1993; Wall and Mosher, 1994) were considered most likely to foster this two-way understanding.
These personal interests, too, led to a wish to explore the use of shared spaces in the teaching and learning of text-based subjects, and a wish to communicate the results to both designers and users. However, there was a change of direction during the process. As originally envisaged, the research would have established a set of design recommendations for this work area and then proceeded to investigate possible implementations of these (see Figure 1.5). This would probably have involved initial field study, followed by laboratory studies to investigate specific phenomena. However, the focus of interest shifted as a result of findings during the first phase. Teachers and students were excited by the shared workspace tool; it seemed to foster lesson attributes that they valued. Understanding and accounting for the intrinsic benefits of shared workspace tools for text-based teaching and learning therefore became the main research interest, because such understanding could both inform design and help foster appropriate use of the tool. This was investigated through further field studies, rather than in the laboratory.

1.5 Contributions of the Thesis

The thesis provides evidence that shared workspace tools can be useful in both distributed and face-to-face teaching and learning, in text-based disciplines. It also adds to our understanding of why such tools are useful.

First, it shows why certain attributes of shared workspace tools offer particular benefits. The sharing of data, the persistence of data, the accessibility of the shared space and the manipulation of on-screen objects all benefit teaching and learning in this context.

Secondly, being a synchronous communication tool, in which data is also persistent, a shared workspace is particularly useful in the teaching and learning contexts considered: it enables a rapid and seamless switch between different kinds of communicative task; it supports fast, informal interchanges, yet these can be revisited; it enables informal interaction with formal text and vice versa.

However, while the sharing of data is useful, it also forces some common learning tasks to be modified and has an affective impact on some students.

The research has generated a list of recommendations to designers of shared workspace tools for text-based teaching and learning. The recommendations are based not only on the information that has been gained about the tasks to be supported but also on the understanding gained, about factors that teachers and students value. A list of recommendations for teachers who wish to use shared workspace tools has also been generated by this research.

It is usual for those studying learning technology to begin with the learners and the learning. Although the learner’s experience has been given considerable attention, this research took as its starting point the need
to support the work of teachers. A user-centered approach was used, working with teachers and students
over a long period and emphasising the importance of designing the work activities alongside the
computer tool.

1.6 Reading the Thesis

The thesis follows approximately the order in which the research was undertaken. Figure 1.6 gives an
overview of the research and the thesis.

This introductory chapter explains why the shared workspace tool was of interest, introduces the
application area in very broad terms and summarises the research.

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<th>Chapter 1 &amp; 2</th>
<th>Chapter 3 &amp; 4</th>
<th>Chapter 5</th>
<th>Chapter 6</th>
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<tr>
<td>Scoping and Planning</td>
<td>Studying co-located groups</td>
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<td>Reviewing</td>
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**Figure 1.6: Outline of research**

**Chapter Two** discusses the application area, in order to give background information and to define
the scope of the research. The outcome of the discussion was that the application area would be text-based
teaching and learning in Arts and Humanities disciplines and that a shared workspace tool was most
likely to be of benefit where real time speech and visual communication were integral to the learning;
where students found the content difficult; where the students were novice learners. The research would
look at small to medium sized groups, interacting together for periods of one to two hours, that is for the
duration of a typical lesson, lecture or seminar. The research had two primary aims:

1. To find out what design features were needed in the shared workspace tool, to enable it to support
interactive teaching and learning in text-based disciplines.

2. To find out how using a shared workspace tool could contribute to teaching and learning in text-based
disciplines, in order that potential benefits could be communicated to teachers.

**Chapter Three** assesses the current state of knowledge in relation to the research aims, through a study
of relevant literature mainly from three fields: Computer Supported Cooperative Work (CSCW); Human
Computer Interaction (HCI); Computer Supported Collaborative Learning (CSCL). Both of the research
goals imply a need to study the tasks to be supported and the way in which teachers and students will
organise them. This also involves considering interpersonal communication and the role of the shared
workspace tool in relation to the other channels of interaction. Previous research had not addressed these
questions in relation to interactive, text-based teaching and learning with a shared workspace.

**Chapter Four** discusses the chosen research methods. This includes reasons for encouraging users to
participate in the design of computer tools and ways to enable them to do so. It explains why an iterative
prototyping approach was adopted, in extended field trials, mainly in foreign language classes. It outlines the field trials, discusses the nature of the data collected and explains analysis methods.

Chapter Five presents the initial research. Two initial investigations were carried out into what was shared and how it was shared in classrooms in the Arts and Humanities. These were:

- Observation of face-to-face small group work in English language and literature classes. The aim was to identify and categorise group learning tasks in a text-based discipline.
- A document study and teacher interview, with a face-to-face Spanish class. The aim of this was to assess the usefulness of the above categories to describe activities in a different educational context, foreign language classes in higher education.

It was found that categories identified in the first study could also be used to describe work with shared printed materials, in the language lessons. The list of categories was one tool used for assessing the impact of the shared workspace on teaching and learning in the next study, described in Chapter Six.

Chapter Six explains the conduct of three extended field trials and three ancillary investigations, in a variety of language teaching contexts. A prototype conferencing system for foreign language tutoring, including a shared whiteboard and shared text editor, was evaluated in use in five courses, lasting from 8 to 22 weeks. Additional data was collected in three further courses with distributed groups. The final study, a field trial, over two academic years, in a face-to-face undergraduate Russian writing course.

Chapter Seven presents the findings. As a result of the trials with distributed groups, it was possible to identify the main functions and features needed in a shared workspace tool to support teaching and learning in these courses. The study confirmed earlier findings about the need for flexible control mechanisms and mechanisms to support awareness and navigation in the shared space. It showed that more flexible restructuring of text, and a facility to hide objects, were needed in order to support the full range of learning tasks in these courses. Also emerging from this work was information about how a shared workspace could support "good lessons". Using a shared workspace:

1. facilitates teacher monitoring of student work;
2. facilitates instant response, feedback, intervention;
3. facilitates close textual study;
4. facilitates integrated development of different language skills, especially speaking and writing;
5. promotes the students' sense of being active;
6. promotes a workshop atmosphere and a sense of shared endeavour;
7. promotes concentration and involvement;
8. preserves a record of the process;
9. supports students' learning from one another;
10. allows the teacher to interact with individuals and their writing;
11. enables the use of a range of learning resources;

A number of these attributes are likely to be valued beyond the text-based disciplines that were studied.

In these language classes, the main benefits of using a shared workspace tool rested in the sharing of data, the persistence of the data, the accessibility of the workspace and manipulation of objects. However, sharing data also limited the range of possible teaching and learning tasks.
The final study, in the Russian course, clarified and extended the design findings, showing the usefulness of mechanisms to promote active student participation, and the need for the teacher to manage the use of the shared space. It also provided insight into the complex role of the teacher, when working interactively with students in a shared workspace. The study confirmed and extended the list of valued lesson attributes that the shared workspace fosters, and showed that students also valued many of these. It confirmed the benefits of sharing data but indicated that this caused anxiety for a few students. It also suggested that, in addition to the four key workspace attributes already identified, teaching and learning in languages benefits from the fact that a shared workspace has some attributes of both synchronous and asynchronous communication tools. It therefore allows a seamless switch between different kinds of communicative task and it preserves the language used for interaction as an object of study. The study also shows that use of the tool changed over a long period of time. As a result of this study it was possible to conclude the research and hence to contribute to both design and teaching guidelines.

Finally, the conclusions are presented in Chapter Eight. The work is evaluated and pointers to possible continuation of this research are given.

1.6.1 Circumstances under which the research was conducted

The research was carried out part-time, alongside full-time employment - for two years as a Research Fellow in the Department of Computer Science, and for four years as a lecturer in the Department of Education and Professional Development. Explaining the relationship between the employment and the research may be useful to readers.

Chapter Six (section 6.3) refers to "three extended field trials" and "three ancillary studies". Trials 1 and 2 were conducted as part of the ReLaTe project, funded by British Telecom under the SuperJANET research programme. This project investigated the feasibility of using desk-top multimedia conferencing to support language tutoring at a distance. The underlying network technology – multicast – was very much in the research domain at that time, and the project built or improved tools to deliver real-time multimedia over multicast, as well as providing an integrated conferencing interface that was accessible to users such as language teachers and students.

The ReLaTe field trials allowed for study of the design and use of the shared workspace. Alongside the work on the project (planning and conducting the trials and evaluation activities), it was also possible to carry out observation that was specifically focused on use of the shared workspace, to collect screen shots and to incorporate PhD research questions into questionnaires and focus groups. The project had an impact on the PhD research, in that it created a large amount of additional data on audio and video quality, system usability and pedagogical concerns. These were examined for the PhD for two main purposes. Shared workspace use was investigated in the context of use of a complete conferencing system. It was therefore considered necessary to identify factors that might interfere with interpretation of data on the shared workspace, particularly problems related to the usability or the quality of the audio or video components. It was also necessary to establish whether the conferencing system as a whole could support language teaching and learning.

1 ReLaTe Project: http://www.exeter.ac.uk/pallas/relate/
The three ancillary studies (section 6.3.2) were conducted after a change of employment. There was a need at this stage of the research to broaden the enquiry and to see the shared workspace used in a wider range of courses. Although now in a different, and non-technical, department, small additional studies (observation, interviews, focus groups) were conducted around field trials that were taking place under the auspices of the PIPVIC project, a field trial of IP Videoconferencing commissioned by UKERNA and led by Dr Angela Sasse in the Department of Computer Science. The project recorded and documented the distributed teaching activities; it was possible to access those data, but also to carry out observation of sessions of my choice, to conduct a student interview and to plan and video record a group discussion with one class (see Table 6.3, English as a Foreign Language). The latter was incorporated into a PIPVIC project evaluation meeting.

Trial 3 (section 6.3.3) has yet another relationship with work. This study was designed entirely for the benefit of the PhD research, but the time spent on it was justified as being in keeping with an employment role that included investigation, support and evaluation of the use of technology in teaching and learning. Further justification came from reporting the work in a presentation at an internal college Conference.

Finally, to illustrate background information in Chapter Two (section 2.4), examples of the use of technology in Arts and Humanities disciplines were sought. One is taken from the project, VDML, funded by JISC, which the researcher managed. A survey was conducted for that project. Its results are published on the WWW and were used as illustration. Another example was taken from a report on the WWW, concerning the use of Internet technologies in a campus-based History course. The third example, however, an interview, was carried out for the PhD, in order to illustrate the experiences of a distance learning student on an Arts degree course.

1.7 Summary

This introductory chapter explained the nature of the shared workspace tool and presented an introduction to the application area. It explained what motivated the research and identified its broad aims. The main contributions of the thesis were stated and an overview of the thesis given. Chapter Two will explore the application area more fully, in order to define the scope of the research and clarify the aims.

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3 VDML Project: [http://www.uel.ac.uk/epd/herds/vdml/](http://www.uel.ac.uk/epd/herds/vdml/)
Chapter Two – Background and Scope

This chapter considers the possible real-world application of this research and, in doing so, also defines its scope. The aim is to identify the potential benefit of a shared workspace tool. The chapter explains how the scope was first narrowed to concentrate on Arts and Humanities disciplines, and especially on text-based study, then narrowed further to focus on teaching and learning situations where interpersonal interaction was most likely to be needed. It concludes by stating the two primary aims of the research: (1) To find out what design features were needed in the shared workspace tool, to enable it to support interactive teaching and learning in text-based disciplines; (2) To find out how using a shared workspace tool could contribute to teaching and learning in text-based disciplines.

2.1 Introduction

2.1.1 The nature of the shared workspace tool

As stated in Chapter One, the shared workspace tool that is the subject of this research is a synchronous groupware tool, to support two or more people working together. Used interactively, it is suited to small or medium sized groups. It offers users free access to a large, or apparently unlimited, two-dimensional shared display space, in which they can write and/or draw and manipulate the objects created. It is usually used in conjunction with other channels of interaction (auditory, visual) and differs from these media in that its messages are persistent. The shared workspace is also interesting because it has been developed and studied both as a replacement tool for distributed users and as an enhancement tool for co-located groups. This chapter considers how a tool of this nature might be of use in teaching and learning.

2.1.2 The nature of the application area

Chapter One mentioned the changes currently taking place in Higher Education. Several drivers of this change (section 1.3.5) suggest a need for computer-based communication tools. However, this alone is not enough to define the user group. An important principle of CSCW, as explained in Chapter Four (sections 4.2.1, 4.2.2), is that design should arise from the real needs of users. This implies close study of the work people do, and “Higher Education” is too broad a field for this to be meaningful. For the research to be useful, the application area must be narrowed down.

The second implication of constant change is that staff are likely to feel pressurized. This can limit willingness to consider innovation and should be taken into account in determining how to study the work being done. Chapter Four explains how this affected the choice of research method.

2.2 Focus on Arts and Humanities

The first narrowing of focus arose from personal interest and experience of teaching in Arts and Humanities disciplines. Even more specifically, it was an interest in Textual Studies, those disciplines within the Humanities “in which the study of texts formed a significant activity” (Condron et al, 2000). This includes disciplines such as English, foreign languages and history. It was decided not to assume
that the findings would apply to teaching and learning in the sciences. Entwhistle and Ramsden (1983),
found differences in teaching and learning between the Arts and the Sciences. More recently, Condron
(2001) found that these extended to the use made of communications and information technology.

2.3 The Potential of a Shared Workspace in Arts and Humanities

"Speed and automatic functions"; "capacity and range"; "provisionality"; "interactivity". According to
DFEE Circular 4/98, which set out what school teachers should know about communications and
information technology (C&IT), teachers must be aware of these four attributes of computer technology.
Here, the four attributes have been used as a starting point for considering how C&IT might contribute to
teaching and learning in the Arts and Humanities.

The "speed and automatic functions" of computers can provide fast counting and comparisons, to
support some of the more laborious kinds of textual analysis. Thus, they support reading and research into
texts and language, with tools such as concordancers (Warschauer, 1996a; Armstrong, 1996; Margolies
et al., 2000). The same attributes can support writing, through spelling and other checking tools, and can
enable multiple identical changes to be made in a document. Used properly, they can free a reader or
writer to concentrate on higher order skills such as interpretation, planning or refining an argument. At
present, shared workspace tools do not incorporate such automatic functions so perhaps the real potential
of the shared workspace does not lie in this area yet.

The "capacity and range" of C&IT offers numerous potential benefits in Arts and Humanities study.
Documents, paintings and artefacts, including fragile originals, can be viewed in remote museums and
libraries (for example: Digital Egypt1 and Early English Books Online2). There is access to material in
different formats (audio, video, graphics, text) and new media are available for presenting information,
giving rise to new forms of writing. Shetzer and Warschauer (2000) discuss this and the Writing and
Computers Association3 is another good source of information. Since computer networks are global,
foreign language students can interact with people and institutions in other countries, read newspapers
and receive radio and TV broadcasts in the language they are studying (Oxford et al., 1997; Warschauer,
1996a). Information can be shared and experts outside the home institution become accessible. In this
area, the shared workspace seems to have a more obvious role. It can support shared viewing and
manipulation of objects, at a distance. It can also support interactions between people at a distance.

The "provisionality" of C&IT provides opportunities to explore texts actively and to examine the effects
of changes by making them. It supports drafting and re-drafting. The capacity to save different versions
and to compare them may facilitate collaborative working. Again, this suggests a potential role for a
shared shared workspace tool, although neither collaborative work nor synchronous work is necessarily
implied by this attribute of computer technology.

"Interactivity" with people has been mentioned above, as a consequence of the range of computer
technology. The interactivity of computer technology can also make reading into a query and response

1 Digital Egypt: http://www.petrie.ucl.ac.uk/digital_egypt/Welcome.html
2 Early English books Online: http://www.jisc.ac.uk/dner/collections/eebo.html.
process, provide instant feedback on grammar or language exercises, give dynamic feedback on pronunciation, create responsive tutors.

In the world of possibilities, therefore, a shared workspace tool might well be useful.

### 2.4 Current Use of Shared Workspace Tools in Arts and Humanities

Three examples are presented, to represent a snapshot of current use of computer tools to support teaching and learning in text-based disciplines. These were considered in conjunction with survey reports, mailing list archives and subject centre websites, in order to assess how much use was being made, in mainstream higher education, of computer-mediated communication and, in particular, of shared workspace tools. Appendices 2.1, 2.2 and 2.3 contain additional information.

#### 2.4.1 Example 1: Computer use by foreign language teachers and students

Access was available to the results of a survey of some 400 language students and 60 language teachers in UK Higher Education institutions. Students were from large and small language departments and their courses spanned most Arts disciplines (see list, Appendix 2.1). Subjects were asked about the computer applications they used in general and the applications they used specifically for language learning. The survey also sought to discover subjects' views on how computers could help with language learning.

<table>
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<td>46.7</td>
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<td>46.7</td>
<td>47.0</td>
</tr>
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</table>

**Table 2.1: Student perceptions of the value of computers for language learning.**

Most students in the sample were confident users of word processing, e-mail and web browser applications. Apart from 8.1% who used chat rooms, very few had used any other Internet applications. However, they made far less use of computers for language learning than for other purposes. Of those who did use computers in language learning, it was almost always to support individual work, not group working. Amongst the applications they used, there was a predominance of grammar and language exercises and individual multimedia study packages, with some use of on-line dictionaries and grammar reference sources. Students' beliefs about computers support this pattern of use: they see the role of

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4 See Chapter One, section 1.6, for clarification of the relationship between the examples and the researcher's employment.

5 The survey was part of the Virtual Departments for Minority Languages (VDML) project, funded by JISC under Circular 5/99, Enhancing the DNER for Teaching and Learning. The partners are University College London, The University of Edinburgh and The University of Hull. Students and teachers in the survey were from these three institutions and from the University of Westminster and the University of East Anglia.
computers as being to support grammar, vocabulary development, reading and writing but not speaking or listening. However, the survey also suggested that teacher-directed use of computers for language learning might alter students' perceptions about the usefulness of computers.

Amongst this sample of teachers, a similar picture emerges. According to the survey report on the project website, most regard themselves as competent users of word processing, e-mail and web browser applications but only 11 of the 60 mentioned a language learning programme they used. Again, although many recognise the usefulness of computers in teaching, most think they are best suited to help with grammar and vocabulary learning. It also appears that technology has not penetrated deeply into the work of this user group, with only a small minority making use of a departmental web site and under a quarter having received training in the use of computers for language learning.

2.4.2 Example 2: History course in a campus-based university

It is not only in distance education that computer-mediated communication is being used. Written reports on innovations in an undergraduate History course show how teachers in a campus-based university are exploring ways to integrate technology into teaching and learning. The source is the web site for University College London's Teaching and Learning Conferences, in 1998 and 2000. The writers explain web-based developments in the undergraduate history programme. Students are given access to texts and other course material via the WWW, undertake web-based assignments and take part in face-to-face synchronous discussion and asynchronous e-mail discussion, both tutor-mediated.

2.4.3. Example 3: An English degree by distance learning.

This was a semi-structured interview with a student, undertaken with a view to finding a recent example of student experience. She was asked about her experience of a module entitled Literature in English, part of an Arts degree at the Open University, in the UK. This example was intended to represent mainstream distance education provision in a text-based discipline. The full transcript of the interview is in Appendix 2.3. Questions were asked about the media used for presenting course material and for course-related interpersonal communication.

Study materials were quite varied. Course books, "acted as tutor". [...] "They guide you through." Additional poetry and drama texts were bought, to supplement those supplied. There were video tapes and audio tapes containing both works of literature and commentaries. TV broadcasts and some on radio contained dramatisations and discussions. These materials were used for individual work and were all that the student needed, "and if you didn't have any interaction with anyone else, you could complete everything."

However, there was some communication both with other students and with a tutor: informal meetings with other students and group tutorials. Summer school offered both informal and formal interactions, including social interactions and group working:

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"It wasn’t just all lecture-type presentations, there was a lot of interactive stuff there. Because it was a literature course, we did all sorts of things, such as we produced small segments of plays that we’d studied. We worked together on a lot of things.

The subject raised a discipline-specific point:

"I think drama and poetry particularly need to be given a presentation. I think you get a totally different view from reading them from the book."

Apart from the face-to-face interactions already mentioned, telephone and e-mail were the main communications media. The subject felt the two media had different uses. E-mail was used mainly for organisation and negotiation. An e-mail discussion list had been set up but the subject felt it would have been too time-consuming to participate. The telephone seemed to have been used more:

"I used to phone a couple of people I knew quite well, who were also on the course – these were students – that was probably more effective than e-mail. [...] ‘It’s slightly more immediate than e-mail, which ... if you’re having a problem, you’re not very good at explaining what the problem is, it’s very difficult to put that into an e-mail’. [...] ‘Especially when you want the same points re-iterated three or four times’.

Asked whether speech was “better” than e-mail the subject responded:

"I think in some instances, definitely, unless you’re asking for a specific answer rather than an interpretation."

Asked how important this interpersonal communication had been for her success on the course:

"I think it was absolutely vital, otherwise it would have ... there’s a huge tendency to feel totally isolated, and also you can go through nine months of the course thinking you’re going the right way and then suddenly discover you haven’t quite got the right idea about one particular point ... If you can bounce ideas off somebody else, hopefully off a lot of other people, you can get some idea of perhaps where you should be heading."

2.4.4. Further evidence of Arts & Humanities computer usage

In order to discover how far the examples are representative of mainstream provision in Higher Education, additional evidence was sought from three sources: learning technology mailing lists; national centres of expertise in teaching and learning; survey reports.

2.4.4.2. Educational Technology Mailing Lists

Mailing lists concerned with educational technology and distance education can be found at http://www.jiscmail.ac.uk/. The mailing lists shown in Appendix 2.4 were searched in August 2001, for references to shared workspaces, shared whiteboards, shared applications or text editors. The search was widened to include references to collaboration and group work. No positive results were returned. A further search was made of the webct-uk mailing list. This list is for users of the WebCT learning environment tool7, which includes a shared whiteboard. WebCT is currently widely used in HE

7 WebCT: http://www.webct.com/
institutions. There were two references to the shared whiteboard tool, both of them incidental to answering questions about Java on Mac-based browsers.

2.4.4.2 National Centres of Excellence

Discipline-specific centres of expertise in teaching and learning were recently established in the UK, under the auspices of the Learning and Teaching Subject Network (LTSN). One of their roles is to act as information centres. The following four centres were investigated, via their web sites.

- Centre for Languages, Linguistics and Area Studies: http://www.lang.ltsn.ac.uk
- Centre for English: http://www.rhul.ac.uk/ltsn/english
- Centre for History, Classics and Archaeology: http://www.hca.ltsn.ac.uk
- Centre for Art, Design and Communication: http://www.bton.ac.uk/adc-ltsn

There was no reference to use of shared workspace tools to support teaching and learning on any of these sites.

2.4.4.3 Survey Reports

The LTSN Centre for Languages, Linguistics and Area Studies gives access to a report by Oxford et al. (1997) on the use of technology in foreign and second language learning. Although firmly rooted in practice, with illustrations from real courses, this paper also reviews relevant research literature, in order to present a rationale for technology use in language learning. The paper discusses a selection of technology-based activities, with a brief assessment of their value in language learning. These are: TV and Radio Production; multimedia simulations; e-mail and chat, telephone tutoring and collaborative publication.

They explain how collaborative projects and publications can be useful in language classrooms, and how they can be shared internationally through shared publications, collaborative investigations of social or environmental issues, compendia of oral history or folklore. Apart from e-mail and web-browsers, the only software tools mentioned are for desk top publishing, web authoring and image editing. When they cite courses where synchronous teacher-student interactions are used, the medium for these is the telephone.

They also stress that technology alone will not influence learning; what is needed is a combination of understanding the students' needs and the learning goals, addressing these with appropriate technology and using that technology effectively.

They consider the use of Internet technologies as tools to develop students' communicative ability:

" [...] Kroonenberg's (1994/1995) research on synchronous, one-to-one, e-mail chat, which allows students to practice rapid interaction, produces more expression than ordinary written composition or oral conversation, and serves as a 'thinking device' by allowing reflection in the midst of interaction."

"Not only can e-mail increase participation by L2 students, but it can also improve the quality of discourse (Warschauer, 1996)."

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8 no clear distinction is made between these but the word, synchronous, is used to describe the chat
9 Page references are not given for documents held on line.
"Comparing e-mail discourse with oral classroom discourse, researchers found that students used more complex language with a wider range of functions (Warschauer, 1996), were more accurate (Kelm, 1992), and produced stronger arguments (Kern, 1995)."

"Comparing e-mail dialogue journals with paper-based dialogue journals, Wang (1993) discovered that the e-mail group wrote more per session, asked and answered more questions, used language more flexibly, and were less formal and more conversational with the teacher."

The discussion of the advantages of chat or e-mail is confused by the fact that sometimes they are comparing these with writing and sometimes with talk. However, it is important that this is mentioned because the emergence, through computer communications, of a new kind of language is a hot research topic in Arts and Humanities disciplines. Schetzer and Warschauer (2000) take the discussion beyond the development of communication skills to what is becoming known as electronic literacy:

" [...] the development of literacy and communication skills in new online media is critical to success in almost all walks of life" [p1]

"So while previously educators considered how to use information technology in order to teach language, it is now incumbent to also consider how to teach language so that learners can make effective use of information technology." [p1]

"Teachers and students can work collaboratively to look at the types of language they use in different media, their attitudes toward communicating in a variety of media..." [p11]

The research described in this thesis showed that a shared workspace tool can increase the quantity of written language that students produce, that it can support collaborative enquiries into language use in different media and that teachers value both of these.

2.4.5 Conclusions about current use of shared workspace tools

Clearly, computer use is increasing in the Arts and Humanities. Even in traditional, campus-based universities, some Internet-based communication tools are being used. They are widespread in distance education. These are mainly asynchronous communication tools, but in language learning there is some near-synchronous use of e-mail and some use of text-based chat, often in MOO environments. There is also great interest in the impact of these communication tools on language use.

However, in the evidence considered, there is no sign at all of regular, mainstream use of a shared workspace tool for text-based teaching and learning. It should be stressed that none of this negative evidence proves that shared workspace tools are not being used. It does, however, suggest that their use is rare and is generally not part of mainstream provision, in the way that e-mail discussion and the World Wide Web now are. The next question to consider is why this should be.

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10 Listed as Warschauer (1996b) in this thesis.

11 A MOO (Multi User Dimension, Object Oriented) is a text-based virtual environment, often room-based, in which those present can talk, perform actions and move via text commands. An example is the University of Virginia's English Department MOO, at http://athena.english.vt.edu/LIT/help/MOO.html. Users access a MOO environment through Telnet or a specialist MOO client.
2.5 Is a Shared Workspace Needed?

2.5.1 Determining the benefit of using a shared workspace

Lack of use can no longer be attributed to lack of an available shared workspace tool. Users in Higher Education are very likely to have access to Microsoft NetMeeting and/or to the WebCT Learning Environment, both of which offer shared whiteboard tools. It might be, of course, that these tools do not have the necessary design features. Alternatively, it could be that the benefits of using them are not known by potential users. But it is also possible that there is no need for a shared workspace tool to support teaching and learning in text-based disciplines. It is necessary to make sure that there is a potential use for such tools. In doing so, it is possible to narrow the scope of the research still further, by finding the educational context in which shared workspace tools are most likely to offer a benefit.

The final narrowing down of the research was to look for teaching and learning contexts in which a shared workspace tool was most likely to benefit teaching and learning. Since such tools support synchronous interactions between people, the main question asked was where such interactions were most likely to be needed.

To answer the question, literature on distance education was reviewed. Synchronous interactions are not taken for granted in distance learning, as they often are in campus-based institutions, and they may be expensive to provide. Distance educators have therefore sought to find out where they are most likely to bring benefits, in order to justify the cost.

2.5.2 Interaction is good - but what is it?

A long standing goal of distance educators has been to ensure that the student experience is at least no worse than they would receive in a traditional educational setting (Shale, 1988). One aspect of this has been to promote interaction. Differing interpretations and terminology, however, can make it difficult to understand what is needed. In an attempt to clarify, Moore (1989) identifies three types of interaction in distance education and labels these "learner-content" "learner-instructor" and "learner-learner" interactions. Otero et al., (2001) investigated the benefits of interaction with diagrammatic learning material, but in a scientific discipline. Moore regarded the provision of learner-learner interaction as the key challenge of the 1990s although, as Hearnshaw (1999a) comments, the benefits were not specified in great detail. Hilman et al. (1994) pointed out that, in order to experience these types of interaction, a student must also interact with the medium, and suggested adding a fourth category, "learner-interface" interaction. Sharples (forthcoming) uses the word, "conversation", rather than interaction:

"Effective learning involves constructing an understanding, relating new experiences to existing knowledge [...]. Central to this is conversation, with teachers, with other learners, with ourselves as we question our concepts and with the world as we carry out experiments and exploration and interpret the results [...]." [p15]

A shared workspace tool has the potential to support all of these interaction types.

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12 This is a pre-print, from the author’s home page: http://www.eee.bham.ac.uk/sharplem/write.htm
2.5.3 Must the interaction be with people?

Interaction with people is valued in distance education partly because it can combat the isolation which students can experience. Fulford & Zhang (1993a) and (1993b) suggest that the opportunity to interact may also increase student satisfaction with a course of study. More specifically, they identify student perceptions of their own and their group’s degree of interactivity as a key predictor of their satisfaction with the course, in a distance education course using interactive television. They consider whether, in view of this, teachers should seek to promote the perceptions and, "should be more concerned with overall group dynamics than with engaging every individual equally or with soliciting overt individual responses." [p18] They also point to earlier research linking both positive attitudes and higher levels of achievement with interaction. Vrasidas & McIsaac (1999) state that interaction can increase the sense of social presence in Computer Mediated Conferencing (CMC).

More direct links have been made between interaction and learning in discussions of the importance of dialogue. This might be the "internal didactic conversation" when learners "talk to themselves about the information and ideas they encounter" (Holmberg, 1986)\(^\text{12}\), but a dialogue between student and teacher is also regarded as a support for learning. Laurillard (1993) believes we need to be aware that teachers and students may conceptualise a topic differently and to find ways to resolve the differences. As a result, learning involves dialogue between teacher and student, which has to reveal the conceptual differences. At each stage, the teacher must determine how the student’s conception differs from what is needed and understanding this will shape the next stage of the dialogue. Moore (1989) also values teacher-student dialogue:

"The instructor is especially valuable in responding to the learners' application of new knowledge. Whatever self-directed learners can do alone, [...] they are vulnerable at the point of application."

"It is for reality-testing and feedback that interaction with an instructor is likely to be most valuable." [pp 3-4].

Vygotsky (1978) outlines the process by which a teacher or other more expert person provides structured support to move the learner through a process of development. Scarcella and Oxford (1992) discuss the application of this in language learning.

Stenning et al. (1999) have suggested that dialogue is essential in a student’s assimilation into the culture of an academic discipline (see also McKendree et al., 1998) and is important in overcoming hurdles such as difficult concepts or the inability to solve a problem. They suggest, further, that vicarious learning - overhearing dialogues, as well as participating in them - can be beneficial.

Having considered these points, the potential of a shared workspace tool still seems promising. Learner-content, learner-instructor and learner-learner interactions can all be supported by such tools. So, perhaps, can some kind of eavesdropping, or vicarious learning. However, a shared workspace is a tool to support synchronous interactions and it is therefore necessary to know whether these are needed.

\(^{12}\) Cited by Moore (1989)
2.5.2 Does interpersonal interaction have to be real-time?

In distance education, asynchronous Computer Mediated Conferencing (CMC) is one of the most widespread means of providing interpersonal interactions and the advantages are well documented (Warschauer, 1996b; 1997). Synchronous interactions may take place over the telephone, through specially arranged face-to-face events, or via text-based or multimedia conferencing. Mayes et al. (1994) suggest that, in the end, the decision about whether to provide synchronous or asynchronous interaction may be a matter of individual judgement between the benefits of reflection, offered by CMC, and the opportunities for fast, immediate interactions, provided by synchronous media.

The student interview (see section 2.4.3) and the discussion of the need for dialogue, above, give some clues about where the greatest benefits of synchronous interaction with other human beings might lie. One is where students find the content difficult. E-mail discussion could provide the necessary interactions in many such cases but the Open University English student (interview discussed in section 2.4.3) describes the advantages of the telephone over e-mail. It is,

"more immediate": better "unless you're asking for a specific answer rather than an interpretation". "If you're having a problem, you're not very good at explaining what the problem is, it's very difficult to put that into an e-mail" ... "especially when you want the same points reiterated three or four times."

This supports Hearnshaw's (1999a) view that the need for interpersonal interactions increases as the content needs more negotiation. In addition, he states that, where learners are novices who need immediate resolution of problems, the benefits of real-time interpersonal interactions are more evident still.

In some situations, synchronous communication is an essential part of what is to be learned. This might include any area in which dynamic interchange of ideas or opinions is needed or where students must develop interpersonal skills. One example is foreign language learning. McAndrew et al. (1996) suggest that communications links which have sufficient bandwidth to support high quality audio and video will add value in cases where communication between people is a central part of the learning task. They note that in second language learning, dialogue provides students with practice and reinforcement of their skills, without which learning will be less efficient or will not take place at all.

Feedback is another important element of learning. McAndrew et al. (1996) state that an essential component of oral practice is synchronous feedback to the speaker. Oxford et al. (1997) also stress the importance of such feedback to the language learner, although the context is a discussion of the potential of intelligent (as in AI) tutors. Fulford & Zhang (1993b) note the previously established link between "teacher immediacy behaviours" and learner satisfaction [p 9].

To summarise this section, although there is no agreed recipe for successful learning, interaction is valued. In certain situations, synchronous, person-to-person interaction is needed. This suggests that a tool to support such interaction could be useful, in these situations.

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14 He states that the need for negotiation is greater where it is difficult for students to map new concepts onto prior knowledge, or where understanding of content and associated cognitive skills must be developed through discussion with others.
2.5.3 Do users know what shared workspace tools can offer?

The benefits of e-mail and other asynchronous computer communications in teaching and learning have been much researched (for example: LaGrandeur, 1996; Warschauer, 1997; Veerman & Veldhuis-Diermanse; 2001). The benefits of text chat tools have also been explored (for example: Warschauer, 1996b; 1997). However, there is so little mainstream use of shared workspace tools for teaching and learning, that no corresponding body of research into educational practice with these tools exists\(^\text{15}\). Not only do we need the benefits to be discovered but they must be explained, if they are to convince potential users. Explaining these benefits is one of the contributions this thesis makes.

2.6 Teachers are Important

The literature shows that the teacher's role is extremely important to the successful use of technology. Circular 4/98 (see section 2.2) states that teachers must know how to structure students' work to enable them to make the most of their use of communications and information technology. Lakkala et al. (2001) show the tutor's varied contributions to "knowledge building discourse" in a web-based collaborative learning environment. Hearnshaw (1999a) reviews the responsibilities of the tutor in CMC, audio- and video-conferencing. CMC needs a skilled moderator who can help the group to avoid the misunderstandings that can arise out of the limitations of text-based communication (see also Salmon, 1998). It also needs a critical mass of contributors, which means activities and assessment must be designed to promote participation. Control of turn taking and of direction has presented problems and it can be difficult to gain a sense of the whole discussion. When using audio conferencing, the tutor must work to make the session a success by planning, managing the start and end of sessions, managing the discussion, ensuring speakers receive feedback and promoting a relaxed atmosphere. Video conferencing makes similar demands, although more has been written about room-based than desktop conferencing. Hearnshaw (1999a) notes that the tutor has to plan and manage sessions to ensure that remotely-located students remain active and engaged and to draw out their contributions.

All of the above factors lend further support to the view that the tutor plays a crucial role in ensuring that learning is effective when using these communication tools. Although a shared workspace can be used to support students collaborating without a tutor, this research considered teaching sessions in which the tutor played an active part. It is still far more common to base requirements for educational technology on a study of the learning process, rather than the teaching process, although there are exceptions, such as Hinostroza & Mellar (2001). This research treated the requirements of the teacher as being of great importance and took as its starting point the need to support teachers' work.

2.7 Summary

The application area was first narrowed down to teaching and learning in text-based disciplines, within the Arts and Humanities. Communication & Information Technology is increasingly being used to support teaching and learning in these disciplines. There is a growing use of networked communication tools, even in campus-based universities. There is, however, no evidence that a shared workspace tool is
being used regularly in mainstream Higher Education, even when such a tool is available in a learning environment.

Synchronous interpersonal interactions are needed in certain teaching and learning situations:

1. Where real time speech and visual communication are integral to what is to be learned;
2. Where students find the content difficult;
3. Where the students are novice learners.

A tool to support them might, therefore, be of benefit. Concentrating on situations with these characteristics would narrow the scope of the research still further.

Since shared workspace tools are available and accessible to potential users, it seems likely that the existing tools are not suited to supporting teaching and learning in text-based disciplines and/or that the benefits of using a shared workspace tool are not known by potential users. Without understanding the requirements, it is not possible to assess the suitability of existing shared workspace tools. The benefits need to be explored in use, as they have been for other computer communication tools. This research therefore had two primary aims:

1. To find out what design features were needed in the shared workspace tool, to enable it to support interactive teaching and learning in text-based disciplines.
2. To find out how using a shared workspace tool could contribute to teaching and learning in text-based disciplines, in order that potential benefits could be communicated to teachers.

These questions were investigated, taking into account the importance of the tutor’s role, using as a testbed situations with the characteristics specified as benefiting from synchronous interpersonal interactions. Chapter Three considers what is known already in answer to these questions, in a review of the relevant literature.

\[\text{Reports on the use of Interactive Whiteboard products in classrooms are now emerging (e.g. Comenius Project – http://www.leics-comenius.org.uk/)}\]
Chapter Three – Review of Literature

This chapter assesses what is known about the design and the use of shared workspace tools in this application area. It begins with an overview of existing research relevant to the design of an electronic shared workspace to support small group work. In order to manage the discussion, the research has been divided into the following broad categories: (1) functions and features; (2) communications media; (3) analysing communication; (4) working in groups. Research in each category is examined with a view to determining whether existing work can adequately inform designers of a shared workspace for teaching and learning, or give clues about the impact of using a shared workspace tool on the teaching and learning process. It emerges that potential designers of shared workspace tools for text-based teaching and learning need more information than is presently available, about (1) the task to be supported and (2) the communication needs of this particular application area. A full investigation of the role and impact of using a shared workspace tool is also needed. The chapter ends by outlining the main implications for the design of the research plan, which is presented in Chapter Four.

3.1 Introduction

The research aims that emerged at the end of Chapter Two covered both design and use of shared workspace tools. They were:

1. To find out what design features were needed in the shared workspace tool, to enable it to support interactive teaching and learning in text-based disciplines.

2. To find out how using a shared workspace tool could contribute to teaching and learning in text-based disciplines.

Chapter Three moves from the real world into the research domain. Previous work is examined in order to find out how far these two questions have been answered, what has been established about the design and the use of a shared workspace tool to support real time teaching and learning and what is still not certain. Throughout the chapter, reference is made to three tables.

- Table 3.1 summarises and categorises previous research relevant to the design and use of shared workspace tools.

- Table 3.2 summarises the shared workspace design questions over which there has been debate in the past. These areas are used, throughout the thesis, as a framework for considering the features and functions of shared workspace tools. They summarise the functionality of the tools used in field trials described in Chapter 6. They later act as a framework for presenting findings, as they emerge from the research, in Chapter 7.

- Table 3.3 draws out the main reasons that previous work does not answer the present research questions.
3.2 Designing and Using a Shared Workspace: Overview of Existing Research

This section aims to convey the range of previous, relevant research, to consider it in relation to the investigation described in this thesis and to identify areas that still need clarification if the research questions are to be answered.

In order to manage the discussion, previous research has been divided into four broad categories: functions and features; communications media; analysing communication; working in groups. Table 3.1 shows how these categories can be used to summarise previous work. In each area, the table lists research topics and findings on which this research can build and also indicates the main limitations of knowledge in relation to the design of a shared workspace to support text-based teaching and learning. Sections 3.3 to 3.7 discuss the five areas in more detail.

<table>
<thead>
<tr>
<th>AREA</th>
<th>Functions and Features</th>
<th>Communications media</th>
<th>Analysing communication</th>
<th>Working in groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPECTS</td>
<td>Control mechanisms:</td>
<td>Media comparisons:</td>
<td>Physical proximity</td>
<td>Group Activities and tasks</td>
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<tr>
<td></td>
<td>Concurrency control</td>
<td>Distinguishing features, eg:</td>
<td>Awareness</td>
<td>Drawing</td>
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<td>Access control</td>
<td>Interactivity</td>
<td>Gesture</td>
<td>Writing</td>
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<td>Floor control</td>
<td>Expressiveness</td>
<td>Gaze</td>
<td>Revisions/editing</td>
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<td>Shared views (WYSIWIS)</td>
<td>Richness</td>
<td>Eye-contact</td>
<td>Annotating</td>
</tr>
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<td></td>
<td>Shared applications vs sharing existing applications</td>
<td>Permanence/persistence</td>
<td>Simplicity (ie ability to switch between kinds of actions, eg taking and drawing)</td>
<td>Design</td>
</tr>
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<td></td>
<td>Supporting reference</td>
<td></td>
<td>Dialogue analysis, especially in supporting communication</td>
<td>Problem-solving</td>
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<td>Supporting awareness – activity feedback</td>
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<td>Brainstorming</td>
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<td>Direct vs indirect drawing</td>
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<td>&quot;Meetings&quot;</td>
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<td>Taxonomies and typologies of tasks</td>
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<td>Influences on how groups work</td>
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<td>Roles and relationships</td>
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<td>What groups need</td>
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<td>How groups work together without computers</td>
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<td>Organization of work – eg Parallel vs interacting groups, sub-groups</td>
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<td>Impact of computer tool on process and outcome</td>
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<td>Group size: eg pairs vs threes</td>
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<td></td>
<td>Motivation</td>
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<td></td>
<td>Enjoyment</td>
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<td></td>
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<td></td>
<td></td>
<td>Understanding the task is essential.</td>
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<td></td>
<td>Characterising the task is useful.</td>
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<td></td>
<td>Having a shared workspace can alter the process of group working.</td>
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<td>It can also alter the participants perceived enjoyment.</td>
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<td></td>
<td>Impact on task outcomes less clearcut.</td>
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<td></td>
<td>Roles and relationships within the group are very influential.</td>
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<td></td>
<td>Group size is less influential (within the 2-5 limits considered here).</td>
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</tr>
<tr>
<td>FINDINGS RELEVANT TO REMOTE TEACHING AND LEARNING (i.e. what we know)</td>
<td>Flexibility is more important than the control which comes from enforcing strict WYSIWIS.</td>
<td>Varying video quality has little impact on learning.</td>
<td>Audio and/or video mediated communication is significantly different from face-to-face.</td>
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<tr>
<td></td>
<td>Trade-offs always have to be made and must be worked out for the situation to be supported.</td>
<td>Multimedia presentation has no strong effect either.</td>
<td>Design of tools for interaction must take account of the differences.</td>
<td></td>
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<tr>
<td></td>
<td>Users become confused unless displays are updated quickly and accurately (ie by behaviour of the tool which seems erratic or inexplicable).</td>
<td>Video does increase enjoyment of process.</td>
<td>The need to be aware of what others are doing in the shared workspace is important for remote group work.</td>
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<tr>
<td></td>
<td>Handling multiple interacting participants is not straightforward.</td>
<td>Individual perceptions and responses vary.</td>
<td>The tutor has a vital role in facilitating communication and learning, whether directly &quot;teaching&quot; or not.</td>
<td></td>
</tr>
<tr>
<td>LIMITATIONS OF KNOWLEDGE IN RELATION TO REMOTE TEACHING &amp; LEARNING (i.e. what we do not yet know)</td>
<td>A more expressive medium is useful where tac is needed.</td>
<td>More expressive medium is an important feature of written or drawn contributions.</td>
<td>Designers do not know enough about what group learning tasks consist of, in different disciplines.</td>
<td></td>
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<tr>
<td></td>
<td>Many not tested in teaching and learning but extensively tested in other areas.</td>
<td>Audio and video may be most useful where fast, dynamic interactions are needed.</td>
<td>Not enough consideration in design, of the interface between synchronous collaboration and the rest of the student's and teacher's work.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confirmation of previous findings would be useful.</td>
<td></td>
<td>Much analysis of asynchronous educational interactions but not enough in real time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Investigation needed into nature of objects shared in this application area, and operations on them.</td>
<td></td>
<td>Much work on role of tutor/ facilitator in asynchronous interactions but less in real-time interactions.</td>
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<td></td>
<td>Not clear what role each communication channel will play in teaching and learning.</td>
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<td>Not enough research in which students are active.</td>
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<td></td>
<td>Multimedia treated as a means of presenting content rather than mediating interactions – even when a person is doing the presenting.</td>
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<tr>
<td></td>
<td>Little exploration of synchronous work over time.</td>
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<tr>
<td></td>
<td>Little small group work with a tutor in real time (but many studies of students working without a tutor).</td>
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</tbody>
</table>

Table 3.1: Literature analysis
3.3 Functions and Features

It is important to establish the features and functionality that are generally agreed to be needed in a shared workspace tool, in order to avoid re-investigating the same questions. Findings in this area also have implications for the choice of shared workspace tool for user trials (see Chapter Four, section 4.3.7).

In some ways, this is the most straightforward category to discuss. However, some of the areas listed under, *Functions and features* are considered to be outside the scope of this research. Early research (e.g. Sarin and Greif, 1985) compared collaboration-aware tools, designed for shared use, with mechanisms to enable the shared use of existing applications, and considered the relative merits of centralised and replicated architectures, performance issues and mechanisms for ensuring consistency. This research has considered collaboration-aware tools only. It has been established that reliable, fast updating of all participants' displays is essential; delays in updating, especially delays of unpredictable length, confuse users and make them lose confidence in the tool (Tatar et al., 1990). Reliable, fast and simultaneous updating (as far as the network permits) is taken for granted in this research, since tools now exist which provide this. Its absence was, in fact, the reason for not using Microsoft *NetMeeting* for the final study (Chapters 6 and 7); during testing, it updated different displays unpredictably when an image was imported.

<table>
<thead>
<tr>
<th>Design question</th>
<th>Sub-questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPACE and NAVIGATION</strong></td>
<td>1. Single or multiple pages?</td>
</tr>
<tr>
<td></td>
<td>2. Canvas? Extendable? In one or two directions?</td>
</tr>
<tr>
<td></td>
<td>3. How do users move around in the space?</td>
</tr>
<tr>
<td></td>
<td>4. How do they know where they are?</td>
</tr>
<tr>
<td><strong>OBJECTS and OPERATIONS</strong></td>
<td>1. What kinds of objects are shared? Eg text, images, graphics?</td>
</tr>
<tr>
<td></td>
<td>2. What attributes must they have?</td>
</tr>
<tr>
<td></td>
<td>3. How are objects created?</td>
</tr>
<tr>
<td></td>
<td>4. At what point are they shared? How fine-grained is the sharing?</td>
</tr>
<tr>
<td></td>
<td>5. What can be done to them? Can they be edited (ie altered)? Deleted? Moved?</td>
</tr>
<tr>
<td><strong>FLOOR CONTROL</strong></td>
<td>1. What floor control mechanism is needed?</td>
</tr>
<tr>
<td></td>
<td>2. None (social protocols only)?</td>
</tr>
<tr>
<td></td>
<td>3. Implicit locking? Explicit locking?</td>
</tr>
<tr>
<td></td>
<td>4. Chair controls floor?</td>
</tr>
<tr>
<td><strong>SHARED VIEWS (WYSIWIS)</strong></td>
<td>1. Is a shared view imposed on all participants? Always?</td>
</tr>
<tr>
<td></td>
<td>2. Can users scroll or change page independently?</td>
</tr>
<tr>
<td></td>
<td>3. What if they resize or move a window?</td>
</tr>
<tr>
<td><strong>OTHER CONTROLS</strong></td>
<td>1. Over structure of work?</td>
</tr>
<tr>
<td></td>
<td>2. Over roles of group members?</td>
</tr>
<tr>
<td></td>
<td>3. Over actions of group members?</td>
</tr>
<tr>
<td></td>
<td>4. Who can modify objects?</td>
</tr>
<tr>
<td></td>
<td>5. Should the system shape the working process?</td>
</tr>
<tr>
<td><strong>REFERENCE</strong></td>
<td>How can users draw attention to something?</td>
</tr>
<tr>
<td></td>
<td>1. Shared pointer?</td>
</tr>
<tr>
<td></td>
<td>2. One shared pointer? Multiple shared pointers?</td>
</tr>
<tr>
<td></td>
<td>3. Always visible?</td>
</tr>
<tr>
<td><strong>ACTIVITY FEEDBACK</strong></td>
<td>1. How can one participant know what others are doing? Or have done?</td>
</tr>
<tr>
<td></td>
<td>2. How visible is input activity?</td>
</tr>
<tr>
<td></td>
<td>3. One or multiple insertion points (cursors)?</td>
</tr>
<tr>
<td></td>
<td>4. Always visible or only when active?</td>
</tr>
<tr>
<td></td>
<td>5. Participants identifiable?</td>
</tr>
<tr>
<td><strong>OTHER FEATURES?</strong></td>
<td>What other features and functions does a specific working situation demand?</td>
</tr>
</tbody>
</table>

Table 3.2: Shared workspace design questions
3.3.1 Functions and features: floor control

Questions of control (floor control and joining mechanisms, access control, locking devices) were the focus of a considerable research effort in the late 1980s and early 1990s, with particular emphasis on the trade-offs between enforcing strict control and allowing natural interactions, including simultaneous activity. Issues and experiences are discussed by Stefik et al. (1987), Tatar et al., (1990), Greenberg et al. (1992), Sasse et al. (1994), Dix et al. (1993).

The aim of floor control is to impose some form of turn-taking and to reduce misunderstandings and clashes between participants. The first option is to rely on human control (social protocols), rather than having the system impose controls. The second is to have an implicit locking mechanism: a participant is automatically granted the floor on beginning to enter data and it is relinquished automatically a set time after activity stops. This is not straightforward, since natural pauses in work make it difficult to set the time after which the floor is relinquished. A more formal procedure is to use explicit locking. Here, a participant explicitly requests and relinquishes the floor with a keystroke or mouse action. Finally, the system can require that one group member act as chair or moderator, with the power to hand over or reclaim control at any time. In this case, a list of requests for the floor will need to be maintained.

The most common implementations nowadays use either no controls or implicit locking (Dix et al. (1993). A floor control mechanism that allows only one person at a time to make entries in the shared workspace denies the possibility of simultaneous work, which Tang (1991) showed to be common practice in design groups. It should also be remembered that even face-to-face working groups encounter misunderstandings and people will generally manage to resolve them. Controls imposed by the system may reduce the participants' freedom to find their own resolution. As Tang (1991) states:

"People are generally skilled at coordinating their communication and interaction with each other, and how they accomplish this is not well understood. Consequently, tools to support collaboration should not impose a structure that attempts to manage the interaction of the collaborators for them." [p158]

3.3.2 Functions and features: shared views/WYSIWIS

Displaying a document or picture for sharing implies that to some extent all participants can say, What You See Is What I See (WYSIWIS). As Fluckiger (1995) states, all these tools offer WYSIWIS to an extent. However, the degree to which the tool should enforce a shared view of the shared object is problematic. Several actions can alter an individual's view, the most common being scrolling or changing page. Resizing a window, or changing font size may also alter the view, depending on how the tool responds to this. For instance, making a window smaller may mean that not all of a drawing is visible. Alternatively, the drawing may be resized in proportion to the window, remaining entirely in view, or all the other participants' windows can be forced to undergo the same resizing. The final alternative is not to permit window resizing at all.
I am waiting for you. I have been travelling all morning through the bush and not eaten. I am lying at the edge of the bush on a dusty path that leads from the burnt-out kraal. I am panting, it is midday, I found no water-hole.

I am very fierce without food and although my eyes are screwed against the sun you must believe I am prepared to.

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**Figure 3.1: Results of scrolling and window resizing when strict WYSIWIS is not enforced.**

Why should this matter? Again, it a question of trade-offs. The more independently individuals can change their view of the shared object, the more difficult it is for them to avoid misunderstandings, particularly over reference to parts of the shared object. As Figure 3.1 shows, the "last line" or the "end of line three" as referred to by participant A is not the line participants B or C will see. Yet this type of reference (*indexical expression*) occurs frequently when people work together on a text.

This suggests strict enforcement of WYSIWIS is desirable. However, groups do not follow the same pattern of working all the time. Dix *et al.* (1993) point to:

*a growing recognition that more adaptable systems are needed to allow for the wide variation between groups and within the same group over time.*

In fact, groups working on a document may choose to spend some time working independently on different sections and some time focusing closely on a single section. If independent scrolling is not allowed, this is impossible. Enforcing scrolling on all participants can also lead to "scroll wars", which can be very disconcerting to users (Dix *et al.*, 1993).

Resolving this again involves trade-offs. Generally, the more individual freedom users have, the less they can be certain that others are seeing exactly what they do (Gutwin and Greenberg, 1998). Greater autonomy means common reference will be more problematic and misunderstandings more likely. Flexibility is probably more important than the control which comes from enforcing strict WYSIWIS (Stefik *et al.*, 1987; Dix *et al.*, 1993; Sasse *et al.*, 1994; Mitchell *et al.*, 1995).

Whether the tool allows different views of the shared object also affects the other design areas, particularly the treatment of pointers and insertion points. The following sections deal with these.

**3.3.3 Functions and features: supporting common reference**

Face-to-face groups working with a shared flip chart or paper frequently refer to "this" or "that" and point. Not surprisingly, the provision of support for this type of reference (*deictic reference, or deixis*), is another problem area. It is relatively common for users to point at their own screens, conveying nothing to geographically distant partners. The main solutions proposed have been:

1. a single group pointer, which group members can select in order to point at something,
2. individual pointers, which may be always visible or invoked via keyboard, mouse or toolbox,
3. no pointers at all.
A single, shared pointer may well bring with it the need for some floor control mechanism. It would also only be useful if all participants shared the same view, so the question of pointers is related to the degree to which WYSIWIS is enforced. Multiple shared pointers can clutter the display if always visible. Without a pointer at all, users can still make marks to draw attention to objects, or they can use spoken directions. Implementations that support multiple pages or division of participants into subgroups have additional problems achieving common reference. Stefik et al. (1987) explore the use of different degrees of sharing, with a pointer that is shared only within the subgroup and another for sharing with all participants. However, this caused users some confusion. Gutwin et al. (1995) propose a semantic pointer for use where group members have different views as a result of scrolling. Mitchell et al. (1995) noted some limitations of telepointers: unlike hand gestures, they carry no information about the person doing the pointing and contain no means of attracting collaborators' attention. Implementation of the shared pointer can overcome these limitations, however; this research used a shared editor with a named pointer.

3.3.4 Functions and features: activity feedback

When the shared workspace is used by remotely located groups, it will almost certainly be in combination with other communication tools, most often to transmit audio and/or video data. This is because:

"Whatever policy is used, floor control requires social behaviour which is greatly facilitated if additional direct communication such as a text chat facility or an audio channel is available." Fluckiger (1995) [p 145] Direct communication helps to, "create a social presence useful for whiteboard floor control". Direct conversation is also needed, "to complement the collaborative work done with the whiteboard." [p146].

Dix et al. (1993) consider how understanding is created between partners collaborating over an artefact. Figure 3.2 shows the co-operative framework for groupware which they use to distinguish between types of groupware tool. Version 1 (on the left hand side) shows understanding being created through direct communication between participants. In addition, each participant interacts with the artefact. However, when people work together, talk and actions are linked with use of the shared work area in complex interdependencies (Tang, 1991). The modified co-operative framework (Version 2, on the right) shows interpersonal communication taking place also through actions on the artefact, feedthrough. This is a more accurate representation of the relationship; these actions are also communicative acts.

This creates another problem area for designers. If actions on the artefact contribute to a shared understanding and efficient working, it is important that participants be aware of one another's actions. Making input activity visible and identifiable is one way to do this. Gutwin (1997) showed the benefits of this awareness and suggested some mechanisms for encouraging it. These included: semantic cursors, locating activity in the document rather than in screen space; radar views, to show unseen parts of the workspace; a global map of the entire document, showing the location of all participants' activity. Some very complicated solutions have been proposed, to enable sub-groups to form and be tracked (for example, Stefik et al., 1987). This is another area in which trade-offs must be made, particularly between group and individual needs. For example, it might be important to each individual to have the freedom to move and work anywhere in the shared space, yet the less individual activity is constrained, the harder it will be for the group to keep track of the overall status of the work (Gutwin and Greenberg, 1998).
Again, the less strictly WYSIWIS is enforced, the more complex this problem becomes. If they can split into sub-groups or work independently in different areas, group members will find it harder to locate one another and to know what others are doing and what has been changed.

This problem was explored by Stefik et al. (1987) and Tatar et al. (1990). Their work on the Boardnoter and Cognote meeting support systems, explores the trade-offs involved in supporting flexible group working, including splitting into subgroups, whilst also enabling reconvening of the whole group and maintaining awareness of progress throughout. In "Rooms" and "Stampsheets", they consider some possible solutions, although it has to be said that they are sufficiently complicated as to carry their own potential problems.

### 3.3.5 Functions and features: visible input activity

One way for participants to keep track of what others are doing is to make input activity visible. The main questions are whether to have one or multiple insertion points and whether they should always be visible to all participants. A related question is whether the insertion point should be identified with the participant, by colour or name, for instance.

With a single shared insertion point, similar floor control issues arise as for a single shared pointer. It also implies that only one participant will be making entries at any one time - that is, that the group undertakes single focus, close collaboration only. It also assumes all share the same view. On the other hand, multiple insertion points, visible on every participant's screen, may be confusing. One possible solution is only to make them visible when they are active. The other solution is that participants see only their own insertion points. When none are visible (except the participant's own), it may be that talk can be used to identify actions and actors, at least if the group is small.

Apart from the insertion point, there are many other factors of which collaborators need to be aware. Sasse et al. (1994) consider the needs in relation to a complete conferencing system and state that notification of events and changes should be timely, obvious but not unnecessarily intrusive and that, since such notification adds to the complexity of the system, implementation might include graded options to suit different levels of user expertise. Gutwin (1997) explores awareness in relation to the shared workspace and shows the need to support it. Gutwin et al. (1995), in the context of student collaboration in a text-based discipline, suggest features to support awareness (see 3.3.4) although they do not discuss how these were evaluated.
3.3.6 Functions and features: shared objects
One question that has been considered is the degree of granularity of sharing, the frequency with which displays are updated. In the early years, this was an important consideration because of the increased pressure on processors of very frequent updating. Some implementations (e.g. Stefik et al., 1987) operated on the principle that an individual participant would create an object for sharing and then it would be shared – other participants did not see the process of creation. This is also related to activity feedback. It proved to be confusing for users to have what was in effect private editing, as well as public. Mitchell et al. (1995) also report students' confusion about when their work was visible to others, in a situation where both private and public writing was possible.

A more fundamental question is: What objects will be shared? Related to this is: What do group members need to do to them? This area has not been investigated very fully in previous research, perhaps because the other design questions seemed to present more interesting problems for researchers. In the mid-1990s, both Fluckiger (1995) and Dix et al. (1993) made clear distinctions between shared whiteboard tools and shared editors. Both put them into different categories of tool1, although Dix et al. (1993) do mention that a shared editor may “include graphics”. The whiteboard was seen as predominantly a display tool, with only annotation, not editing possible. However, more recent tools, such as the MS NetMeeting whiteboard have some characteristics of both. Since one aim of this research is to find out requirements, it is important to keep open the possibility of a composite shared workspace. That was one reason for using both a whiteboard and a text editor in the research.

3.3.7 Limitations in relation to teaching and learning
In relation to investigating the features and functions required in a shared workspace tool for text-based teaching and learning, the main limitation of previous research is that there is unlikely to be a universally right answer to any of these design questions. Trade-offs always have to be made. Solutions must be worked out for the individual application area and the group work to be supported. This means that it is necessary to conduct investigations of a shared workspace tool in use, in order to be certain that what has been found for other application areas also applies to this one.

In addition to this, the question of the objects to be shared and the operations to be performed on them is still open and needs investigation. None of the research into shared workspace design probes deeply into the kind of object to be shared. Given the need for text to be shared, there has been no analysis of what a specific work situation needs to do with text. Tools to support meetings have been developed but text-based study is likely to have specific requirements. We also cannot assume that the same operations are needed in shared workspace tools as are needed in tools to support individual work.

3.4 Communication Media
Studies of communications media are important because we can not assume that, when we move from face-to-face to computer-mediated domains, there will be a neat translation of speech to audio channel, vision to video channel, writing or drawing to shared workspace. Instead, if we are to understand the role

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1 Dix assigns whiteboards to the "Meeting support" category [p434], whilst shared editors are classed as other "collaboration aware" tools [p441]. Fluckiger sees shared whiteboards as distinct from shared applications (which include shared editors) [p150].
and contribution of a shared workspace tool, we must be aware of the potential and limitations of all the media being used and be open-minded about their roles.

Secondly, the best use of a medium may be dictated by its attributes. We need to understand what the attributes of the shared workspace are in order to account for the way it is used. Some studies seek to explain apparent benefits of using a tool or channel by isolating certain of its attributes, such as expressiveness or richness (Chalfonte et al., 1991), permanence or persistence (Whittaker et al., 1991), Dillenbourg and Traum, 1999).

Studies of different media are important in any environment in which technology is being used to mediate communication – because media variations can complicate evaluation. This is particularly the case where the process is of interest or where the enquiry considers participants' level of satisfaction with the experience, as is the case here. An understanding of the part that media variations might play in the teaching and learning environment, should inform interpretation.

3.4.1 The nature of communication media studies

Studies of communication media often examine the impact of different conditions on outcomes and processes. They vary the kind, number or quality of communications media, in order to discover how such variations affect task performance or subjective perceptions, or in order to identify which attribute of a medium has a particular effect. Table 3.4 shows comparisons that have frequently been made.

<table>
<thead>
<tr>
<th>Medium</th>
<th>Compared with</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen</td>
<td>Paper</td>
<td>Luff et al. (1992)</td>
</tr>
<tr>
<td>Text</td>
<td>Audio;</td>
<td>Chalfonte et al. (1991); Gallegher &amp; Kraut (1992); Dillenbourg &amp; Traum (1999)</td>
</tr>
<tr>
<td></td>
<td>Text + audio;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Whiteboard</td>
<td></td>
</tr>
<tr>
<td>Audio</td>
<td>Audio + video</td>
<td>Olson et al. (1995)</td>
</tr>
<tr>
<td>Audio + video</td>
<td>Audio + enhanced video</td>
<td>Hearnshaw (1999a)</td>
</tr>
</tbody>
</table>

Table 3.4: Summary of comparisons that have been made between media

Studies with an education context (e.g. Kies et al., 1996; Hearnshaw, 1999a) often try to measure the impact of such variations on learning, which can be treated as both outcome and process. They may also measure subjective satisfaction (most often the student's level of satisfaction, rather than the teacher's) with a course or educational event (e.g. Kies et al., 1996).

Another body of work has investigated media choice. Groups working together may be able to choose how they use the available tools or communication channels. Their choices are analysed and interpretation seeks to reveal which characteristics of a chosen channel fit the purpose for which it is used - that is, to account for the choices by developing or testing a theory. Researchers may explain their findings in terms of one or more theories, such as: Social Presence Theory (Kies et al., 1996); Media Richness Theory (Chalfonte et al. 1991); Contingency Theory and Adaptive Structuration Theory (Gallegher & Kraut, 1992). This work may reveal things about the task, about the way people work or about the potential of the tool or channel. Findings, of course, always depend on what choices users are offered. For example, a synchronous text channel might be offered alongside an audio channel in one study, while another uses it with a shared whiteboard. The two studies may well find out different things about the uses of synchronous text communication.
3.4.2. What has been established?
The following points are regarded as a reliable basis on which to build in this research.

1. **Having a public area, such as a shared workspace, makes grounding easier.** *Grounding* is the process, through which participants in a discussion or group activity establish and maintain a shared understanding, or common ground. The medium through which people are working and communicating can affect grounding mechanisms, the ways in which people achieve mutual understanding. In particular, the cost of grounding, that is the amount of work needed to establish common ground, varies according to medium (Clark & Brennan, 1991), and the work reduces as visibility increases. Text-only communication makes grounding difficult, increases the number of misunderstandings and makes them harder to resolve. The experiment described by McCarthy *et al.* (1991) supports the hypothesis that common ground is hard to achieve via text-only communication and shows that having a public space reduces the difficulty. This finding is supported by Dillenbourg and Traum (1999).

2. **An important attribute of a shared whiteboard is the permanence or persistence of its display.** This attribute may account for its role in some group activities. Whittaker *et al.* (1991) distinguish the media they compare as *permanent* or *temporary*. They compared groups engaged on brainstorming and calendar co-ordination activities, supported by shared whiteboard only and shared whiteboard with audio channel. They found process differences (more parallel activity with permanent media) and that participants used spatial location of whiteboard entries to show relationships. Dillenbourg & Traum (1999), however, found their subjects used the graphical features of the whiteboard less than had been expected. They offered text as the *temporary* communication medium for their groups, with a shared whiteboard as the more permanent one. They found that the whiteboard functioned as the central space and shared memory for the group. The text-based MOO² was used more often to disambiguate whiteboard entries than vice versa. This contradicted their initial hypotheses about the function of the whiteboard, which were that it would support grounding "by helping partners to share references" and that "the whiteboard's role in mutual understanding would be to support drawing schemata".

3. **Audio communication allows greater expressiveness and interactivity.** Chalfonte *et al.* (1991) compare speech and text as media for asynchronous revision of a document. In particular, they found subjects who only had access to text communication tended to limit their revisions to textual detail. More complex revisions, or suggestions that might need tactful expression, were more likely to be offered by those who could use speech to communicate. Interactivity and expressiveness are seen as the distinguishers between the two media, with speech being more interactive and more expressive. This work may well be important in relation to teaching and learning activities. Not only do tutors have to make revisions and corrections to students' work, but pairs of students are often asked to comment on one another's work.

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² A MOO (Multi User Dimension, Object Oriented) is a text-based virtual environment, often room-based, in which those present can talk, perform actions and move via text commands. An example is the University of Virginia's English Department MOO, at http://atha english.vt.edu/ITT/help/MOO.html. Users access a MOO environment through Telnet or a specialist MOO client.
4. **Audio quality should be as good as possible.** Degradation in audio quality can interfere with speech intelligibility and therefore may affect communication on a more basic level than poor quality video (Watson, 2001; Kies et al, 1996)

5. **A video channel adds value.** It "adds satisfaction" (Olson et al., 1995). It can improve participants' ability to:

   "show understanding, forecast responses, give nonverbal information, enhance verbal descriptions, manage pauses and express attitudes". (Isaacs and Tang, 1993 [p199])

   Obviously some of the benefits outlined would only be available if the video image provided sufficient information.

   "People like to see each other. Video makes them feel more able to communicate with each other, to persuade and resolve issues. For work that extends over long periods of time, these preferences are very likely to be important." (Olson et al., 1995) [p 367]

   Educational working relationships do frequently extend over long periods of time, so this knowledge is useful.

6. **Video can reduce the amount of time spent clarifying points.** Olson et al. (1995) found that, with audio only,

   "the communication system got in the way of their being able to persuade others about their ideas or to resolve disagreements" [p 367]

   However, they also found that the face-to-face situation led to the highest levels of satisfaction, the best quality of output and the fewest misunderstandings.

7. **Video does not necessarily improve task performance or learning.** Neither does enhancing the quality of the video. Hearmshaw (1999a) presents a convincing case for this, based on both extended field trials and on a review of other studies. This is backed up by Olson et al. (1995), who found that, in terms of outcome of a group's work:

   "... if there are quality differences when one takes away video connections, they are small and do not always overcome the large between-group variances in performance." [p 366]

   However, they also found that:

   "the quality of the output of work with remote high-quality video is not significantly different from that of face-to-face work. Remote work without video is not a good as face-to-face." [p366]

   The audio and video connections in the 1995 Olson study were optimal. It is based on groups working together for a single session. Hearmshaw's (2000) work is based on desktop videoconferencing, multiway, over the Internet, over a period of several weeks. This is closer to the conditions likely to be encountered in distance education, so seems to offer a better guide in this instance.

8. **Using multimedia to present information does not have a clear cut effect on learning,** at least as measured by post-testing (Large et al., 1994). There are obvious exceptions, of course. Kies et al. (1996) found, perhaps unsurprisingly, that in a quiz based on teaching sessions over low-quality video links,
students answered questions based on information conveyed solely by the video channel less well than those based on information conveyed by other channels.

9. **Factors about people can influence results and individuals vary.** Subjective perceptions vary and some people find poor quality more distracting or irritating than others (Watson, 2001). Just as the conditions can affect the performance of the task, so the difficulty of the task may affect subjects' rating of the conditions (Wilson & Sasse, 2000b).

10. **People can compensate for poor working conditions.** They can often achieve success in a task despite obstacles imposed by the tools with which they are working (Galegher & Kraut, 1992). In the teaching and learning context, this compensation effect could enable students to succeed in learning when there are obstacles.

11. **We do not yet know enough to set quality standards for video in educational interactions.** Kies et al. (1996) seek a lower limit for video quality for distance education and make very specific recommendations (for example, to avoid a frame rate of less than 6 frames per second). In a combination of field trial and experiment, they vary frame rate and resolution with the aim of determining the lowest acceptable video quality level for distance education. They acknowledge the surprising variation in individual subjective ratings of quality and pinpoint this as an area for future research. They are also aware that in a real field trial, users may be more tolerant of quality degradation than in a laboratory situation.

Learning is measured by quiz (short test) questions. Subjective evaluations are also sought. Frame rate had little significant effect on quiz performance, but low quality (especially low frame rates) had a significant effect on levels of satisfaction. Subjects were reported "annoyed, disappointed, and generally dissatisfied". They appeared more distracted and less attentive. However, a number of factors might have had a negative impact on the students' satisfaction. Two or three students share each workstation. This research showed that students may find this unsatisfactory (Chapter Seven, Table 7.6). There is a local class as well as a remote one, and different strategies may be needed to engage the two kinds of audience. In this trial, audio quality was stated to have been poor. In addition, the evaluation is based on "delivery" of learning materials and lectures to a class, rather than on interactive small group teaching.

**3.4.3 Limitations in relation to teaching and learning**

As the last section shows, a great deal of knowledge has already been generated but, in relation to supporting teaching and learning, existing research is limited.

Firstly, it is not clear yet what role each communication channel or computer tool will play in a synchronous, interactive teaching and learning situation. It follows that we do not know for certain how important the shared workspace will be. As Hearnshaw (1999a) points out, the novelty of the technology also means that those studies which have used desktop multimedia conferencing have often been feasibility studies, and technical difficulties can interfere with analysis in such cases.

Secondly, not enough work has taken place in which students are truly active participants in the educational event. In educational studies where communication is synchronous, the continuous media are often used as "delivery channels". There are exceptions. Mitchell et al. (1995) studied students interacting synchronously in a collaborative writing project. Students are also active in the studies of collaborative
problem solving reported by Whitelock & Scanlon (1998). But here, participants are using a different type of shared tool, a simulation tool (see Chapter 1, section 1.1.1).

Third, most longer-term educational studies – Mitchell et al. (1995) is an exception – have been of asynchronous computer-mediated conferencing (CMC). Hearnshaw (1999a) reviews a large body of work analysing interactions between students with and without tutor intervention. However, these are interactions expressed in writing, and with time to consider responses. The findings can not be used to inform the design of a tool to be used synchronously.

3.5 Analysing Human Communication

A goal shared by many researchers (Shale, 1988) is to provide for distance learning students opportunities and experiences similar to those provided for co-located students. This includes:

"...providing the same advantages to distance learning students afforded by peer interaction and peer presence..." Whitelock & Scanlon (1998), [p 158].

It follows that research into face-to-face collaboration is important, since this may identify key features of face-to-face interaction and show why designers must try to support these in a computer-based system.

It is important to be aware of these communication factors, even when the research questions are about a shared workspace tool, since it is impossible to separate task performance from the person-to-person interactions needed to carry out the task (Tang, 1991 and see section 3.3). In teaching and learning, the interactions between people can also affect student satisfaction (Fulford & Zhang, 1993a and 1993b).

3.5.1 The nature of studies analysing human communication

These studies generally isolate one or more components of human communication in order to examine their role in a given situation or work context. Most studies in this category are based on observation and/or recordings of groups either in their real work situation or in a simulated work situation. They may be working face-to-face or communicating via a computer system. The working context, or task, is always a factor, so the aim of such studies is to say, "When they design together ...." Or "When they are solving physics problems ....", rather than making blanket statements about communication. Again, it suggests needs vary according to context and must be investigated for each new context.

Analysis is often based on logging actions as they happen and then assigning them to previously-defined categories. One of the best-known examples is that devised by Tang (1991). He recorded the activities of face-to-face design groups in a matrix which plots action: list, draw or gesture against purpose: store information, express ideas, mediate interaction.

The role of gesture is a key interest of their work. Others (for example, Whitelock & Scanlon, 1998) have investigated the role of gaze and eye contact. Factors that promote awareness of others and of their actions have been of interest to a number of researchers. Gutwin et al. (1995) suggest that such awareness makes collaborative learning more efficient by creating opportunities for opportunistic collaboration, although it is not clear how this was tested. Whitelock et al. (1995) compare four different conditions,
in which students are aware of others to different degrees and suggest that even working in the presence of others, without overt collaboration, is motivating for students.

3.5.2 What has been established?
In broad terms, reviewing existing research literature has shown that audio and/or video mediated communication differs significantly from face-to-face communication. Differences stem from (1) the lack of physical proximity, (2) the lack of eye contact and (3) the inability to convey gestures clearly. Design of tools to support interaction in distributed groups must take account of the differences. More specifically:

1. In face-to-face design groups, Tang (1991) found that "hand gestures, and their relationship to the drawing space, convey significant information" [p156]. Tang & Leifer (1988) also point out that gesture is overlooked in the conventional view of group design work. Gestures in fact help to give information as well as to refer to existing objects. They also focus attention and engage attention.

2. For face-to-face groups, the workspace has a key role in mediating interaction, as Tang & Leifer (1988) and Tang (1991) found:
"concurrent activity in the drawing space can be a resource for helping the group smoothly negotiate using it" and "actions in the drawing space are often used to bid for a turn in the conversation." Tang (1991) [p154].

3. Females appear to make more use of gesture and to gaze at one another more frequently than do males during computer-supported collaborative learning (Whitelock & Scanlon, 1998):
"[...] females sustain the collaboration with more non-verbal behaviour than males." [p 162]
"[...] females interacting together as pairs do use gaze significantly more than male pairs or those of mixed gender." [p 164]
They investigated the roles of gaze and gesture amongst pairs of adults collaboratively solving physics problems. They believe that their findings have design implications:
"This result suggests that any video which supports groups of females working together should be large enough for the reciprocal gestures to be recognised." [p161]

4. Individuals need to be aware of what other group members are doing in the shared workspace and this is harder to achieve when they are not working face-to-face. Tang (1991) states that awareness of one another is an important contributor to successful group working but that we do not fully understand the way in which this awareness is generated. As part of a broader consideration of awareness and its design implications, Gutwin et al. (1995) consider the kinds of awareness students need when they work together. Having identified social, task and concept awareness, they add "workspace awareness". In the educational context of their study, they define this as:
"The up-to-the-minute knowledge a student needs about other students' interactions with the shared workspace." [p 147].
They consider how workspace awareness helps students carry out a collaborative learning task, which is to assemble a poem from individual lines. Students who are aware of what others are doing will take
advantage of opportunities for collaboration, as they arise, and thus perform the task more effectively. They provide an example: one student assists another by supplying a line which s/he needs.

From a review of the literature, they draw out ways in which students can learn in a collaborative situation: (for instance, from a more knowledgeable peer; through identifying and resolving differences and conflicts, by peer teaching). They state that all these need workspace awareness and give some examples of how the user interface might promote such awareness. No details are given of the conditions under which these suggestions were tried out.

3.5.3 Limitations in relation to teaching and learning
Again, a major limitation is that most explorations of synchronous work do not study the groups over time, so participants are always in an unfamiliar computing environment and studies do not show how communication develops over time. Hearnshaw (1999) is an exception but focuses on the role of video, not the shared workspace tool. The teaching and learning context, a computer science course, is also different.

Another difficulty is that studies of communication in small group educational collaborations tend not to involve both a teacher and students. Hearnshaw (1999a) is an exception and there are many (e.g. Whitelock et al., 1995, Mitchell et al., 1995) which focus on students interacting amongst themselves. This research considers situations where the teacher is interacting with the students and it seems likely that the teacher’s role will have an impact on group communication.

3.6 Working in Groups
The research with the longest history is the study of how groups collaborate, whether or not they are computer supported. Some writers, such as Mandviwalla and Olfman (1994), provide general recommendations about the needs of groups. Others (see examples below) focus on one task or aspect of group working. Roles and relationships, the organisation of the collaborative process and group size are three areas which are relevant to this research and have been investigated in relation to shared workspaces.

It would seem obvious that one needs to study group tasks in order to understand how a shared workspace can support them. The split between this section and the last one exists in order to facilitate analysis and manage the review. Many studies could fit into both sections. Tang's (1991) work, for instance, has already been mentioned, as has the work of Whitelock & Scanlon (1998) and Dillenbourg & Traum (1999). The studies discussed here say something about the task itself - that is, they "anatomise" the task (Fleming, 1990), in the same way that other studies anatomise the communication. However, in doing so, they are also contributing to knowledge about what the task involves for the people who undertake it. Just as communication cannot really be studied independently of the situation in which it takes place, so the performance of a group task cannot be investigated in isolation from the group’s communication. Tang's (1991) work, referred to in the previous section, illustrates this in relation to design tasks and also shows how important this is in relation to activity in a shared work space. Another example is the work of Ishii & Kobayashi (1992), who summarise efforts to provide support for shared drawing through the shared whiteboard, Clearboard. They identify eye contact and direct drawing as factors important for its effective use, but also emphasise the importance of seamlessness, that is enabling group members to move seamlessly between drawing and interpersonal communication.
3.6.1 The nature of studies of group working

The aim is usually to understand the group task and to find out how best to support it. One task or type of task may be studied, in order to understand the participants’ goals, the factors which affect successful performance, the operations needed to carry out the task and the ways in which people organise the process. Ways in which the computer support tool changes the task are also of interest.

Collaborative activities, such as brainstorming (Hymes and Olson, 1992), designing (Tang, 1991; Minneman & Bly, 1991; Olson et al., 1992), drawing (Ishii et al., 1992), writing (Beck & Bellotti, 1993; Sharples et al., 1993; Mitchell et al., 1995) have been much studied, although, in the case of writing, much of the research has been on asynchronous collaboration. Design and brainstorming sessions are of interest to researchers because of their loosely-structured nature. Drawing and writing play a part in many tasks but have also been studied as tasks or work activities in themselves - that is where, for example, the end product of the group collaboration will be a document or a drawing.

Both the outcome and the process are usually of interest, so research questions may include both whether a task can be completed using a particular tool and how the tool affects the way in which it is completed. Another important aspect concerns the ways in which the physical characteristics of a computer system can change certain parts of an activity, for example comparing systems which allow direct drawing on the surface on which the drawing is displayed, with those which demand that the drawing is done indirectly, as would be done on a mouse mat or graphics tablet.

Hymes & Olson (1992) show how the use of a group editor can encourage parallel work in a group brainstorming task. They aim to clarify possible confusion over the results of previous studies, confusion that they believe might arise from the effect of using a computer to report/record brainstorming, rather than to support the actual task. Serial interacting, parallel interacting and nominal groups (total 116 subjects, groups of 4) all used the same text editor (stand-alone and shared versions as appropriate) to record their ideas. This revealed a need for more research into the parts played by group size and rate of idea generation. But it did replicate previous findings that nominal groups outperform serial interacting ones. Olson et al. (1992) report changes in both outcome and process, as a result of using a collaborative tool, for groups working on a design/problem-solving task. The main differences were: higher quality designs, less extensive "exploration", slightly less enjoyment.

Another type of study aims to provide a framework for understanding tasks in the future, in the form of a taxonomy or typology of tasks. In theory, if one accepts the framework, tasks that have not yet been examined in depth can be placed in the framework, which will help understanding of what they involve. One example (see Figure 3.3) is devised by Gutwin et al. (1995).
They present a framework for describing collaborative situations, in which View Separation (the extent to which users are looking at the same things) is tabled against Task Separation (the extent to which they are sharing activities). The purpose of this is to allow them to organize the work situations so that the specific mechanisms people use to maintain workspace awareness can be examined.

They assign group creative writing and peer editing to the same task, same view category, with problem solving in a physics microworld. Suggested examples of same task, different view situations are students making a group collage or constructing a long time line. They also consider briefly what they call “mixed focus” situations. Here students are engaged on the same tasks but switch between same view and different view situations, or between individual and shared activity. This has been identified as a characteristic of many group collaborative situations. Figure 3.2 lists the questions that participants in educational collaborations may need to answer about what other people are doing.

Another framework was proposed by Posner & Baecker (1993) based on their interview study of collaborative writing. Figure 3.4 summarises the main elements.

Though not directed at use of shared workspace tools, this was seen as potentially useful because it allows for differing roles, which might be needed to accommodate teacher and students working together, and because a framework to characterise writing might well apply to some of the activities found in text-based teaching and learning.

### 3.6.2 What has been established?

The major finding is that understanding the task is essential in order to design a support tool for it and in order to explain the impact of the tool on the task. This understanding should cover process as well as outcome.
Characterising the task can be helpful. One way to do this is to fit it into a framework. This can be a good way to consider requirements and can help to clarify how technology can help with this particular task.

The support tool should not over-structure the task it is supporting. Even when research has shown that a collaborative process usually follows a predictable pattern, users should be free to improvise, not forced by the technology to fit in with the pattern every time (Dix et al., 1993; Tang, 1991).

A general-purpose shared workspace tool can usefully be used (as a kind of prototype) by groups performing specific tasks and its use can be informative about the requirements of this task (Olson et al., 1992).

A shared workspace tool can influence process, the way people carry out their work. It can alter the way the work is organised (Hymes and Olson, 1992) and the way group members communicate with one another (Mitchell et al., 1995). It can also alter the participants' enjoyment of the process (Olson et al., 1992). Roles and relationships within the group can be very influential (Beck and Belotti, 1993; Posner & Baecker, 1993; Mitchell et al., 1995).

3.6.3 Limitations in relation to teaching and learning

Designers currently do not know enough about what tasks are needed in interactive, text-based teaching and learning. There has, of course, been a huge amount of research into learning, and into educational group work, but designers need to know what group learning tasks consist of, at a low level (that is, at the level of actions carried out on objects) and they need to know the rationale, goals and priorities of the teachers and students involved.

There also has been little work done on how a real-time teaching and learning support tool should interface with the rest of the users' work (for both teachers and students). CSCW considers seriously the social and organisational context in which groupware tools will be used but it appears less common to link learning technology design with its working context.

3.7 Conclusions

All the areas in Table 3.1 are relevant to this research and contributed to the thinking and the research plan. The actual findings, however, are not a reliable guide to design of a shared workspace to support this particular area of work, for three main reasons:

1. they addressed different research questions, or
2. the communication environment, task, group characteristics or support tool were different, or
3. the whole working context was not considered in the study.

Table 3.3 summarises these differences.

<table>
<thead>
<tr>
<th>Area of difference</th>
<th>For example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Communication environment</td>
<td>Different tools or quality levels or interface</td>
</tr>
<tr>
<td>2. Task</td>
<td>Synchronous tasks studied as one-off events. Extended studies of other shared working (e.g. co-operative writing)</td>
</tr>
<tr>
<td>3. Conditions of field trial or laboratory study</td>
<td>Field studies of single events, or large lectures. Shared workspace not used interactively but only for presentation of material</td>
</tr>
<tr>
<td>4. Research question</td>
<td>How are the graphical marks used to communicate?</td>
</tr>
<tr>
<td>5. Tool itself imposes a structure or imposes different limits</td>
<td>Shared simulation tool</td>
</tr>
<tr>
<td>6. Factors about the group</td>
<td>Artificial groups</td>
</tr>
<tr>
<td>7. Environmental, organisational factors not considered in study</td>
<td>What else is part of participants' work or learning environment? What other support tools are used? Do groups also meet face-to-face?</td>
</tr>
</tbody>
</table>

Table 3.3: Differences between previous work on shared workspaces and this research
Many of the questions asked in previous studies will need to be asked again in this research. Previous work showed, for example, that persistence of data was important for certain tasks (section 3.4.3). In order to understand the contribution of a shared workspace tool, it will be important to find out which attributes of the tool are useful in this particular application area and what precise benefits they bring.

In the research considered here, writers draw conclusions only about the specific tasks on which they focused. The tasks that teachers and students undertake in interactive text-based study will have to be investigated. To find out exactly what features and functionality are required, trade-offs will need to be investigated in relation to these tasks. It must also be remembered that the review of previous work has shown there is no simple separation between task and communication. The task may affect perceptions or ratings of the tools - perhaps even more than the tools affect task performance. Account must also be taken of the fact that people will often perform a task successfully but that it may be at considerable cost. For instance, Galegher and Kraut's (1992) study of students' media choices showed that performance did not suffer even when the technology presented groups with considerable difficulties.

This leads on to considering communication. Whether co-located or distributed groups are studied, it will be taken for granted that auditory and visual channels are available in conjunction with the shared workspace tool. This means collecting data about them and taking this into account in interpretation - considering the whole working environment, in other words. Consistent audio and video quality over a packet switched network is unlikely (Watson 2001). Instead, the fluctuating quality and any striking peaks or troughs will simply have to be considered when interpreting results. So, another point to be aware of is that absolute control over conditions can not be guaranteed.

In addition to these points, in order to contribute new information, the research must use situations where students and teacher interact together, synchronously. The tasks must be text-based teaching and learning tasks. The students will be active participants. The study must pay attention to the tutor's role and consider how the synchronous activities relate to the whole of the students' and teachers' work. The research must also take account of developments over time.

Although the findings of previous work do not show what part a shared workspace tool can play in text-based teaching and learning, the work does give pointers about appropriate research methodology. The research methods were chosen on the basis of both the work discussed in this chapter and the findings about the work area, which were discussed in Chapter Two. They are explained in Chapter Four.
Chapter Four - Investigative Methods

This chapter introduces the chosen research methods. It begins by reviewing the potential problems and constraints, and outlines the research plan that was developed in response to these. It explains why a user-centred approach was appropriate, and why requirements were elicited using a prototype shared workspace tool, in extended field trials. Finally, it explains how data was collected and analysed and what measures were taken to ensure that findings were valid and reliable.

4.1 Introduction

Research methods were governed by the need to address problems arising from:

1. the nature of the research area,
2. the nature of the application
3. the nature of the work to be supported.

The next section explains these potential problems.

4.2 Potential problem areas

4.2.1 The problem of designing tools for groups

The failure of new groupware technology is a problem addressed by CSCW research over the last twenty years. The most common reason for it is that design is based on inadequate understanding of the work to be supported. It is clear from numerous studies, especially those carried out by Grudin (1991), Grudin & Palen (1995), Greenberg et al. (1992), Hepp et al. (1994) and Sasse et al. (1994), that the following practices increase the chances of designing groupware tools that are accepted by users:

- study how the work is actually done, including the flexible ways in which people really work, rather than the work systems and procedures that are documented;
- design systems that enable users to develop their own ways of working, rather than ones which impose a rigid structure;
- develop new work practices and new technology together, rather than introducing the technology and expecting people to change the way they work;
- build into the development process strategies for managing the introduction of the technology and aiding its acceptance. This includes providing adequate training.

The place of group working in relation to the whole work environment must also be considered. People do not spend all their working time in groups. In fact, although collaboration is a part of most jobs, they will almost certainly use a group support tool less frequently than individual support tools (Grudin, 1994b). Tools to support communication and group working will have a greater chance of acceptance if they inter-work with those used for individual work. In the teaching and learning context of this research, the shared workspace tool will support periods of synchronous collaboration, but these have to be prepared and followed up by both teachers and students. The individual tools they use for preparation and follow-up should integrate easily with the shared workspace tool. The initial observation and document
studies, described in Chapter Five, and the field trials, described in Chapter Six, identified these tools and showed what was required in the shared workspace in order to enable inter-working.

### 4.2.2 The problem of understanding group working

Grudin (1994b) explains why group activity is more difficult to study and characterize than individual activity. Task analysis and evaluation are both more difficult for groupware than for single-user applications. People rarely make their working priorities and assumptions explicit, which makes it hard for designers to recognize needs or to understand the social dynamics of group working. It is also difficult for users to define their group working needs because,

"Users do not make explicit distinctions between working in co-operative or individual modes; they just want to carry out their work." (Gronback, et al., 1993) [p75].

The suggested strategy, again, is for the designer to study how work is actually done in the workplace. However, this is not straightforward.

Group interactions take a long time to play out, so requirements analysis and evaluation also take time (Greenberg et al., 1992). Field observations may be complicated by the number of people involved and by environmental factors at different sites. This may make it difficult to account for problems or successes and to attribute cause to effect.

Greenberg et al. (1992), writing about group drawing, stress the importance of understanding the collaboration. They review the literature, to show that observation is essential in order to avoid designers' relying excessively on their own intuition about group work activities. They cite Bly (1988) and Tang (1989) to underline the importance of studying the process as well as the resulting artefact, since groups can be resourceful enough to achieve success in their task despite an inadequate tool (Gallegher and Kraut, 1992). Chapter Three, section 3.6.3, has shown that process as well as outcome must be studied, and this was an important consideration in developing the research plan. In particular, it led to the use of observation and a variety of methods for eliciting teacher and student perceptions and experiences (see section 4.4).

### 4.2.3 The problem of novel technology

Although shared workspace tools have existed for over ten years, teachers in text-based disciplines in Higher Education are likely to have no experience of them and no information about them (see Chapter Two, section 2.4.1). This could lead to problems of different kinds.

First is the problem of envisionment: users have difficulty imagining how they might use very new technology. Gronback et al. (1993) state:

"...most users are not able to bridge the gap between dry descriptions and their professional knowledge and skills." [p 67]

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1 Relying on intuition in relation to education may be particularly likely. Since everyone has some experience of education, they may feel their perceptions are especially reliable in this case.
This research repeatedly revealed examples of this, in relation to shared workspace tools. For instance, the Russian lessons discussed in Chapter Seven attracted a number of interested teacher-observers. When the tool was first described to them, the essential concept, that all participants write in the same shared space, was often not grasped. When the tool was demonstrated, this concept was accepted politely but not seen to apply to their own practice. When they observed a whole lesson, and especially when they tried the tool out themselves, an element of excitement seemed to be generated. Only at this point would the teachers begin to talk about how they might use such a tool. If users cannot imagine using a tool, it is difficult for them to state what they need from it. This, of course, contributes to the difficulty of specifying requirements.

The novelty of the technology may also be intimidating to users and prevent them from exploring its potential. Lack of confidence about technology is a contributory factor. Bates (1995) blames lack of training (arising from lack of time and money) for some teachers’ reluctance to undertake innovation. Potter & Mellar (2000) suggest that time, training, and the integration of personal and work computer use will increase teachers’ confidence. Teachers’ conceptions about the potential of computer technology may also influence their use of it. For instance: Hinostroza & Mellar (2000) discovered that teachers viewed the computer as a tool for classroom management, more than for communicative purposes; Potter & Mellar (2000) found teachers attached relatively low priority to the collaborative possibilities of the Internet. The VDML Survey² showed that language teachers regarded computers as best suited to developing grammar and writing skills. A further consideration is that teachers who are hard pressed by continuing demands for change (see Chapter One, section 1.3.5) may not welcome further innovation.

These factors must be considered because the teacher’s role, as designer and co-ordinator of the teaching session and the course, is highly influential, as explained in Chapter 2 (section 2.6). Misconceptions about the potential of the tool and over-reliance on established teaching methods would reduce the chances of discovering any new opportunities that a shared workspace tool might offer; possible benefits would remain undiscovered. The research methods had to enable and encourage teachers to explore the use of a shared workspace.

Finally, it is difficult with very new technology to find out about how it will be used after users have built up their experience and explored its potential. Design should support the “mature use” of a tool, as well as its use in the early, exploratory stages. To capture information about this, in the absence of a large body of regular users, accumulating and sharing experience (see Chapter Two, section 2.4.5), it was considered necessary to study shared workspace tools in use over a considerable period of time.

The need to help teachers imagine how they would use a shared workspace tool influenced the decision to use a prototype system. It was used in extended field trials in order to give teachers an opportunity to explore its use over time.

4.2.4 The teaching and learning problem

There are two types of constraint to point out: the constraints on research method and the need to study process. An educational context imposes constraints on the manipulation of study conditions and on data collection methods. The cost of studying "real" working conditions, in the field, is usually some loss of
control, compared with what is obtainable under laboratory conditions. Firstly, ethical considerations prevent certain manipulations. For instance, treating students in a way that they perceive to be unequal, or imposing conditions seriously detrimental to learning, would not be acceptable. Secondly, data collection methods cannot be too intrusive. The study described in Chapter Seven, for example, took place with co-located students, in a small room. It was not possible to use more than one video camera and it was considered necessary to consult the students about camera placement. Thirdly, the closer the study is to the real working environment, the greater the impact of restrictions on that environment; lack of money and other resources, for instance, may make it impossible to use certain software or hardware. Another problem is that "real" students have no commitment to the research, do not attend every lesson and sometimes arrive late. In Trial 3, for instance, this affected the number of questionnaire responses obtained.

Although this research was conducted exclusively in the field, the degree of control over conditions did vary, as explained in section 4.3.2.

The other issue is that, as already stated, the teaching and learning process is important, as well as the outcome; in fact, the process is the outcome, in a sense. Further, the process is an extended one. Beyond the most superficial memorising of "facts", considerable time is needed both for learning to take place and for teachers to develop a new way of working. This is another argument for trials of long duration. Observation was used as a means of studying the process. Observers included teacher-experts, who reported on both process and learning outcomes. In addition, participant perceptions about the process were elicited through questionnaires, focus groups, interviews and written reports.

4.3 Description of Research Method

4.3.1 Key points

The research plan developed out of reflection on the research questions and on the issues discussed in section 4.2. Findings presented in Chapter Two, about the most suitable teaching and learning context for synchronous interpersonal interactions, also contributed.

The key points about the conduct of the research are:

1. The research was carried out through a series of field trials and field observations (4.3.2, 4.3.3, 4.3.4).
2. Methods from the participatory design movement were used in order to encourage teachers to explore and thus reveal design requirements (4.3.5).
3. A fully-functional prototype conferencing system, including two shared workspace tools, was used in the field trials (4.3.1).
4. Both distributed and co-located groups were studied (4.3.4).
5. Varied learning situations (within the constraints outlined in Chapter 2) were selected (4.3.4).
6. Group size varied from two to ten.
7. The duration of the trials ranged from four weeks to two academic years (4.3.4).
8. Quantitative data was collected to investigate user problems and feasibility (4.4.1).

3 VDML Survey: [http://www.ucl.ac.uk/epd/herdu/vdml/survey.htm](http://www.ucl.ac.uk/epd/herdu/vdml/survey.htm) see Chapter Two, section 2.4.1
Other data collected was predominantly qualitative and covered both subjective participant perceptions and more objective observer views. (4.4.1, 4.4.2, 4.4.3).

Findings were based on: lesson observation; video recorded lessons; questionnaires and interviews; focus groups; written reports from teacher-expert observers; screen shots and saved text files. (4.4)

**4.3.2 Summary of field studies**

The three tables below summarise the studies that were done. The order of the research was: initial studies (Table 4.1); Trial 1 (Table 4.2); Trial 2 (Table 4.2); ancillary investigations (Table 4.3); Trial 3 (Table 4.2).

<table>
<thead>
<tr>
<th>Course</th>
<th>Group size</th>
<th>Aim</th>
<th>Findings based on</th>
</tr>
</thead>
<tbody>
<tr>
<td>English language and literature (school)</td>
<td>2-6</td>
<td>Find out what is shared and how.</td>
<td>Observation notes and sample lesson materials.</td>
</tr>
<tr>
<td>Spanish evening class</td>
<td>2-4</td>
<td>Find out how far shared material is similar in different areas of textual study; Find out why teacher uses shared material and how it is created.</td>
<td>Documents: all printed learning materials; Interview with teacher.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trial</th>
<th>Course</th>
<th>Duration/ Group Size</th>
<th>Aim</th>
<th>Findings based on</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Distributed Language Classes: Advanced French; Business French; Latin Reading; Beginners Portuguese</td>
<td>9 Weeks 2-4</td>
<td>Establish feasibility of using the system to teach foreign languages. Identify usability problems that might affect findings or interpretation.</td>
<td>1. Observer notes and checklists 2. Questionnaire responses 3. Focus group transcripts 4. Screen shots 5. Written reports from teachers and expert evaluators.</td>
</tr>
<tr>
<td>2</td>
<td>Distributed Advanced French Class</td>
<td>22 Weeks 4</td>
<td>Examine use of the shared workspace tool. Establish necessary features and functions.</td>
<td>As 1-4 above.</td>
</tr>
<tr>
<td>3</td>
<td>Co-located Russian Writing Class</td>
<td>2 Years 7-10</td>
<td>Explore impact of tool on teaching and learning.</td>
<td>As 2-4 above, plus: Analysis of videotaped lessons; analysis of saved text editor contents.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Group Size</th>
<th>Aim</th>
<th>Findings based on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish for Lawyers</td>
<td>3</td>
<td>Substantiate design findings: See more use of a second shared workspace tool.</td>
<td>Observer notes; Notes and transcripts of teacher and student discussion;</td>
</tr>
<tr>
<td>Russian</td>
<td>4</td>
<td>See more varied courses.</td>
<td>Notes on Interview with student.</td>
</tr>
<tr>
<td>English as a Foreign Language (EFL)</td>
<td>5</td>
<td></td>
<td>Videotape and transcript of teacher and student discussion</td>
</tr>
</tbody>
</table>

**4.3.3 Why field studies?**

Field trials can offer a high degree of ecological validity. If they are part of the users' real work, the motivation for succeeding will be similar to that in the real work situation. Field trials can also provide, "evaluation conditions [...] similar to those anticipated for the actual operation" (Dix et al., 1993 [p 175]), which was considered likely to increase the reliability of findings.

The main disadvantage is that, in real teaching and learning situations, conditions cannot be controlled as closely as in the laboratory. Factors from the real working environment can interfere with the research agenda. In the case of a real teaching and learning context, anything from erratic student attendance to the demands of examinations could cause interference.
Experimental studies have the potential for more control. They are attractive where the research questions are very clear cut or where the design has clearly identified targets. The evolution of **ClearBoard**, as described by Ishii and Kobayashi (1992) is an example. Their design goals are:

"A smooth transition between face-to-face conversations and shared drawing activities [and]
Eye contact to support real time and remote collaboration between two users." [p829]

As a result of comparing systems and observing groups in action, they add requirements for direct drawing on the work surface and a common orientation for participants, both left-right and up-down, in relation to the work surface. The scope of the study is to find out whether the prototype they create fulfils these requirements. They are thus able to design the experiment around a task that enables them to answer the question.

In this case, however, there was no such clear target. It is possible to investigate specific design requirements through laboratory studies but this was also an open enquiry into the role and impact of a shared workspace tool and more suited to investigating in the field.

It can also be difficult to design laboratory investigations of group working. Olson *et al.* (1992) identify problems in previous studies which might account for contradictory results. Task and group sizes vary and it is difficult to find a large number of "intact" groups; the solution is often either to be content with a small number or to create artificial groups. In addition, not enough account is taken of differences in the technology used, for example, the amount of structure it imposes on the activity.

Finding an appropriate task can also present problems in the laboratory, especially if the intention is that findings should transfer to the field. The most convincing experiments choose a task which demands the kind of collaborations they wish to study and are clear about what they need to measure and how to do it.

So, for example, Olson *et al.* (1992) wish to assess both the output of a design meeting and the process. This experiment calls for both computer-supported and unsupported groups, since it is the effect of the support tool on the collaboration which is of interest. They are clear about the scope of the study and take steps to validate the task they choose⁴.

Researchers may carry out a series of studies, some in the field and others in the laboratory. The choice usually depends on the research questions and the stage of the investigation. Olson *et al.*, (1992) for instance describes a sequence that moves from achieving a baseline of understanding (field), to study of specific phenomena (laboratory), to assessing technology use in organisational context (field again). In a similar way, Watson (2001) and Watson & Sasse (2000a, b) show how field trials can be combined with laboratory experiments in a research programme to investigate the impact of audio and video quality. Kies *et al.* (1996) also use a mix of laboratory and field work although their field studies are short in duration.

Another approach is to combine features of field and laboratory work in a single study. Thus, somewhere between field and laboratory studies are those in which conditions in the field are controlled and manipulated over a period of time. Galegher and Kraut (1992) wish to examine a hypothesis derived from *contingency theory* and related to media choice. Contingency theory suggested that, given a choice of

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¹ It is assumed that "intact" means "already existing", "having an existence outside the study".

⁴ They use McGrath's (1984) Task Taxonomy for task validation.
communication conditions (face-to-face, telephone, document exchange, computer conferencing), face-to-face will be chosen for the most "communicatively intense" parts of the work. Two tasks, both complex group projects which could be broken into sub-tasks, are given to groups of students who have different sets of media choices. For each project, the sub tasks varied in the intensity of communication they demanded. One project, however, was designed to demand far more collaborative activity than the other. Collection of subjective data is integrated into the normal work pattern through a requirement for daily work reports. Since it is integrated into day-to-day study, this has aspects of the field trial, but far more control has been exercised over conditions than is usually possible in the field. All the same, the writers note the constraints imposed by using students from a real class for an experimental study. The need to be fair, for example, prevents exactly equal numbers of groups from being assigned to each condition. Similarly, Whitelock et al. (1995) conduct an empirical study in a school environment, exercising considerable control over the conditions. 15-year-old students, assigned to 4 conditions, are given a pretest of conceptual understanding, some exploratory work with a simulator, three problems to solve, and a post-test, a few days afterwards. This is a one-off event but it is embedded in the curriculum and planned in the way that a good lesson would be.

In the case of this research, field studies were considered appropriate but the degree of control varied according to the stage of the research. This is explained in the next section.

4.3.4 Points to note about the field studies.

4.3.4.1 A mix of co-located and distributed teaching

The research began with co-located groups. At the time (the mid-1990s), there was very little synchronous, interactive teaching over computer networks and none that was accessible and used desktop multimedia conferencing for language tutoring. To find out about the tasks to be supported, it was necessary to study classroom lessons and this is what was done in the initial studies (Table 4.1).

Next, in order to determine whether a shared workspace could support the same range of tasks as its classroom equivalents, distributed groups were studied. This work was in two phases. The first (Trial 1, Table 4.2) established that the conferencing system as a whole could support language tutoring, and provided a suitable framework within which to investigate use of shared workspace tools. It studied four different foreign language courses. The second (Trial 2, Table 4.2) looked specifically at the way two shared workspace tools were used in an Advanced French class.

As a result of these two trials, it was possible to make recommendations about the features and functions required in a shared workspace tool for language tutoring. The trials also showed that the shared workspace tools had a very strong impact on the teaching and learning, so interest then shifted to investigating this impact. Co-located groups were used for this final stage of the research (Trial 3, Table 4.2). The final study was intended to highlight the best uses of the tool and to show whether it could really enhance teaching and learning in text-based disciplines or whether it just provided distance learners with a substitute for the classroom equivalents. This is easier to establish in a co-located group, where users have a choice about how to share material. Some questions relating to interpersonal communication and classroom atmosphere were also easier to address without the complicating factors of audio and video mediated communication (see Chapter One, section 1.2.1). Finally, access to all participants would be more straightforward.

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4.3.4.2 Varying degrees of control

The degree of control imposed on conditions varied between the studies. In the initial studies, the researcher was a visitor to the classes, with no influence whatsoever over conditions. Following this, Trials 1 and 2, with distributed groups, were field trials in which the research agenda was quite influential. Students and teachers were on real courses but all had agreed to take part in the trials and to co-operate with the research. The teachers controlled what happened in lessons, but the hardware and software platform and the technical support were controlled by the research team. The final study (Trial 3) was, again, in a class that existed independently of the research. It was therefore subject to the constraints and conditions of day-to-day teaching and learning, and the demands of the course, not the research, governed what took place in lessons. However, this study was approached as a partnership with the teacher (see Use of Participatory Methods, below). As a result, the teacher made every effort to facilitate the research. This included allowing students to complete questionnaires during lessons, explaining the work that was being done and giving the researcher copies of files.

4.3.4.3 Role of the ancillary investigations

The ancillary investigations differed from the main studies in that they made no attempt to capture the whole of the teaching and learning experience. Instead, as Table 4.3 shows, they collect only one type of data or consider one aspect of the course. They were carried out in order to broaden and deepen understanding of the potential role of a shared workspace tool in teaching and learning. They increased the range of learning situations and group sizes. They provided more examples of the use of a second shared workspace tool. They did not contradict earlier findings, substantiated a number of design findings and raised some new questions, which were addressed in the final study.

4.3.4.4 Duration of field trials

The need to explore use of the shared workspace over time has been stated repeatedly in this Chapter. This was given high priority and the courses studied in the three main trials lasted 9, 22 and 40 weeks. The last was a longitudinal study. It followed one teacher and the students on her course (73 in total) over two academic years. This is a relatively unusual method of capturing design requirements for a synchronous collaboration support tool. However, Mitchell et al. (1995) showed that an extended study of collaborative writing with school students could generate knowledge useful to designers. It was believed to be appropriate here because of the questions addressed at that stage of the research and because the previous study had shown that use of the shared workspace tool was still changing after two terms. The fact that use of the shared workspace tool continued to develop into the second year of this study lends support to the decision.

4.3.4.5 An appropriate teaching and learning context

Foreign language teaching and learning supplies conditions in which synchronous interpersonal interactions are likely to be needed (see Chapter Two, section 2.5.2):

- Communication is integral to the learning;
- Students working in a language that is not their own may find tasks difficult. They may also suffer from lack of confidence, also known as “language anxiety” (MacIntyre & Noels, 1996).

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5 This stage of the research was undertaken in association with the ReLaTe project (http://www.exeter.ac.uk/pallas/relate/).
At first sight, all the courses are "language classes", and the aim of this research was to look at support for an area broader than this, defined as "text-based" teaching and learning. In fact, the courses studied were varied. They included:

- beginner/early stage foreign language acquisition (Portuguese);
- applied, work-related language courses (Business French, Spanish for Lawyers);
- reading courses (Latin, Advanced French - Trial 2);
- a writing course (Written Russian);
- three different courses for advanced students (a recreational French evening class; a French course for credit, including literary material; a course in English for academic purposes).

It was considered that this degree of variation would enable generalisation of findings to the area of text-based teaching and learning.

4.3.5 Use of participatory methods

In order to reduce the distance between researcher and subject and encourage teachers to explore and take charge of the new computer tool, user-centred design methods, which originated in the Participatory Design (PD) movement, were used. Whilst field studies enable designers to understand the work place, the Participatory Design (PD) movement goes further and expects users to understand, and participate in, the designer's and developer's work.

The Participatory Design movement evolved in European countries with a strong trade union tradition and an interest in the social aspects of introducing technology. It certainly involves the end users, so Participatory Design methodology seemed appropriate as an approach to this design problem.

4.3.5.1 PD ideas & principles

The principles of PD fit this research. One principle is that people should be able to affect technology as well as vice versa. Hence, the technology and the use of the technology should be designed together, with a view to enhancing working life as well as increasing productivity. This accords with the recommendations of researchers already cited (eg Grudin (1994b); Bly (1997); Greenberg et al. (1992)). It also suggests that this approach is right for capturing requirements where very new technology may have an unknown impact on the work process - as here.

PD involves more than simply consulting the users; it aims to empower them to participate as equals in the design process. An important principle is therefore that designers and developers should value other expertise as well as their own. This again seemed appropriate, particularly as a motivating factor. It was believed that teachers would feel motivated to contribute design recommendations and be more likely to have the confidence to explore new teaching methods if their expertise were acknowledged and their experience valued.
4.3.5.2 PD practices

PD is flexible in its methods. There is no fixed formula or series of steps to be followed, though some modifications do impose more structure (Carmel et al. (1993)). Instead, PD practitioners have developed a repertoire of tools and techniques to encourage users to take an equal part. Muller et al. (1993) present a taxonomy of practices. Wall and Mosher (1994) and Kensing and Munk-Madsen (1993) also provide reviews of methods.

Typical PD techniques include unstructured interviews, group discussions and workshops, graphical techniques to aid visualisation and representation, prototyping and - essential - observation of the system in use and of the workplace. Prototyping is a particularly important tool and includes everything from storyboards, through HyperCard simulations, to working systems. Section 4.4 explains why prototyping was used in this case.

4.3.5.3 PD enables cross domain communication

PD requires that users and developers work as part of the same team. People from different domains must convey to one another their perceptions of their work domain. PD methods therefore take account of the fact that cross-domain communication may be difficult. Novick & Wynne (1993) analysed conversations in a design team to reveal numerous signals of inequality. Kensing & Munk-Madsen (1993) also address the problem. They note that effective communication may be time-consuming, because this is an interaction, not a one-way flow. To help the two sides represent their perceptions to one another, PD practitioners use artifacts, graphical and other visualisation techniques which reduce language barriers.

To specify requirements in this research, teachers and students have to describe their work to the researcher and communicate ideas about the potential uses of a computer tool they have never seen in mature use. This means that methods must enable effective communication across domains and makes PD methods especially useful.

4.3.5.4 Reservations about PD

Using participatory methods does not guarantee success and some aspects were not ideal for this particular investigation. A movement which developed to design large, custom-built systems is not necessarily suited to designing a small-group software support tool. Secondly, participatory methods were developed for use in industrial settings. The movement has certainly changed over time, expanded its definition of users and moved into the service and office sectors but this does not automatically make PD suitable for use in an educational setting.

Involving users may lead to a system that will suit the particular work situation and the group of workers involved but it does not guarantee a universally-useful system. This could also pose a problem. Although this research does focus on one discipline area, there is considerable variety within that and the aim is to capture design requirements that apply across this range. To combat this potential problem, a wide range of teachers and students was therefore involved in the research, from different subjects, courses and levels (see 4.3.4). The opinions of expert observers, with a broad perspective on the needs of learners and teachers, were also elicited.
PD approaches have not always even resulted in more positive attitudes towards technology or greater acceptance of the resulting system - despite some extravagant claims to be found in the literature (for instance, Crane (1994) suggests users exhibit "a reaction close to love" for the system).

Other problems were also kept in mind. Sometimes workers have seemed passive or over-dependent on the researcher (Clement & Van den Besselaar, 1996). One reason for using focus groups (see section 4.4.4) was to try to prevent this, to ensure teachers felt their contribution was needed. Defining the user group has also posed problems in PD. Are managers users, for example? Simonson & Kensing (1994) show how different groups in the workplace may have different perceptions of the work being done. The subject here, however, was a single computer tool, not a large-scale administrative system, and the number of relevant user groups was manageable. This was an enquiry into the design requirements. It was important to be aware of factors which affect the acceptability of technology, but only to the extent that they could distract or mislead. An enquiry into the impact of shared workspace tools on a university language centre needs to involve managers but this one did not.

4.3.5 PD as an educational design tool

Despite the reservations just mentioned, a participatory approach was chosen as a starting point. Williams (1994), Chin et al (1997), Carlson (1998), Hinostroza & Mellor (2001), and Hémard & Cushion (2001) all show the value of involving teachers in design.

4.3.6 Prototyping

The reasons for studying the work area and for adopting a user-centred approach have been explained. The next stage is to show why, within this framework, it was decided to use a working prototype in extended field trials.

The first reason was that a prototype can be a useful requirements capture tool. Information about requirements was likely to be sketchy and teachers might have difficulty in envisaging possible uses of a shared workspace tool.

". . . requirements for an interactive system cannot be completely specified from the beginning of the life cycle. The only way to be sure about some features of the potential design is to build them and test them out on real users. The design can then be modified to correct any false assumptions that were revealed in the testing." Dix et al.(1993) [p173]

A prototype can also be a communication tool. This was the second reason for its use. Gordon & Bieman (1995) believe the use of a prototype may help to resolve misunderstandings between users and developers. Baumer et al. (1996) consider prototyping case studies and conclude that a prototype can: “develop and communicate a vision of a future system” [p535]. and that prototyping is, “a valid means of transferring knowledge between developers and end users” [p535]. Multimedia communications technology involves terms and concepts that are difficult for non-technical users; having something to point at often helps.

As a design tool, prototyping does have drawbacks, however. An iterative prototyping approach may never lead to a conclusion, may allow design mistakes to persist indefinitely and may be time-consuming and costly. (Dix et al., 1993). Boar (1984) discusses possible concerns about the use of prototyping as a design tool but ends by defending and recommending it. Gordon & Bieman (1995) analyse 39 case
studies with a view to developing guidelines on how to use rapid prototyping effectively. They support the view that you cannot find a point at which you can freeze requirements, since they change as people use a system. Dix et al. (1993) point out that evaluation of a prototype system will not be trustworthy unless it takes place in conditions similar to those in which the final system is likely to be used [p175]. There are costs associated with providing such conditions and, in general, the closer to reality, the greater the cost.

Here, however, the prototype was a research tool and the advantages were considered to outweigh the disadvantages. Giving teachers and students the chance to work with a prototype system, over an extended time, would be a reliable way to capture design requirements. It was accepted that these would change over time. The possibility of never arriving at a final conclusion was less worrying than it would be if the aim were to develop a system for production.

The prototype was to be used in field trials and users would need to work with the system for some time. This implied that the prototype must be towards the fully-functioning end of the spectrum. Whilst it might be possible to use drawings and simulations to stimulate discussion or for short, focused experiments, one cannot “mock up” teaching and learning for a whole term on a real course. A relatively stable system, which could support flexible group sizes, would also be needed.

4.3.6.1 Shared workspace tools

The choice of shared workspace tool for the trials is explained in Chapter Six, section 6.6. Shared workspace tools, developed for Computer Science research purposes, acted as prototypes. These were wb (Jacobson, 1993), a shared whiteboard tool developed to support distributed presentations and nte (Handley & Crowcroft, 1997), which was developed to support distributed meetings. For Trials 1 and 2, with distributed groups, they were part of a multimedia conferencing system (see section 6.4). The tools were chosen because they:

- would operate on a variety of hardware platforms.
- were relatively stable and reliable in use.
- offered users the main design features that had been found to be useful in studies of other application areas (see Chapter Three).

Two different shared workspace tools had to be used in order to cover these requirements (see section 6.5).

4.4 Data

4.4.1 Multilingual data

As the research plan shows, much of the data was collected in and around foreign language classes. This raises a possible problem for the researcher: both live interactions and documents may be multilingual. In this research, expert observers were recruited to assess language learning outcomes. Expert observers, teachers and students contributed to understanding of the teaching and learning elements which participants valued. However, at each stage of the research, efforts were also made to find methods of analysis that could be carried out by someone who did not have command of these languages, to find ways for a non-expert to recognise elements that were valued. This was managed by using documents
(screen shots, saved text files) and observation notes in conjunction with interview, focus group and questionnaire data.

In addition, a high proportion of those participating in discussions were not native speakers of English. All had an extremely good grasp of the language but expression is sometimes slightly unusual. As a result, during discussions, points were re-stated, or clarification was sought, more often than might otherwise be the case. In the thesis, where extracts are quoted in support of a conclusion, these are often longer than usual, to give the reader an opportunity to assess the interpretation.

4.4.2 Observation of lessons

Since poor design can result from inadequate understanding of the co-operative task and situation (see 4.2, above), observational studies were conducted in order to understand this particular work situation. Observational studies have a strong history in both CSCW and Education research. Such studies either observe groups in their real work environment, or re-create such an environment, with differing degrees of fidelity.

Bly (1997) and Fleming (1990) suggest that observation is a good method for understanding process, and this is one reason it was used in this research. Bly's aim is to study the context in which new technology is to be used, bearing in mind that work is influenced by more factors than simply the demands of a given task at a given time. Fleming (1990) believes observation is best used in educational research to provide "data on the concrete details of how educational events unfold" [p5]. He shows how observational methods can reveal: the structure of educational events, the way in which they are organised; the functions of educational events, the point of their use; and an understanding of "the 'machinery' by which educational events are made to work" [p.6]

This use of observation to "anatomise" events is exemplified by Tang (1991). He observes the work of co-located design groups with a view to informing the design of tools to support such work. All groups have some kind of shared drawing space, such as a whiteboard or large piece of paper. Short design sessions are videotaped. The analysis plots the action (list, draw or gesture) against its apparent function (to store information, express ideas, mediate interaction). Amongst many revealing findings is the importance and the complex role of gesture in such collaborations and the effect of physical proximity around the work surface.

Writers sometimes refer to observation as "participant" observation. Whilst it is almost impossible to eliminate some kind of participation in the events studied, it should also be accepted that the observer cannot completely share the perspective of one of the subjects. The role of the observer varies, and Silverman (2001) states that this is an important question for the observer to resolve and that the role should be made clear to the subjects. This was done in all of the trials.

As is common (Fleming, 1990; Silverman, 2001), observations were recorded both on paper and on video, which was then revisited. No analysis, only recording, took place during lessons, but checklists and headings were used to structure the written observations that were recorded. Some of the observational data was quantitative, in which case the observer checked off or counted instances of previously-chosen

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*Fleming (1990) discusses the use of observation to arrive at an "anatomy" of educational events.*
phenomena. This was the case with the recording of user problems, task-types and instances of student-teacher interaction, for example. Other enquiries, such as those into what teachers valued in lessons, were more open-ended. For these, a qualitative approach, in which data was categorised, was considered more appropriate (see Silverman 2001).

Teaching was observed both locally and via desktop multimedia conferencing. Distributed groups could be observed over the network very intensively, by several people, without intruding on lessons. This was particularly helpful in Trials 1 and 2. It enabled each lesson to be observed by several people, to cover both system use and pedagogical considerations. As stated in the previous section, screen shots and lesson output files were collected and studied in conjunction with the observational data (see 4.4.2).

4.4.3 Observation of document use

Another important research tool was document study, observation of the way teachers and students used documents. The use of shared paper documents in face-to-face classes (initial studies, Table 4.1) and of shared screen and paper documents in both face-to-face and distributed field trials (Trials 1-3, Table 4.2) were studied. This choice of research method was influenced by the work of Luff et al. (1992). They aim to extract "generic issues" [p163] for the design of systems to support collaborative activities. They undertake "naturalistic analysis" [p163] of work, interaction and technology in an architecture practice, a medical practice and a London Underground control room. Their enquiry focuses on practices and procedures in the use of paper- and screen-based documentation. It leads to consideration of the intrinsic properties of the two, their flexibility and ease of use, the extent to which they impose a structure on work and their ability to support the kinds of customising users need. The study also reveals the complex ways in which colleagues share information on paper or screen. All three of the situations they study show how paper is used alongside recently introduced computer systems. Small group teaching seems very different from these situations but the students and teachers are likely to be in a similar transitional situation and hence to use both screen and paper and the intrinsic properties of the shared workspace may help explain its role in lessons.

4.4.4 Eliciting teacher and student perceptions

Interviews, questionnaires and focus groups were used to probe the participants' view of events. An important principle, in using all of these methods, was to include in the enquiry the whole experience, rather than to focus on the shared workspace alone. Distributed groups were asked about the audio and video and other aspects of using the desktop conferencing system, as well as about their learning in these lessons. This was made easier because of the co-operation of other researchers in the ReLaTe and PIPVIC project teams. The policy, which continued in the work with co-located classes, did result in the need to condense and assess the relevance of a very large amount of data.

4.4.3.1 Questionnaires

Questionnaires were used to ascertain background information about participants (previous computer experience, for example) and their perceptions and attitudes towards events. Examples in Appendix 6 show that they contained a mixture of ratings and more open-ended questions. Subjects were asked:

1. Questions about what they did – their actions and usual practice

2. Questions about what they thought – opinions and suggestions they wished to make
3. Questions designed to reveal their experiences and opinions incidentally

4. Very open-ended questions – an opportunity to comment on areas that had not been covered.

4.4.3.2 Interviews

Interviews can be both supplementary to other means of collecting data or can be the main instrument. Beck and Belotti (1993) study co-authoring, which involves a mixture of synchronous and asynchronous communication and their longitudinal study shows how interview material can be combined with data from other sources to create a complete picture. In this research, interviews were used, as Fleming (1990) suggests, to reveal, "issues, concerns, values, assumptions, intentions, perspectives and approaches participants bring to particular educational activities" [p71]. Interview notes and transcripts are in Appendix 6 and 7. Semi-structured interviews were conducted, mainly with teachers but also with one student. Where possible, these interviews were audio-recorded, but two subjects preferred to have their responses recorded only in note form. In addition, structured interviews were conducted with three students in Trial 2. Since they were at another institution, they were interviewed using desktop multimedia conferencing. Their responses were entered into a form, which was displayed in a shared text editor and therefore was visible to the students.

4.4.3.3 Focus groups

This section explains why focus groups were used and how they were conducted. Focus groups (Lunt & Livingstone, 1996; Morgan, 1998) were considered particularly suitable because they are means of understanding the issues that matter to participants. They can be summarised to make recommendations, based on the participants’ priorities. They can give insight into the feelings of participants about the experience, in this case the task of teaching and learning with a shared workspace tool (Morgan, 1998).

Focus groups are suitable for identifying problems that need to be addressed, to enable improvements to implementation. They therefore suited evaluation of the prototype shared workspace tools. They allow in-depth exploration and the pursuit of interpretive questions. They can be used to reduce gaps in understanding between groups of people. Also important was the fact that the focus group is a "friendly, respectful research method" (Morgan, 1998, [p59]), which conveys to participants that their views are important. At the same time, a focus group does enable the researcher to ensure that certain questions are addressed; the agenda or “focus” comes from the researcher but the topics are explored through the group’s conversation. This also means that the researcher can start a discussion without having expert knowledge of the field (Morgan, 1998), since her/his job is to listen.

Teachers and students were split into separate focus groups. Morgan (1998) notes that similarity within groups and differences between groups is recommended. It was also felt that the teacher-student relationship might constrain contributors. However, a joint session was held after the separate focus groups, so that points could emerge from an exchange of viewpoints. Splitting into groups demanded two facilitators; they worked from written guidelines (see Appendix 6).

Printed screen shots were used to refresh memories about events. A varied repertoire of questions was used to stimulate talk:

- Workshop-style questions. These asked participants to do something, such as to make a list of recommendations for teachers and students using the conferencing system in the future.
• Questions designed to encourage discussion or negotiation: for instance, rather than being asked for a list of good and bad points about the system, they were asked to reach agreement on its three best and worst features.

• Participants were asked for anecdotes, to relate a successful and an unsuccessful or unsatisfactory experience. They were encouraged to reflect on why these had been more and less satisfactory.

• At other times, a topic was simply suggested and participants invited to conduct the discussion as they wished.

In all cases, the focus groups were considered in the context of the observation of events. Observation contributed to the agenda by generating questions. In these cases, it was the power of the focus group to generate interpretive data that was important, to explain why things happened. However, open questions were asked, too. On one occasion (Chapter Six, section 6.12), it was considered necessary to follow up a focus group with another, more quantitative enquiry.

Analysis of focus group material was entirely qualitative. It was influenced by case studies reported by Morgan (1998) and is discussed in the next section.

4.4.5 Analysis

Data collection and analysis methods were selected because they were conducive to generating the insights that were sought. Given a large amount of disparate data, which included transcripts, observational data, and saved shared workspace content, there was a need to structure, condense and integrate, to treat all the data in a coherent way. The approach is explained here; any variations or additions are noted in Chapter 6, section 6.10.

The research had quite a practical focus. The aim was to capture requirements that would enable a shared workspace to enhance teaching and learning. This meant that it should be possible to derive recommendations or guidelines from the findings. It was necessary to draw out the important issues relating to: requirements for supporting specific tasks in these lessons; factors that were considered beneficial to lessons.

The enquiry process (design of checklists, questionnaires, focus groups, for example), had already structured the data to an extent. Analysis sought to build on this by identifying themes and accumulating examples of these. The focus group and interview transcripts were divided into units of analysis, defined as one or more sentences concerned with a single point. Of course, more than one point might be addressed in the same sentence, in which case the unit was noted as an example of more than one theme. Care was taken to determine whether an issue was of concern to most participants, or only to one or two, and whether the observational data and/or screen shots, raised the same points.

In analysing the interview and focus group transcripts, all utterances are accounted for. Users were asked to validate findings where possible; Silverman (2001) suggests that a good test of qualitative analysis is whether the outcomes make sense to the participants in the events.

Other means of analysis were considered. Activity Theory (Nardi, 1996) suits developing situations, takes account of context and can accommodate different perspectives. Its concepts of goal/action and of tools as mediators of action may explain why there has been so much recent interest in the application of Activity Theory to research into learning technology (Issroff & Scanlon, 2001). It can throw light on the impact of
new tools and the changes that occur as users become accustomed to them and actions become more routine. Using Activity Theory to re-visit some of the data obtained in this research would make a very interesting follow-up investigation (See Chapter Eight, section 8.5). Discourse analysis (Potter, 1997) can also accommodate varied data. However, although the research aimed to understand what issues were important to teachers and students, it was felt that the kinds of insights offered by discourse analysis, were not those required here. Again, there could be opportunities for building on this research, which has raised some intriguing incidental questions about possible tensions between teacher and student constructions of what lessons are for (see section 8.5).

4.5 Summary

This chapter has outlined the methodological approach chosen for the research and explained what research methods were considered appropriate. It established the need to study the whole work area and explained the decision to use a participatory approach to capturing design requirements.

The chapter established that extended field trials, using a prototype shared workspace tool, were preferred to experimental studies. It explained the need to combine these with means of eliciting user experiences and perceptions and explained how this was done.

The next three chapters show how these decisions were implemented in three sets of studies.
Chapter Five - Workplace Observation and Document Study

This chapter presents two initial studies designed to find out more about the teaching and learning activities that a shared workspace tool would have to support. It explains the purpose of these studies in relation to the whole investigation. It then presents observation carried out in face-to-face school English classes. The outcome was a tentative list of activity types. This work was extended by studying the documents and organisation of an adult Spanish class. It was found that the same list of activity types could also be used to describe the activity around shared printed material in these classes. The final section of the chapter summarises the outcomes and explains how a study with distributed groups, described in Chapter Six, made use of these.

5.1 Introduction

5.1.1 Reminder of context

Chapter Two established areas where synchronous, person-to-person interactions were likely to be useful and hence where a tool to support these could be of benefit. In Arts and Humanities disciplines, where this research is located, foreign language learning and the study of difficult texts emerged as likely areas for support. Chapter Three showed that information about specific tasks and interpersonal interactions, in this work area, is missing from the CSCW literature. This information is needed to design an effective shared workspace support tool. Chapter Four presented reasons for studying the work area, for adopting a user-centred approach to design and for using a prototype as a requirements capture tool, over an extended period, in the field.

The two studies presented now were the first steps towards understanding the task and interactions to be supported. They acted as preparation for work with the prototype system, which is described in Chapter 6. The studies took place in face-to-face classes, the first with school students and the second with adult learners. Since the design target is a shared workspace tool, the focus was limited to activities around shared material.

The first was an observational study of 14-19 year old school students in English language and literature classes. It involved collecting new sample learning materials and re-analysing notes made the previous year for an MSc course. The outcomes were a tentative list of task types for these lessons and a descriptive account of how these were organised by the participants.

The second study considered whether these task types might be more generally applicable in text-based teaching and learning. Teaching materials used over a whole term in a Spanish evening class were studied, together with the way their use was organised. The conclusion was that the list of tasks was a valid starting point for evaluating a shared workspace tool for text-based teaching and learning.

5.1.2 Goals

This work was undertaken with a view to answering three main questions:

• What would be shared in the shared workspace?
• What would the participants do with it?
• How would the participants organise their work with the shared material?
The objectives were, to gather information about the kinds of shared material, the task types and the range of ways of working. The hoped-for outcome was a list of broad types of teaching and learning activities that must be supported and the beginning of an understanding of the purpose of the activities. The aim was to get an aerial view of the materials and the way they were used in these lessons, a view that eliminated detail and might allow some abstraction. It was hoped to arrive at something that had validity and meant something to teachers but was generalised to the extent that it was of some use to designers.

5.2 Lesson Observation - School English Classes

5.2.1 Summary of work done

Small groups of school students in the 14 to 19 age range\(^1\) were observed working on tasks designed to improve their understanding of literary and non-literary printed material. These were English language and literature classes.

These were lessons in which a class was at some point split into small groups to carry out a specified task. There were four to six students per group. The usual scenario was for the teacher to set the activity in motion, giving verbal instructions to the whole class. Groups then worked on the material they were studying, usually with a written reminder of the instructions if these consisted of more than a single operation.

Notes were made on a restricted set of topics: the physical placement of students and teacher; the tasks the students were expected to undertake; the ways in which these might contribute to their goal of better understanding; the way the groups organised their work. Actions were not broken down in detail or logged at regular intervals because the objective was to find broad categories, not to carry out a fine-grained analysis of the work process.

Because of time pressures, it was not possible to have extended conversations with teachers. Information about the purpose of the work was derived from brief, introductory explanations, from what the teachers said to classes when explaining the work and from the sample lesson materials. These are in Appendix 5.1. In retrospect, the enquiry should have included finding out more about the source of the materials and how they were created, since this might have revealed other tools with which a shared workspace would need to interact.

5.2.2. Analysis

The observation notes were made in a structured way, using the three questions (What material is shared? What do participants do with it? How do they organise their work?) as headings, so they were simply summarised, to give a descriptive account of how the work was organised.

Observation notes and sample lesson materials were used to generate a general description of the kinds of objects the students encountered and what they were asked to do with them. This was done simply by assigning a keyword label that seemed to describe the activity. Subsequent tasks were either given one of the existing labels, if it fitted, or given a new one, if it did not. However, it should be pointed out that such categories never exist independently. These were undoubtedly influenced by the researcher's own

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\(^1\) From four London schools, members of the LaSwap consortium, Camden, London NW5.
experience as a teacher of English and, especially, by work done in the ILEA (Inner London Education Authority) during the 1980s, on active approaches to enabling students to read difficult texts.

5.2.3 Findings from lesson observation

Findings are given in relation to the three initial questions which the study addressed.

First, what was shared? Although the content of the lessons varied, the shared materials were, superficially, remarkably alike: short to medium length blocks of text, small pictures or diagrams. In many cases, the physical appearance or layout of this material was an important part of its meaning (as with poems, advertisements, newspaper pages).

What did the participants do with the shared material? The specific activities varied but it was found that they could be allocated to relatively few categories. These were labelled as:

1. Order: included listing items, adding items to a list, re-ordering, charting, completing time lines
2. Match: involved matching items from two or more lists, matching words to pictures
3. Label: pictures or diagrams with arrows pointing to specific areas; sometimes there was a list from which to select labels.
4. Caption: Similar to label but where there was not necessarily a right answer. Included headlining.
5. Fill in gaps in text: usually single words but one instance of supplying missing parts of a narrative. Sometimes given a selection from which to choose.
6. Complete tables: great variation in size and purpose.
7. Mark: this included underlining or marking areas of text. This was sometimes set by the teacher, as a task in itself (examples might include, "underline all the references to mountains") but was also done incidentally to other tasks.

A few activities are not included in the above categories. These were entirely oral, most frequently where students were asked to speculate or predict based on material they had encountered prior to the lesson, to relate reading to other facts or experiences, or to “discuss”.

The tasks were intended to help students:

1 understand a sequence,
2 understand choices writers made;
3 understand cause and effect;
4 identify main points;
5 see the purpose of an argument;
6 appreciate aspects such as tone and atmosphere;
7 see the significance of individual elements;
8 identify patterns and understand their possible significance.

How would the sharing of material be organised? The material was always on paper, more often a single worksheet, sometimes a page of a book, sometimes both. Sometimes, physical manipulation was needed to perform the task, as when pieces of paper had to be assembled in order, in order to construct a poem or other text.

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2 The CILT Information Sheet, (http://www.cilt.org.uk/infos/76to100/info76.htm ) refers to the reading support software developed by the ILEA Computing Centre. See also Bentley, (1990).
It was shared in two main ways. Either each group member had a copy or there was a single copy to be shared by the whole group. A few groups of three simply sat in a line but students would usually sit in some approximation of a circle (that is, facing one another). This meant that where a single copy of the material was shared it was impossible for them to share the same view of it. When a single complete text had been cut into pieces it was, similarly, difficult for all group members to see all the pieces. Where there was a single copy, there was also occasionally a tussle for ownership. It is tentatively suggested that having a copy of the material increased the sense of involvement in the task. Roles (such as chair, secretary) were usually allocated formally only if the teacher had specifically asked for this.

The activity was not observed closely enough to analyse how ideas were shared, beyond the observation that much of the sharing appeared to take place through talk.

The teacher visited the groups in turn, as well as spending some time looking at the class as a whole.

5.3 Document Study and Interview - Spanish Class

5.3.1 Summary of work done

A second study considered activities and teaching materials used over a ten week period, two hours per week, in an intermediate level Spanish class\(^3\). Copies of all paper documents given out to students were collected. A note was made on each, if this was not stated on the paper itself, saying what students were asked to do with it. The list of activities is in Appendix 5.2.

As in the school groups, students alternated between working as a whole class, and being subdivided into smaller units. The most common pattern in these language classes was for students to work in pairs, with only occasional use of larger groups. Tasks were shorter in duration than in the school English classes. In between these pair activities, the whole class (usually 6-10 students) would assemble for a session directed by the teacher.

The learners were adults in a university language centre. They were not taking the course for credit. Group size was different from that used with the school students. Because of these differences, and the subject difference, it was not expected that the activities here would be very similar to those of the school students.

After the course had ended, the teacher was interviewed. The interview had to be recorded in note form, on paper because the teacher did not feel comfortable about being recorded on audio tape. The notes are also appended (Appendix 5.3).

5.3.2 Analysis

The set of categories derived from observing the school students was used as the basis for analysis. Each item of lesson material was examined and assigned, if it fitted, to one of the categories. If it did not fit, it was set aside under "Other activities" (see Table 5.1).

---

\(^3\) It was classified as a Level 3 class by UCL Language Centre, which runs classes from Level 1 to Level 4.
Notes on the interview with the teacher were used to illuminate findings from studying the lesson material. They were regarded as illuminating what this particular teacher did, not as representing any generalisable truth about language teaching.

5.3.3 Findings from document study and interview

What was shared? As the samples show, on the surface (from an aerial view) these materials are very similar to those used with the school students. Again, small diagrams, photographs and line drawings are mixed with pieces of text which varied in length from single words to paragraphs. The main difference between the two learning situations was that the students in the English classes often used book texts — for instance the novel or play they were studying — in addition to shared printed materials.

What did participants do with the shared material? Surprisingly, although the teaching and learning context was different, the majority of the activities could be classified under the same headings as those of the school students. Of almost 80 activities, those, such as homework assignments, which involved purely individual work, were discarded. Table 5.1 shows how the remaining 56 activities fitted into the categories derived from the study of school students.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of occurrences</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>3</td>
<td>Includes one graphical activity — completing a timeline</td>
</tr>
<tr>
<td>Match</td>
<td>10</td>
<td>Includes matching items from lists, matching pictures to text.</td>
</tr>
<tr>
<td>Label</td>
<td>3</td>
<td>Includes labelling items in room, parts of body. Often labels selected from a given list.</td>
</tr>
<tr>
<td>Caption</td>
<td>6</td>
<td>Most frequently writing text to fit small cartoon stories.</td>
</tr>
<tr>
<td>Fill-in-gap</td>
<td>12</td>
<td>Frequently used for grammar exercises, for example, inserting correct form of verb.</td>
</tr>
<tr>
<td>Fill-in-table</td>
<td>7</td>
<td>Includes marking items true and false, for example, to test comprehension.</td>
</tr>
<tr>
<td>Mark</td>
<td>6</td>
<td>Mainly marking words in a certain category (past tense verbs, for instance) or underlining difficult vocabulary.</td>
</tr>
<tr>
<td>Other activities</td>
<td>9</td>
<td>Includes 2 that involved walking around the room. 3 pair activities where only one partner knew the answer and concealed material from the other. 5 where the item that was the focus was simply viewed and all the interaction was oral. (1 overlap - total = 9, not 10)</td>
</tr>
</tbody>
</table>

Table 5.1: Spanish language learning tasks

How was the work organised? As stated, students usually worked in pairs. They did not always work with the same person and the teacher organised the activities to ensure that partners changed. Pairs sat together, usually facing the same way. Usually individual students had their own copies of materials used. Sometimes the two members of the pair had a different sheet of paper. In this case, the sharing only took place at the end of the activity, by showing or swapping papers.

The teacher alternated between keeping an eye on all the pairs, visiting pairs in turn to join in or answer questions and writing additional information or vocabulary on the whiteboard in the room. This was also, of course, shared material.

What is the motivation for these activities? During the follow-up interview, the teacher explained why such activities should be group endeavours. The strongest reason, in this language class, was to promote communication and to provide varied contexts for this. She also explained that where one partner has information others need, this creates a real need to communicate in the language — hence the activities which involved hiding information. The teacher would try to vary both tasks and group composition.
Finally, the teacher was asked how the material was created. Some items were photocopied from text books. Others were from *El País* (using the World Wide Web) or from magazines. Some she had drawn herself. Some activities she had devised and some were taken ready-made from books.

### 5.4 Discussion

Only three objects were used in these classes to hold textual or graphical material that was shared by everyone. These were worksheets, the classroom whiteboard and textbooks. It should be remembered that sharing also took place by means of talking and that in the language classes, audio- and videotapes also held material that was shared by everyone; this material was not included in the analysis above (Table 5.1). In addition, there was some informal sharing between individuals, or between the teacher and a single student. Most often, it was the student’s notebook that held this part-shared material.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Created by</th>
<th>Created when</th>
<th>Created using</th>
<th>Visible during lesson to</th>
<th>Acted on during lesson by</th>
<th>For reference during lesson by</th>
<th>Kept after lesson by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksheet</td>
<td>T or Other</td>
<td>Before lesson</td>
<td>Pen, paper, computer, photocopier</td>
<td>S and T</td>
<td>S</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Whiteboard</td>
<td>T</td>
<td>During lesson</td>
<td>Pen, eraser</td>
<td>S and T</td>
<td>T</td>
<td>S</td>
<td>Not kept</td>
</tr>
<tr>
<td>Textbook</td>
<td>Other</td>
<td>Before lesson</td>
<td>N/A</td>
<td>S and T</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>

T = Teacher  S = Students

**Table 5.2: Classroom objects holding shared lesson material**

Bearing in mind what has been said in Chapter Four (section 4.2.1) about the need for group support tools to be integrated with tools used for individual work, each of the three objects used here was considered in relation to: who constructs it, how it is constructed, who sees it and who acts on it during lessons, and who keeps it after the lesson. In a sense, it sums up the relationship of these lesson participants with the material they used.

For example, the whiteboard in a classroom usually (not always) holds material constructed during the lesson, by the teacher, for reference and visible to all. Other tools are involved in creating materials: computer, pen, paper, photocopier, for example. The photocopier should be distinguished from the others, since it acts as a means of distribution, rather than creation of materials.

A tentative hypothesis about the role of an electronic shared workspace in such classes might be drawn from this. First, it might be expected, as a minimum, to perform the functions of these objects (worksheet, whiteboard and textbook page) - that is, to accommodate all of the materials constructed during the lesson, and/or visible to more than one person. Other kinds of classes may use other objects, such as overhead projector, or data projector, to hold shared material but neither was used in the classes observed here. Secondly, the shared workspace tool, like the photocopier, can be a means of distributing material to students. Finally, the use of audio and video tapes in the language classes highlights the fact that the shared workspace is only one of several tools likely to be used to support teaching and learning, not a complete solution.

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4 A national daily paper.
As shown in Chapter Three, however, one cannot take for granted a direct translation from face-to-face to computer-mediated domains. A supplementary question, was therefore whether this was all that it would do -- or whether an electronic workspace might be used as means of sharing other kinds of information.

Another prediction was that some tasks would have to change if the means of sharing material were a shared workspace tool. Face-to-face language students took part in activities which involved hiding information, for instance when one student held information that others needed to acquire. Since this is the opposite of sharing, it seemed unlikely that a shared workspace would easily support such activities. The studies reported in Chapter Six show that the range of teaching and learning activities was indeed restricted by the fact that objects were always shared with all group members.

However, it was not assumed that all changes from usual, face-to-face practice would necessarily be negative ones. For instance, the school groups observed in the earlier study did encounter some problems arising from not having individual copies of the material, or not having a good view of it. The language students usually worked in pairs, which made it easier for them to share the same view of a single piece of paper. It is possible to envisage a gain, in the sense that each participant in a desktop conference will have the same view of material and will be able to perform operations on it easily. So, perhaps, paradoxically, sharing could increase the sense of ownership? This question was answered in part by the later studies; it appeared that both teacher and students perceived a change in relationships brought about by the fact that the shared workspace is equally accessible to all, unlike the classroom whiteboard. The effect was variously described, as "a sense of shared endeavour" and "a workshop atmosphere."

5.5 Conclusion

This chapter has reported the use of classroom observation and document analysis to identify a set of activities that a shared workspace tool might need to support. Interactive work around shared material was used in the observed classes both to help understanding and to encourage communication. The same set of activity categories (Table 5.1) could describe group learning activities in both school English classes and adult education Spanish classes, suggesting that a degree of generalisation had been achieved in describing the tasks, sufficient to make the categories useful as an evaluation tool in later studies.

The work discussed here also identified classroom objects that held shared material in these lessons, and the items that teachers and students used for lesson preparation and follow-up. This suggests the shared workspace will need to inter-work with individual tools both for creating shared material and for storing and using it after a lesson. This is important because groupware tools will be used for only a part of users' work, so compatibility with individual tools will make them more acceptable (Grudin, 1994b).

These studies raised questions, as intended, rather than providing answers:

1. Can distributed students, using shared workspace tool in a desktop conferencing system, experience a similar range of learning activities to those experienced in a face-to-face class?
2. What impact will using the tool have on the way these activities are conducted?
3. Will a shared workspace replace worksheets, whiteboard, textbook page, photocopier?
4. What other role will it play?

The field trials in which these questions were addressed are described in the next chapter.
The observation notes and document analysis also throw some light on the kinds of objects to be shared and the actions to be carried out on them, although the study did not address detailed design requirements. The materials used in these classes (see section 5.3.3) suggest that a shared whiteboard would be an appropriate shared workspace tool to investigate. Such tools support graphics as well as text and preserve layout and positioning, which were seen to be important aspects of content in some of the observed activities.

The work reported here has shown that, to describe the task adequately, it is necessary to describe how people communicate and organise themselves to carry it out. It has sketched out a distant view of the interactions that typically take place in face-to-face classes, in text-based disciplines. Students may switch between working in pairs, in small groups and as a whole classes, with the teacher interacting at different times with all of these.

The next step in the research was to investigate questions arising from this field work, using a computer system. Distributed groups were used. A distributed group provides a good test of feasibility, of whether an activity can be supported at all, since alternative ways to share material are available. However, a study of distributed groups also brings with it potential distractors -- the other communications channels. This has been discussed already (Chapters One and Three).
Chapter Six – Conduct of Field Trials

This chapter explains how the remaining part of the research was conducted. First, two extended field trials and three ancillary investigations were undertaken, in small group foreign language classes. A prototype desktop multimedia conferencing system, incorporating two shared workspace tools, was used. This was followed by a longer trial in a face-to-face Russian writing class. After recapitulating the reasons for adopting this research method, the prototype system and the conduct of the trials are described, including details of data collected and problems encountered.

6.1 Introduction

Chapter Five described field work in face-to-face classes. Studying observation notes and documents generated a set of activity categories to describe learning tasks, using shared printed materials, in these text-based classes. Bearing in mind the research aims - to understand both the design requirements and the impact of using a shared workspace tool on text-based teaching and learning - it was decided that the next studies needed to address two questions:

1. Can distributed students using a desktop conferencing system experience a similar range of learning activities to those experienced in a face-to-face class?
2. How will a shared workspace contribute to teaching and learning? Will it perform the replacement role predicted (replacing worksheet, whiteboard or textbook page, photocopier)? How will it affect the way in which learning activities are conducted?

These questions were investigated through extended field trials, in small group foreign language lessons. Participants were geographically separated. Classes were conducted using a prototype desktop multimedia conferencing system, incorporating audio, video and shared workspace.

In addition three ancillary investigations were carried out, in order to deepen understanding and increase confidence in the design findings.

After establishing the features needed to enable a shared workspace tool to support teaching and learning, the research moved on to deepen understanding of how and why a shared workspace tool is beneficial to text-based teaching and learning. Such an understanding is needed to inform design decisions and enable designers to make use of their own expertise, in order to offer new solutions, and also so that the benefits can be articulated to potential users.

This meant that interest had now shifted to:

1. Identifying and accounting for the intrinsic benefits of a shared workspace tool in this application area;
2. Understanding the tool's impact on teaching strategies and the conduct of classes.

This shift of interest led to consideration of conditions for the final trial. Distributed classes had provided an excellent test of whether the conferencing system and shared workspace could support the necessary activities at all. In distributed classes, the shared workspace has to be used for sharing material since there is no alternative, whereas in a face-to-face class it need not be used if paper works better. On the other
hand, the conferencing environment and the computer network may lead to usability and communication
difficulties that distract from the main findings. If participants are geographically distant, it is also more
difficult for the researcher to gain access to them.

Using co-located groups for the final study could highlight the best uses of the tool, since alternatives
would be available. It could therefore show whether a shared workspace tool really enhances teaching and
learning in text-based disciplines, or whether it just provides distance learners with a substitute. Questions
relating to interpersonal communication and classroom atmosphere might also be easier to answer without
the complicating factors of audio and video mediated communication. Access to all participants would be
more straightforward.

However, in order to be consistent with the earlier studies, a test-bed was sought which was, in addition to
face-to-face:

- a real teaching and learning context;
- a text-based course;
- of long duration.

The question of duration was considered particularly important. Use of the shared workspace tool was
still changing at the end of the 22-week Trial 2 (see Chapter Seven). The design guidelines should take
account of how the tool might be used when it is in mature use, not only in the early exploratory stages. A
longitudinal study would make this possible. The final study followed one teacher over two academic
years, teaching a second year undergraduate course in Russian writing.

The next section, 6.2, presents a brief reminder of why these investigative methods were chosen. Sections
6.3 to 6.12 describe the conduct of the trials and the data collection and analysis methods. Section 6.13
outlines the problems encountered in carrying out the research.

6.2 Investigative Method: What was done and why

A participatory approach was chosen for requirements capture (Chapter Four, section 4.3.5) because
Participatory Design principles are appropriate. Participatory Design, as well as being a means of
capturing requirements for designing systems, has historically also been used for research. A "design by
doing" research method was considered particularly suitable for working with practitioners. It was hoped
that making teachers partners in the research would make them more likely to experiment and explore.

The Participatory Design (PD) movement has developed many useful methods for capturing design
requirements. Prototyping is one method used in this research. PD methods can break down
communication barriers, which the nature of the user group and the newness of this technology were
likely to create. PD has been used in educational settings, though not often to design interactive
applications.

Field trials were more likely than laboratory experiments to provide the time needed for group
educational interactions to develop and the time that teachers need to be able to shape their use of the
technology. Information about the “mature” use of the technology would inform design guidelines.

Foreign language teaching and learning supplies conditions in which synchronous interpersonal
interactions are likely to be needed (see Chapter Two, section 2.5.2):
• Communication is integral to the learning.
• Students working in a language that is not their own may find tasks difficult and suffer from loss of confidence, also known as “language anxiety” (see Chapter Two).

The courses, though all in the area of foreign languages, are very varied (see Chapter Four, section 4.3.4)

6.3 Overview of Field Trials

6.3.1 Trials 1 and 2: Distributed Foreign Language Courses

Information about the trials is given in Table 6.1. Two sets of trials were conducted. Chapter One (section 1.6) explains the relationship between the PhD research and the ReLaTe project, through which the trials were administered.

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Group Size</th>
<th>Emphasis</th>
<th>Workspace</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 hours p.w.</td>
<td></td>
<td></td>
<td></td>
<td>2. Questionnaire responses</td>
</tr>
<tr>
<td></td>
<td>2 hours p.w.</td>
<td></td>
<td></td>
<td></td>
<td>4. Screen shots</td>
</tr>
<tr>
<td></td>
<td>1 hour p.w.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portuguese Beginners</td>
<td>Oct 1995-Dec 1995</td>
<td>Tutor + 2 students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 hours p.w.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.1: Summary of Trial 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
<th>Group Size</th>
<th>Emphasis</th>
<th>Workspace</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>French Advanced</td>
<td>Nov 1996-Apr 1997</td>
<td>Tutor + 3 students</td>
<td>Use of the shared workspace tool</td>
<td>Whiteboard (wb) and text editor (nte) UNIX</td>
<td>As 1-5 above.</td>
</tr>
<tr>
<td></td>
<td>2 hours p.w.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.2: Summary of Trial 2

Data was obtained from lesson observation, shared workspace content, interviews, questionnaires, workshops and focus groups (see section 6.10 for details).

The emphasis of the two trials was different. Trial 1 aimed to establish that the conferencing system as a whole had the capacity to support the teaching and learning of foreign languages. It was necessary to do this in order to show that it was a suitable context in which to investigate use of a shared workspace tool. Trial 1 also aimed to identify factors that might interfere with shared workspace operations and hence lead to misinterpretation of findings. Characteristics of the audio and video might affect the user’s experience and cloud the findings. Usability problems might also affect users’ evaluation of the experience. This meant that the focus in trial one was on the conferencing system as a whole and on usability. Trial 2 considered more closely how the shared workspace was used and its role in these language classes. This was a longer trial (22 weeks), with a slightly larger group.

1 ReLaTe Project: [http://www.exeter.ac.uk/pallas/relate/](http://www.exeter.ac.uk/pallas/relate/)
6.3.2 Ancillary Investigations

Additional studies (see Table 6.3) were conducted around the activities of the PIPVIC project\(^2\), (see section 1.6) with two main aims: to increase confidence in the design findings; to deepen understanding of how and why a shared workspace might be beneficial and of its role in text-based teaching and learning. Although none of the PIPVIC project activities was created specifically for this research, the nature of the project meant that real teaching and learning events were used as a test bed. This provided access to a larger number of students and tutors than would otherwise have been possible, and to slightly larger group sizes.

The main disadvantage of using existing project activities was that the "parent" project controlled the agenda and it was not possible to exercise control over the circumstances or conditions in which these collaborations took place. Data was necessarily collected in an opportunistic way, but thanks to the cooperation of the PIPVIC project team, it was possible to distribute questionnaires, conduct group discussions and individual interviews and observe participants locally and over the network.

Chapter Seven, section 7.4 explains how these studies contributed to the findings.

6.3.3 Trial 3: Co-located Written Russian Course

The two years of the study are referred to as Year 1 and Year 2. Table 6.4 summarises the circumstances of each year's course. The main difference was that Year 2 had more students and they were taught in slightly larger groups.

---

Table 6.4: Written Russian course details

<table>
<thead>
<tr>
<th>Year</th>
<th>Dates</th>
<th>Emphasis</th>
<th>Group Size</th>
<th>Workspace</th>
<th>Data Collected</th>
</tr>
</thead>
</table>
2. Video recordings of lessons  
3. Questionnaire responses and ratings |
| 2    | Oct 2001- Mar 2002 | Tutor + 9 students 5 groups = 45 | Nte - Text editor | 4. Focus group and interview transcripts  
5. Text editor contents and screen shots  
6. Written comments from teacher. |

---


---

Table 6.3: Ancillary Investigations around PIPVIC Project Trials

<table>
<thead>
<tr>
<th>Trial</th>
<th>Course</th>
<th>Course Dates</th>
<th>Group Size</th>
<th>Emphasis</th>
<th>Workspace</th>
<th>Data collected</th>
</tr>
</thead>
</table>
| PIPVIC | Spanish for Lawyers           | Feb 1998- March 1998 | Tutor + 2 students | 1. Substantiate design findings;  
2. See more use of the text editor, nte;  
3. See more varied courses. | Whiteboard (wb) + Text editor (nte) UNIX | Observer notes  
Notes and transcripts of teacher and student discussion |
| PIPVIC | Russian                       | Check dates 1 hour p.w 4 weeks | Tutor + 3 students | 4. See viewpoints of a teacher and a student who were experienced computer users. | Text editor (nte) Windows | Notes on Interview with student |
| PIPVIC | English as a Foreign Language (EFL) | Aug 1999 1 hour p.w | Tutor + 4 students | | Text editor (nte), UNIX and Windows | Videotape and transcript of teacher and student discussion |

---

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<th>Dates</th>
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<th>Group Size</th>
<th>Workspace</th>
<th>Data Collected</th>
</tr>
</thead>
</table>
2. Video recordings of lessons  
3. Questionnaire responses and ratings |
| 2    | Oct 2001- Mar 2002 | Tutor + 9 students 5 groups = 45 | Nte - Text editor | 4. Focus group and interview transcripts  
5. Text editor contents and screen shots  
6. Written comments from teacher. |
In all *Written Russian* lessons, each participant had the use of a shared text editor, running on a PC. The work of teacher and students was studied over two years. Findings are based on analysis of videotaped lessons, lesson observation notes, shared workspace content, teacher interviews and written comments, student questionnaires and focus groups.

### 6.4 Working Environment 1: Multimedia Conferencing System

This was the conferencing environment used for Trials 1 and 2 and the ancillary investigations. It was a desktop multimedia conferencing system, developed by the technical team on the ReLaTe project\(^3\) and modified for the PIPVIC project\(^4\) (Watson & Sasse, 2000a). It incorporated audio, video and a shared workspace. The user interface is illustrated in Figures 6.1 and 6.2, below. The shared workspace tools are described in Section 6.5.

![Figure 6.1: Interface to Conferencing System, Trials 1, 2](image)

The key points about the system were: multi-way, multimedia communication; an integrated user interface; a choice of shared workspace tool.

#### 6.4.1 Multi-way, multimedia communication

**Multimedia:** The conferencing tools used were: the video tool, *vic* (Jacobson, 1994), the audio tool, *rat* (Hardman *et al.*, 1998), the shared whiteboard tool, *wb* (Jacobson, 1993) and the shared text editor, *nte* (Handley & Crowcroft, 1997).

**Multi-way communication:** The tools transmit their data using multicast (Deering, 1988). Most conferencing tools use unicast, or point-to-point, transmission, which means they link two users, as with a telephone call. Arrangements can be made to accommodate a group of speakers but this often involves advance planning. Multicast has two big advantages for teaching at a distance:

- It can accommodate groups of any size, and of fluctuating size. No complex joining mechanisms are needed, and there is no need to set up special network connections in advance of a conference\(^5\).

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\(^3\) ReLaTe Project: [http://www.exeter.ac.uk/pallas/relate/](http://www.exeter.ac.uk/pallas/relate/)


\(^5\) One does need appropriate hardware and a network connection that can deal with multicast. This is becoming more widespread on the Internet but, at the time of the trials, it involved some configuration by systems staff.
• It uses the available bandwidth economically, because of its efficient method of routing packets over
the network. This reduces the cost of multiple video streams.

As a result, all participants can see video images of all the others, and of themselves, at all times. Many
conferencing systems enable participants to view only one or two images at any one time and they thus
have to switch between them.

6.4.2 Integrated user interface:

The three conferencing tools were combined into an integrated interface, giving users only one window to
manipulate and having sensible default settings at start-up, which users would rarely need to alter. Figures
6.1 and 6.2 illustrate the single window, which is described in points 4-6, below. The main aim of this
user interface was to reduce usability problems, which would increase the burden on users and distract
from the main questions being studied.

Three factors were likely to cause usability problems:

1. Multicast tools were predominantly research tools. The interfaces were designed with expert users
in mind and deliberately gave users access to "low level" functions, such as choosing the audio or
video encoding format.

2. Technical vocabulary and unfamiliar units of measurement, such as kilobits per second, on the
controls users need to manipulate.

Figure 6.2: Integrated interface used in PIPVIC trials

Figure 6.3: User's view of conferencing tools, rat, vic and wb as separate tools
3. Managing screen space. It was believed that manipulating the windows of three separate conferencing tools would pose organisational and operational problems for inexperienced users. For instance, the configuration shown in Figure 6.1 would, if the three conferencing tools were separate, present users with at least 7 windows to manage. Figure 6.3 illustrates this.

**Video:** On the left is the video area. Up to four images could be displayed with a choice of size. Participants could select one image to be displayed in the larger rectangle by clicking on the name bar above it. The PIPVIC studies used the interface illustrated in Fig 6.2, which increased, to eight, the number of video images that could be displayed simultaneously.

Head and shoulders images of all participants (captured by small cameras mounted on the workstation) were simultaneously displayed. A *power meter*, seen in Figures 6.1 and 6.2 as a green band to the right of the speaker's image, indicates who is speaking and gives a crude indication of level. Participants could choose between two sizes for display of video images. Video frame rates were low (set at 2 frames per second during the first trial, 4 - 6 in the second). Resolution was QCIF, which is 176 x 144 (Fluckiger, 1995, p.361).

**Audio:** The audio controls allow users to adjust incoming and outgoing volume. To make spoken communication as spontaneous as possible, the audio tool was configured to provide *full duplex* audio. It is common for audio tools to require *push-to-talk*, so that the mouse button must be depressed during speech in order for it to be transmitted. Full duplex audio makes this unnecessary. It allowed users to acknowledge one another's spoken contributions naturally and to communicate encouraging sounds. It also allowed them to write or draw in the shared workspace whilst they were talking. The drawback was that, to prevent feedback (echo), users had to wear high quality headsets, which were quite heavy.

**Shared workspace:** The shared workspace shown in Figure 6.1 is the whiteboard, wb. In the second set of trials, users were offered a choice of shared workspace, wb (Figure 6.1) and the shared text editor, nte (Figure 6.2). At the start of a session the default was to display the whiteboard. Users could toggle between the two tools by clicking a button but could not display both simultaneously. The integrated interface makes it impossible for users to resize the shared workspace window.

The two tools are described more fully in section 6.6.

**6.5 Working Environment 2: Classroom for Trial 3**

The teaching room, part of the library, contained eight PC workstations (nine for Year 2), running Windows NT. They were arranged as shown in Figure 6.4. This was a room designed for individual study, not class teaching.
In the initial interview, the teacher said she felt the room layout was not ideal and her physical position in relation to the students was a concern to her. When using her computer, she would have her back to four students and see the remaining three side-on. She felt this was unnatural for a teacher talking to a group of students but, in the event, it appeared to cause no comment or problems.

### 6.6 The Shared Workspace Tools

The choice of shared workspace tool was subject to a number of constraints. Neither of the tools used had all the features which research had already shown to be desirable. It was therefore likely (and so it proved) that this would result in re-finding out requirements that had already been established. However, the tools had several advantages. Both were robust and reliable. Between them, they allowed all the required areas to be investigated, as Table 6.2 shows. It was also possible to affect the development of **nte**, the shared text editor.

Table 6.5 summarises the differences between the two tools. Perhaps more importantly, it shows that, between them, they offered most of the features which previous research had shown to be desirable in a shared workspace tool (see Chapter Three, section 3.3).
<table>
<thead>
<tr>
<th>FEATURE/FUNCTION</th>
<th>Wb</th>
<th>Nte</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPACE &amp; NAVIGATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multiple pages. Slider and arrows.</td>
<td>Scorable canvas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Document map, showing location of activity</td>
</tr>
<tr>
<td><strong>OBJECTS &amp; OPERATIONS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text</td>
<td>Type: keyboard entry Yes Yes</td>
<td></td>
</tr>
<tr>
<td>Import: file entry</td>
<td>Yes</td>
<td>Yes. Size limit. Truncates files above this. Always inserts at top of page. Imported file becomes a block of text.</td>
</tr>
<tr>
<td>Fonts</td>
<td>Four fonts, including one italic; 3 sizes for each</td>
<td>Courier, one size, plain, italic, bold, bold-italic.</td>
</tr>
<tr>
<td>Text editing</td>
<td>Can add and delete characters while typing current text object. After it is created, can only delete or move it.</td>
<td>Can add or delete characters at any time. Can also move, delete, change colour. Operations on whole text block only. Can not select and edit words or paragraphs which are part of the block.</td>
</tr>
<tr>
<td>Graphics</td>
<td>Draw Freehand plus some graphics primitives (line, ellipse, rectangle), arrow.</td>
<td>No</td>
</tr>
<tr>
<td>Import image file</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Formats for image files</td>
<td>Postscript</td>
<td>N/a</td>
</tr>
<tr>
<td>Colours</td>
<td>8 including black and white. Lighter colours can be difficult to see on white background</td>
<td>8 including black. All show up reasonably well on white background.</td>
</tr>
<tr>
<td>Graphics editing</td>
<td>No – only move or delete</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>FLOOR CONTROL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No system controls</td>
<td>No system controls</td>
</tr>
<tr>
<td><strong>REFERENCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No system controls</td>
<td>No - user invokes with right mouse button</td>
</tr>
<tr>
<td><strong>SHARED VIEWS/WYSIWIS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Page changing, scrolling</td>
<td>Default: page automatically changes for all to the one where activity is taking place, enforcing shared view. Individual can override this by locking her/his page.</td>
<td>Individuals can scroll to different parts of the document. No shared view enforced.</td>
</tr>
<tr>
<td>Resizing windows</td>
<td>Individuals can resize window independently; redrawn page preserves view by scaling page contents.</td>
<td>Individuals can resize window, or alter interface. This may cause text to be hidden.</td>
</tr>
<tr>
<td><strong>OTHER CONTROLS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ownership of objects</td>
<td>Only creator can modify object</td>
<td>Default – all participants can modify all objects. Lock mechanism can override this.</td>
</tr>
<tr>
<td><strong>ACTIVITY FEEDBACK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant information</td>
<td>Activity window shows participant names and highlights active user(s). Also shows multicast address/port and encryption key.</td>
<td>Can choose to display participant names. These are highlighted when active. Pointer, pen and truck icons carry participant name and current colour.</td>
</tr>
<tr>
<td>Visible cursor</td>
<td>No</td>
<td>Yes (in the form of a pen and truck icon.)</td>
</tr>
<tr>
<td><strong>OTHER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Can print whiteboard contents, Mute input from new sources, Select either point of click to type, Encryption.</td>
<td>Save workspace contents, Encryption</td>
</tr>
</tbody>
</table>

Table 6.5: Main features of wb and nte compared
6.6.1 Shared whiteboard - Wb

The shared whiteboard, Wb (Figure 6.5), was developed to provide a shared display for multimedia conferencing amongst researchers in the field of networked multimedia. Projects such as MICE (Sasse & Bennett, 1995) helped to broaden the user base, but there is no Windows or Macintosh version, which has limited its adoption. Versions are available for UNIX platforms (including Sun, Dec Alpha, SGI) and for PCs running Linux and Free BSD.

![wb window](image)

A toolbar on the right, vertical edge of the drawing area offers a selection of tools: freehand drawing, straight line, arrow, rectangle, ellipse, erasing, moving and copying objects, choosing font (a limited choice), colour and brush size. On this bar there are also: Undo, Print and Quit buttons and buttons to alter the orientation of the page.

Buttons on the bar along the lower, horizontal edge allow the user to create new pages, navigate through the pages and import files. Only ASCII or Postscript files are accepted. Input is also via keyboard and mouse. All participants may write, draw and type in the working area simultaneously; there is no built-in floor control mechanism.

The working area is divided into pages. Any user can create a new blank page. A slider is used to move between pages. The current page number is displayed, with the name of its creator. The default behaviour of Wb is to enforce a page change on all participants if one participant changes page. It is, however, possible for an individual to override this and “lock” a page s/he is working on.

Limited resizing of the window is allowed. Such resizing is not enforced on other participants but objects on the page will be redrawn and scaled to ensure that the user retains the same view of whatever is displayed, proportionally resized.

Although all participants in the session can use Wb simultaneously, it is not possible to carry out an operation on an object created by someone else. There are no visible cursors and there is no shared pointer. Once an object is created, it can not be edited, only moved or deleted.

6.6.2 Shared Text Editor - Nte

Nte (Figure 6.6) is a shared text editor, hence the absence of graphical display features. Like Wb it was designed for research into multimedia conferencing, in this case to allow remotely located users to keep notes during a meeting or to share text documents. At the time of the trial, versions were available for UNIX (Sun, SGI, HP) and PC (Linux, NT, Windows95).
Text can be entered via the keyboard or from a file. The unit on which nte operates is the block of text. A block may be of any size, from a single character to the file size limit that the user selects. After being defined, a block can be edited, moved or deleted. The style and colour of font can also be changed. A block can not, however, be restructured; existing blocks can not be subdivided or combined, for example, and modifications such as colour changes work on the whole block. Unlike wb, nte allows text files to be saved.

The nte work space is a single canvas and navigation is by scrolling. Users can choose to display a list of participants and a map of the canvas to help them locate activity. The nte window may be resized by individual participants more flexibly than is the case with wb. If this is done the existing text is not re-scaled and other users are not notified.

Unlike wb, there is a shared pointer. A pen icon (see Figure 6.6) appears when participants make contributions and a truck icon as they move objects. The pointer and icons can be labelled with participant name and appear in the colours participants are using.

For Trial 3, the MS NetMeeting shared whiteboard was tested with a view to using it. This was because the earlier studies, had shown that drawing operations were useful in textual work and suggested that a shared whiteboard would be preferable to a text editor. However, when tested with multiple users, the tool displayed some erratic behaviour (uneven delays in updating displays, inconsistent placing of images on different computers). It was believed that such behaviour would make the students distrustful of the tool and be detrimental both to the learning and to the research. It was therefore decided to continue using Network Text Editor, nte (Handley & Crowcroft, 1997). The editor was modified slightly: the font size could be changed (this had been requested by participants in Trials 1 and 2 and the ancillary investigations).

6.7 Teachers and Students

The students for Trials 1 and 2 were all in Higher Education and aged between 19 and 25. In the first trial, they were volunteers from amongst those wanting to register for language classes at the University of
Exeter and UCL. They paid for their classes, as they would for a face-to-face class, but the fee was refunded if they attended 80% of sessions over the ten weeks. Though the students in the first trial were not taking their language courses as part of their degree programme, they were generally well motivated. In the second trial, their language course was assessed for credit. The students did agree to take part but it was a timetable problem that led to the use of a tutor from another institution.

The teachers were selected largely because they taught languages that the students wanted to learn. The other criteria were a compatible timetable and willingness to take part. They were all face-to-face tutors in university language centres or language departments. They ranged in age from mid twenties to mid-sixties. One (the EFL teacher) was a confident computer user. One (French for Business) had no previous computing experience. The rest had some experience of using word processing applications.

Students in the ancillary studies included some adult learners who were in employment.

In Trial 3, the students were not volunteers; these sessions were part of their degree course. There were 29 students in Year 1 and 45 in Year 2. In Year 1 they were divided into first three, then four groups and in Year 2 into five groups, taught in successive one-hour sessions. Students were allocated a regular group but permitted to make changes if they needed to. Group size and composition therefore varied slightly from week to week. The teacher was the regular class teacher.

The students' prior experience with computers varied. According to their questionnaire responses, most used word processing and the World Wide Web regularly, but none had ever used a shared workspace tool. The teacher used e-mail, word processing and a web browser fairly regularly. She had previously used the text editor to teach a short introductory Russian course to distance education students (see Chapter Six, section 6.3.2). Unlike the other teachers in this research, she therefore began the course with some experience of the shared workspace tool and some goals which she hoped to achieve through its use.

### 6.8 Training and Support

#### 6.8.1 Training and support, Trials 1 and 2.

In Trials 1 and 2, all the participants were introduced to the shared workspace tools as part of the whole conferencing system. Training consisted of a one-to-one review of the main functionality, given shortly before the first teaching session. This was face-to-face at the computer and took about ten minutes. It was followed by about half an hour in which users could try the tools out with others, over the network. Tutors and one Portuguese student were trained by staff from the UCL Computer Science Department. One teacher and the remaining students were introduced to the system by Humanities Computing staff at the University of Exeter.

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6 This is what the researcher was led to believe at the time. However, in one of the focus group discussions, a teacher mentions "choosing" the students.

7 The regrouping was done in order to avoid the need for students to share computers. In the first three weeks of Year 1, they did so. The teacher found this made the class difficult to manage and some students complained.

8 Information about the students' experience of computers and their attitudes towards computers in language learning was obtained via a questionnaire administered for the VDML Project. Results are at: http://www.ucl.ac.uk/epd/herdu/vdml/. This background information was seen as a possible aid in interpretation.
The technology was both unfamiliar to the users and "leading edge"; some of the computer workstations were working at full capacity to decode the video streams and this was not mass distribution software. In order for the users to feel confident in the system, technical support was provided, both for troubleshooting and to help with the preparation of teaching materials. In the first trial, when it was not certain how robust the system was, technical staff were always standing by, to provide reassurance for the participants. In the second trial the tutor worked alone in a teaching room but could call on support by telephone if necessary. Students could also call for support.

Teachers were encouraged to ask for whatever they wished, in terms of teaching materials, and the support team made every effort to provide what was asked for. This was seen as a way to find out about what the teachers wanted to do.

6.8.2 Training and support, Trial 3
In Year 1, the teacher introduced the text editor's features to the students gradually, over several lessons. She chose this gradual introduction because she feared students might be hostile to a language lesson that was entirely devoted to learning to use a computer tool. In response to Year 1 student feedback, however, an introductory training session was provided for Year 2.

There was no technical support beyond that which was available to the department on a daily basis. A part-time technician maintained the network and installed software, but was not available during the teaching sessions. Any problems arising could be reported to library staff. However, support staff did spend time installing and testing the software before the course began. The students were also told that the observer would be prepared to help them, should a technical problem arise.

6.9 Tasks to be Supported

6.9.1 Tasks for Trials 1 and 2
The courses in Trials 1 and 2 were very varied. However, the teachers did agree on a list of tasks that they believed the system must support in order to make language teaching and learning feasible. They listed the essential activities as: conversation, grammar, spelling, gap-filling, reading, writing, vocabulary, pronunciation. The list was useful because it underlined the importance of the whole set of multimedia conferencing tools, not just the shared workspace. It was possible for an observer who was not a language teacher to identify these activities and the list was used in the research as part of an observer checklist (see section 6.10.1). It is acknowledged that, as a tool for analysis, it is flawed, since the categories are not mutually exclusive.

In addition to this, the list of activities using shared printed materials (Chapter Five, Table 5.1) was used in conjunction with observation data and saved screen shots, in order to discover whether the shared workspace allowed a range of activities similar to that supported in classroom language and literature classes.
6.9.2 Tasks for Trial 3
To understand the tasks, it is necessary to have some information about the Written Russian course and its relationship with the Russian language programme. Information has been obtained from an initial interview with the class teacher and from the Russian Department's web site. The Written Russian class is an integral element of the Year 1 language programme. The thematic content of language work (topics from Russian life, history, society and culture) relates to the rest of the degree course, so language is also central to the whole study process. Students also have classes on listening comprehension, grammar, translation, oral (one hour per week for each aspect). All parts of the language programme are co-ordinated; they share the same text or subject and aim at the same lexical and grammatical task. Thus, the Written Russian course places emphasis on developing skills to create a coherent written text, using the linguistic and background information provided by the rest of the programme.

It is important to point out that this course, with its emphasis on written accuracy and grammatical construction, represents a big change for the students, compared with their previous Russian language classes. This is the first time in the language course that written skills are emphasised, and at this stage, students begin to write essays in Russian. The course moves from work on individual words (vocabulary enrichment is a priority) to activities on sentences and paragraphs, to the point where students are collaborating to construct texts.

At this stage, students are supposed to be aware of distinctions in registers, to the level where they can choose the most appropriate words for the type of text they are constructing. From a syntactical point of view, a written text is often more complex than a spoken one. At this level, students are expected to learn to form compound and complex sentences, with subordination, to use participle phrases and passive construction, certain grammatical forms characteristic of literary Russian, 'introductory' words (to express attitude), and conjunctions.

6.9.3 Trial 3 key tasks: paraphrasing and creative writing
During a transition from paper-based to screen-based work, people tend to work with a mixture of the two (Luff et al., 1992). This class was no exception. In Year 1 especially, many of the computer exercises that were used to develop these written skills were adapted from paper-based exercises from previous years. Although gap-filling, matching and listing tasks were used frequently, this was specifically a writing course, about the construction of texts, and two kinds of task were particularly important. Information about these is obtained from the teacher.

The first task is paraphrasing. Students are asked to replace words or phrases in a paragraph with synonymous Russian construction. They can change the grammar or the vocabulary or both. This type of exercise is included in the Year 1 examination and considered useful preparation for the acquisition of summarising skills. The purpose of paraphrasing is to enrich vocabulary and teach students how to use complex expressions and phrases actively and effectively. Changing a word or phrase almost always leads to changes in the structure of the whole sentence.

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9 SSEES Department of Russian: http://www.ssees.ac.uk/russhome.htm
10 SSEES admits students on two tracks, those with "A" level or equivalent qualification and ab initio learners. For ab initio learners, "Year 1" is actually the second year of study.
Students usually find this type of exercise difficult and it is almost impossible to check it in a traditional classroom. In previous years, students had been asked to do the exercise at home and the paraphrased sentences were then read out or written on the whiteboard and discussed. It was a very time-consuming process which participants found boring. In addition, certain points would escape unnoticed and there was never enough time to look through every version of a given sentence. As section 7.5.1.3 shows, this activity was felt to be much more successful using the shared editor.

The second was a creative writing task. A topic would be suggested (to give a description of a typical middle class Russian, for instance). Students would work on this individually. Some students would cope with it more quickly than others, in which case they were asked to look through another participant's text, to concentrate on the linguistic form of the constructed text and make suggestions about how to improve it. In a classroom, this involved waiting for others to finish, moving round the room and negotiating. The shared editor worked better for this task. (see Chapter Seven, section 7.5.1.3).

6.9.4 Trial 3 teacher goals

The teacher had identified some problems when using traditional classroom equipment to teach this course:

- It is difficult for the teacher to monitor students' individual writing during a lesson or to know what everyone is taking away from the class. Consequently, the teacher has little control over the material used for revision.
- It is difficult to organise collaborative writing of texts, using paper and/or a traditional classroom whiteboard.
- A classroom whiteboard provides insufficient space for constructing texts. Repeatedly erasing the contents to create space also erases a potentially useful record of the lesson.
- Increasingly, the skill of typing in the Russian language is important for students, particularly if they hope to work using the language. Writing by hand does not help them to develop this skill.
- Language teachers usually spend a large amount of time photocopying material for every lesson, even when they have the materials available in electronic form. This can be wasteful of time and paper.

The teacher's initial motivation for using a shared text editor was the hope that it might alleviate some of these problems. Using the text editor solved the first three very effectively (see Chapter Seven, section 7.6.3). The students also developed their Russian typing skills, but not without difficulty (see section 6.13.3). The teacher continued to use the photocopier, although this was now in order to distribute materials after the lesson, rather than in order to distribute lesson activity sheets. (see sections 7.4.3.3 and 7.5).

6.10 Data Collection – Trials 1 and 2

The areas of interest were: the range of tasks that could be supported; the role and impact of the shared workspace. Data collected included both qualitative data (on student and teacher perceptions and language learning outcomes and processes) and quantitative data (logging user problems and identifying patterns in use of the shared workspace). Both subjective perceptions of participants and the more objective opinions of language teacher experts and other observers were elicited.
The target was to obtain results supported by both subjective and objective data, and repeated either across courses or, in the case of Trials 2 and 3, over the period of the trial concerned. Where this was not the case, the data were regarded only as raising questions, Additional research was then carried out to explore these and to discover whether the suggestions were substantiated. For example: a question raised in the Spanish ancillary study, about student-teacher communication, was investigated in Trial 3; questions arising from Trial 3 student focus groups were followed up in a questionnaire. The nature of the data supporting the findings is stated in Chapter 7.

Finding design requirements for the shared workspace is the focus of this study but, as has already been stated (Chapter One, Chapter Three), evaluation and interpretation may be complicated by the audio and/or video conditions, by usability problems, or by the fact that task performance relies on the interworking of all the conferencing tools. Reference was made to data collected about the audio and video tools, as well as the shared workspace. Data on the usability of the conferencing system was also collected and taken into account.

Conclusions have been based on the following data:

1. Checklists from observation of the system in use (Appendix 6)
2. Questionnaire responses from students. (Appendix 6)
3. Transcripts of video and audio tape recordings of focus groups and interviews. (Appendix 6 and 7)
4. Written reports from teachers and expert (language teacher) observers. (Appendix 7)
5. Screen shots of whiteboard and text editor pages. Figures 7.1-7.7 are sample whiteboard and text editor pages from Trial 2. Further examples, are in Appendix 7.

The rest of this section discusses the nature of the data, and the circumstances in which it was collected and analysed.

6.10.1. Observation of the system in use

<table>
<thead>
<tr>
<th>Date</th>
<th>Language</th>
<th>Observer</th>
<th>Date</th>
<th>Language</th>
<th>Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.10.95</td>
<td>Business French</td>
<td>OBSERVER2</td>
<td>14.11.95</td>
<td>Business French</td>
<td>OBSERVER1</td>
</tr>
<tr>
<td>11.10.95</td>
<td>Advanced French</td>
<td>OBSERVER1</td>
<td>15.11.95</td>
<td>Advanced French</td>
<td>OBSERVER2</td>
</tr>
<tr>
<td>13.10.95</td>
<td>Latin</td>
<td>OBSERVER3</td>
<td>17.11.95</td>
<td>Latin</td>
<td>OBSERVER3</td>
</tr>
<tr>
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<td>OBSERVER2</td>
<td>21.11.95</td>
<td>Business French</td>
<td>OBSERVER2</td>
</tr>
<tr>
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<td>23.11.95</td>
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<td>Latin</td>
<td>OBSERVER3</td>
</tr>
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</tr>
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<td>01.12.1995</td>
<td>Latin</td>
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<td>05.12.95</td>
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<td>07.12.95</td>
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</tr>
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<td>OBSERVER1</td>
<td>08.12.95</td>
<td>Latin</td>
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</tr>
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<td>OBSERVER2</td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.6: List of teaching sessions and observers, Trial One

Observation generated both quantitative and qualitative data. Observation took place both in the room and over the network. Each of these had advantages. In the room, the observer was close enough to the participant to see usability problems, particularly those related to the physical situation. On the other hand, the observer in the room had a rather distant view of the tutorial as a whole, which might limit
understanding of events. It was possible to listen in, but this was potentially quite intrusive, since it involved sitting close enough to the workstation to attach a headset.

Observing over the network was less obtrusive. It enabled all participants to be observed, but did not provide as much information about any single participant as did observation in the room. The observer's view was limited to what was shown by a small camera on the remote workstation (a head and shoulders view of the individual). This meant that it might sometimes be difficult to interpret events. On the other hand, the observer was "in" the tutorial, in the same way that an observer can be in a classroom and therefore shared the view of the participants, to an extent. However, there was one further complication of remote observation. A feature of networked multimedia communications is that no two participants' experiences are exactly the same because of network variations, variations in computer processing power and quality of peripherals. For instance, the quality of the audio may vary considerably.

Observers in the room concentrated on whole system design and usability. Questions addressed were: Did nominated language learning activities take place? Which shared workspace features were used? How much did students use the shared workspace? What usability problems occurred? What other problems did teachers and students have? In addition, observers recorded comments made by the participants and their own comments and questions.

A standardised checklist (see Figure 6.8) covered technical settings and hardware, language learning tasks, use of audio, video and shared workspace tools, including usability problems, with space for observer comments. The original checklists have been retained.

Three different observers were used (see Table 6.6). They filled in their checklists on paper and then entered this data into an html form. Figure 6.8 is a sample return from entering the data in the html form, annotated in order to explain the coding. To try to ensure reliability over identification of tasks, the observers met before the first session and after a few sessions had been logged. Secondly, observers exchanged sessions, so that all courses were watched by at least two of the three observers. Thirdly, screenshots of shared workspace pages were available as a cross check of the task data (see 6.10.5). The set of checklists was analysed using a Perl script, which, as appropriate, counted instances that were logged and aggregated comments. A printout of the output is in Appendix 6. The aggregated observer and participant comments were categorised in order to identify a list of issues, which could then be compared with the issues that emerged from analysis of the student and teacher focus groups, interviews and the expert observers' report.
Conditions: The name and date of the class has been deleted since it would enable identification of tutor and students. In addition to identifying class, date and observer, this section records whether the session was recorded (using a prototype multimedia data recorder), whether the audio tool's packet repair mechanism, "redundancy," is switched on, whether the frame rate is set at other than the default of 2 frames per second, machine name, whether extra light is provided and any other conditions that may arise.

Date=Deleted Class=Deleted Observer=2
Recorded=N Redundancy=na Frame_rate=na Machine=Henry Headset=na Light=na Other conditions=0

Teacher-identified tasks are coded, T.
T1-T8 correspond with the list of tasks in section 6.9.1. T9 is for observers to list activities that fall outside these categories. T10 was a project, not PhD, attempt to indicate the extent to which students were interacting with one another, as opposed to responding individually to the teacher. It was not used in this research.

T1 Conversation=1 T2_Grammar=0 T3_Spelling=0 T4_Gap-filling=0 T5_Reading=1 T6_Writing=0 T7_Vocabulary=1
T8_Pronunciation=1 T9_Interaction=Intermittent

Video-related items are coded, V:
V1_Camera - observed participant adjusts camera: each instance logged.
V2_Position - observed participant adjusts own position in relation to camera: each instance logged.
Numbers V3 and V4 relate to possible user problems, commonly found in video-conferencing environments: V3 - a participant moves out of shot (instances counted). V4 Participant image suggests lighting is inadequate 0 or 1 = Yes or No.
V5 - observed participant enlarges one of the images (see Figure 6.1 for an example of doing this) Instances counted.
V6 - complete loss of video image(s). Each instance logged.
V7 is for events that fall outside the given categories (described briefly by observers).
V1_Camera=0 V2_Position=0 V3_Out-of-shot=2 V4_Poorly-lit=0 V5_Large-pic=0 V6_loss=0 V7_Other=Student1 responded to question with a nod. She is well-lit so this works and you can see her expression. Student1 tends to give visual as well as verbal responses and therefore appears at first sight to be more fully involved than Student2.

Shared workspace-related items are coded W:
W1 to W7 refer to the main functions of the shared workspace. The observer records whether each is used in the session (0 or 1). To clarify 2 of these: W5 = creation of a new, blank page during the session. W6 = change between pages created, usually prior to the session, through file imports. W8-W10 differentiate between importing Postscript and Text files, and record whether files were imported during the teacher-identified tasks.
W11 and W12 count instances of problems: W11 - crash or freeze of the tool. W12 - failure of the click-to-type mechanism.
W_Other is for events that fall outside the given categories (described briefly by observers).
W1_Type=1 W2_Draw=0 W3_Erase=1 W4_Colour=0 W5_Blank-page=0 W6_Change-page=1 W7_Move=0
W8 ImportedPS=1 W9 ImportedPlain=0 W10_Lesson-import=0 W11_Freeze-crash=1 W12_Type-failure=2
W13_student_use=frequent W14_Other=Start plus 14 minutes TUTOR cannot get whiteboard to respond. OBS. also tried. Worked after quit and restart. In the meantime students wrote the words which TUTOR said and appeared to enjoy doing it. Problem when TUTOR wanted to erase one of the student-typed words. TUTOR also appeared frustrated by inability to write. Some problems navigating between pages especially remembering which way to scroll. Page numbers not noticed so all found it hard to reference them. Student2 continued to use wb after problem was fixed. Scanned text in small font. Student1 leans forward to read it and is therefore only visible in the bottom of the window. Scrolls too fast and skips pages 3 times.

Audio-related items are coded A:
A1 - observed participant adjusts the headset (instances counted).
A2 and A3 - observed participant adjusts different volume controls (instances counted).
A4 - a participant requests an utterance to be repeated (instances counted).
A5 - complete loss of audio.
A_Opinions enables the observer to record any remarks made by the observed participant about the audio.
A_Other is for events that fall outside the given categories (described briefly by observers).
A1_Headset-adjust=1 TUTOR also asks student to speak more quietly A2_Vol-mike=0 A3_Vol-Head=1 TUTOR tries several times. A4_Repeat=10 or more A5_Loss-crash=0 A_Opinions=TUTOR commented that the audio was very poor and made it extremely tiring to teach. A_Other=Audio problems intermittently throughout the session. Audio described as broken, also sometimes too loud. A result TUTOR spoke very slowly and loudly all through.

General comments: Observations that fell outside the above categories.
General comments=TUTOR had problems with the mouse, moving it around across the mat and in the air, clicking left button, also pointing it at screen. Some general space management problems when TUTOR needed sheets of paper to refer to and these were on the mouse mat. OBS. general impression that TUTOR was discouraged by the various problems in this session.

Figure 6.8: Sample checklist for single observation session with explanatory notes.12

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12 Student, tutor and observer names have been replaced with "Student1", "Student2", "TUTOR" and "Obs." Times New Roman (e.g. A_Other) indicates output resulting from entering observation data into an html form. Arial Italic (e.g. A_Other) indicates an explanatory note.
Language teacher expert observers (see 6.10.3) watched lessons over the network. Each was a specialist in the language being taught, except for Latin. Though offered a checklist, they preferred to make their own notes. They wrote reports, which were used in evaluating language learning outcomes. The expert observers also participated in the workshops and focus groups (see 6.10.4).

6.10.2 Student interviews and questionnaires

The questionnaires were intended to elicit subjective perceptions, experiences and opinions (see Chapter Four, section 4.4.4). They sought mainly qualitative data but did also ask users to rate audio and video quality on a five-point scale. Questionnaires were used in order to target the individual. They are contrasted with the output of focus groups where a standardising of opinions is possible and where stronger voices may dominate.

Questionnaires on previous computing experience were administered at the start of the trials. Questionnaires were also given to students at the end of both trials. One set of structured interviews was conducted with students, over the conferencing system, at the mid point of Trial 2 (see Appendix 6).

As stated in Chapter Four (section 4.4.4), all the questionnaires included questions about the whole conferencing system. Users were asked to give subjective ratings, on a five point scale, for audio and video quality and for the language course as a whole. They were asked specific questions (for example, about whether they ever enlarged a video image) but the answers still relied on an individual's memory and perceptions. They were also asked to compare this experience with face-to-face classes, to list problems they encountered with each element of the conferencing system and to suggest improvements to the system.

6.10.3 Teachers' and expert evaluators' written reports

There were four language teacher expert observers. As already stated, they watched the lessons over the network and made their own observation notes. The teachers also wrote short reports on their experiences of teaching their courses via the conferencing system. Two of the expert observers compiled the pedagogical evaluation report (Appendix 7), based on the lesson observation (see section 6.10.1) and on considering the content of the teachers' reports.

As with the interview and focus group data (see Chapter Four, section 4.4.4), the main interest was to identify issues important to the teachers and students, since design must take account of them. There was also a similar need to consider all the data initially and then to determine its relevance to design and use of the shared workspace tool. The approach to analysis was therefore similar to that adopted for the focus group and interview data. Analysis sought to discover: (a) how well the evaluators believed the system could support language learning; (b) what impact they believed the shared workspace had on the lessons; (c) what changes they believed would improve the shared workspace tool's contribution to lessons. The reports were divided into units of analysis, each concerning one issue (see Chapter Four, section 4.4). These were initially listed. No statement was omitted at this stage. The next stage grouped items according to their relevance to shared workspace, audio and video. This involved replicating items which

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13 An introductory section, which listed participants by name and gave the dates and circumstances of the trials was not included in the analysis and is not appended.
applied to more than one conferencing element. Finally, all items in the shared workspace category were regrouped into themes, which could then be used to address (a), (b) and (c), above.

6.10.4 Focus groups

Focus groups (see Chapter Four, section 4.4.4) were used for post-trial evaluation and to elicit ideas about design changes. They took place face to face and it was usually the first time that the students were able to meet their tutor physically. After initial introductions, students and tutors met in separate groups before taking part in a joint discussion. This was intended to free both parties from the need to modify their comments because of the presence of the others. Expert observers also took part in the joint discussions.

In focus groups, a facilitator encouraged tutors and students to review their experiences in the trials and to discuss the future development both of the system and of ways to work with it. See Chapter Four, (4.4.4) for a list of the kinds of question asked. Sample outline questions are appended (Appendix 6). Discussions were recorded and recordings transcribed by three people. Recordings have been retained.

6.10.5 Whiteboard and text editor screen shots

This data is the saved whiteboard and text editor contents from Trial 2. It is tempting to regard these screen shots as a record of lessons or the product of lessons, but it should be remembered that in neither case were they complete. They only represent the finished state of shared written contributions. However, they do preserve written interactions and enable crude assessment of quantity of contribution.

Workspace pages were treated as work documents and analysed with reference to tasks that needed to be supported and in close conjunction with the rest of the data, particularly the reports from language teachers and expert observers. First, the pages supplemented observation, as evidence that target activities took place. Secondly, the shared workspace pages were scrutinised in order to account for phenomena identified by system or language-teacher observers. Of particular interest was how the shared workspace fostered lesson attributes that the focus groups and evaluators' report showed to be valued by teachers. In doing this, elements of graphical communication were considered, such as the ways in which position, colour and other visual attributes were used to convey meaning.

6.11 Data Collection – Ancillary Investigations

As stated in section 6.3.2, data was collected opportunistically. The EFL teacher and one of the Russian students were very experienced computer users prior to the course. They were selected for attention as they represented a contrast with the rest of the students and teachers involved.

<table>
<thead>
<tr>
<th>Previous experience of computers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous experience of multimedia conferencing</td>
</tr>
<tr>
<td>Previous experience of learning languages</td>
</tr>
<tr>
<td>Audio-related comments (quality for purpose; benefits; problems)</td>
</tr>
<tr>
<td>Video-related comments (quality for purpose; contribution of video; problems)</td>
</tr>
<tr>
<td>Workspace (text editor)-related comments (benefits and useful features; difficulties and suggestions for improvement)</td>
</tr>
<tr>
<td>Other comments?</td>
</tr>
</tbody>
</table>

Table 6.7: Topics covered in interview with Russian student
The interview with the Russian student was conducted face-to-face. She asked not to have the interview audio recorded, so it was recorded in note form by the interviewer. The student was shown a copy of the notes, once they had been typed up. The list of topics shown in Table 6.4 was used to structure the interview but the student was also encouraged to introduce her own topics. The notes are in Appendix 6.

The EFL group discussion was conducted differently from all the focus groups and other discussions in this research. This time, there was no facilitator and no member of the project team was present. The participants were left alone and their discussion videotaped. The tutor was given a list of guideline questions (Appendix 6) half an hour before the session and asked to lead the discussion. The group was asked to talk for approximately half an hour but told they could have longer if they needed it. In the event, the discussion lasted about 40 minutes.

The reason for leaving the group alone was to see whether this would allow a freer discussion of problems with the system, without the need to be polite to the developers or led by a researcher with an agenda. Topics were raised which were not mentioned in any of the previous group discussions, so this may have been useful. A full account of the discussion is in Appendix 6.

Observation of Spanish for Lawyers was undertaken but the results were not used (see Problems Encountered, Section 6.12). Findings are based on the focus group discussion which took place at the end of the course and on the PIPVIC project report on this course (see Appendix 6).

6.12 Data Collection – Trial 3, Written Russian

This study aimed to understand working processes and to elicit the perceptions of teachers and students. Methods were governed by these aims and constrained by the need to avoid intrusiveness and by limits in resources. Some restrictions resulted from the computing environment in which the classes took place (see section 6.12.3). This was the most fully "Participatory" of the trials. The teacher's involvement extended beyond contributing her viewpoint and experiences; as the trial progressed, she became increasingly interested in the research aspect and influenced the design and the timing of the Year 2 student questionnaire. The following data was collected:

1. Video recordings of lessons - Year 1: All lessons in the first term and the last four sessions in the second term were videotaped. Figure 6.4 shows the camera position but does not show that it was elevated, in order to get all participants in shot. Figure 6.9 shows the view obtained. Using two or more cameras would have enabled closer study of individuals but in such a small room would have been very intrusive.
Two things were sought from this video data:

- broad-grained analysis, to identify activity patterns and changes over time;
- information about the frequency of the teacher's non-shared (one-to-one) interactions with individual students. This was in order to address a question raised in the earlier studies, about the possible need to support private teacher-student dialogues.

First, the whole set of videotaped lessons from Year One was studied in order to characterise the use of the shared workspace tool and identify patterns of use. As the tapes were watched, activity was first described in words. Each activity was timed, using the VCR timer. The written descriptions were initially analysed using a simple framework:

<table>
<thead>
<tr>
<th>Who</th>
<th>Looking at</th>
<th>Talking</th>
<th>Typing</th>
<th>Other activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Students</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

This framework enables teacher and student activity to be distinguished and also acknowledges the fact that paper-based materials were also in use in these lessons. It therefore differs from the analysis frameworks (see Chapter Three, section 3.6.1) that have been used to analyse shared workspace activity; these consider only where participants are looking and located within the shared space.

To address the question of non-public teacher-student interactions, 10-minute periods from the whole set of videotaped lessons were sampled and instances were logged and counted. Ten minutes seemed an appropriate length of time, firstly because many of the observed lesson activities took approximately that time and secondly because it was a realistic time for an observer to maintain concentration and make findings reliable. It was decided to study minutes 15-25 in each session. Study of the videotapes had revealed that the first ten to fifteen minutes of a lesson were often taken up by teacher exposition, with the teacher illustrating points by typing in the shared editor. After that, the pattern of activity varied.

Timing was done with the timer on the VCR. Each instance of non-public interaction between teacher and student was logged. These were identified in most cases by the fact that the teacher moved to talk directly to the student. On one or two occasions, interaction was with the student seated next to the teacher, so she did not move across the room. Reference was also made to the actions of other students: were they paying attention to this interaction or concentrating on something else? The
interaction was observed to try to determine its purpose. There was some concern that this might be
difficult. For the students furthest from the camera it might not be easy to see or hear. Speech was in
Russian. In all the observed interactions, however, the reason for the interaction was evident from
catching odd words and observing actions. This is probably because there were so few instances (see
Chapter Seven, section 7.6.2.4).

2. Notes from lesson observation - Year 2: All sessions in the first term and one session per week in
the second term were observed. The aim, as with the video analysis in Year 1, was to identify
patterns of activity. Notes were highly structured, creating a single-page record of each session.
Notes covered the number of students, the machines they used (enabling their shared workspace
contributions to be identified), brief descriptions of teaching and learning activity, with timings for
these. Appendix 7 contains a sample, which has been typed, in order to make it more legible (all the
notes were hand-written). The original observation sheets have been retained. The notes simply
record and describe; they do not attempt to categorise the activity patterns. Analysis took place
afterwards and consisted of comparing these activities with the categories identified in Year 1, in
order to determine whether any new kinds of activity were being used and whether there had been
any change to the structure of lessons. In ten sessions, workspace contents and screen shots were
saved at regular intervals, for comparison with the data from observation.

3. Text files: A complete record of the output of every lesson in both years was saved as a text file (see
Appendix 7). This included all text created by the teacher and the students, from file or keyboard,
during the lessons. A file saved at the end of the lesson does not contain a record of all activity, since
no evidence of deletions remains. In ten sessions, the editor contents were saved at five-minute
intervals throughout the lesson. This was done in order to add to knowledge about patterns of activity
- out of curiosity rather than with any expected outcome in mind. One advantage of a text file was
that it was continuous and allowed the whole of a lesson to be viewed as a unit. It also enabled crude
measures of lesson output or production of written Russian; a high level of language production
appeared to be valued by the language teachers in all the trials. Since the text format does not
preserve colour information, individual teacher and student contributions could not be differentiated.
The files were therefore used in conjunction with:

4. Images of the computer screen: These provided a set of snapshots for a teaching session, in which
individual contributions could be distinguished (see Figure 6.10). Further examples are in Appendix
7. As in Trials 1 and 2, these images were used in conjunction with the data from interviews,
questionnaires and focus groups text files, to investigate shared workspace contribution to lesson
attributes that teachers and students valued.

5. Year 1 focus group discussions were recorded and transcribed (see Appendix 7). The sessions took
place at the mid-point in the course, at the end of the first term. The aim was to understand issues
important to the students and their experience of using the text editor. Areas addressed were:

- the differences between this class and classes without a computer;
- how the text editor can help language learning;
- language learning activities that do and do not work well with the shared workspace
- suggestions for future improvements to the text editor or the way it is used.
Students were also invited to comment on anything else they regarded as important.

6. Students in Year 2, instead of taking part in focus groups, responded anonymously to a questionnaire. As with the focus groups, the questions aimed to elicit students' views of the whole experience and to find out what contribution they believed the shared editor made to this course and what they thought were the drawbacks of using it. Questions covered:

- Students' expectations of the course compared with actual experience
- what they thought would be lost and gained if they did not use the shared editor for the Written Russian course;
- what use they made of the printout of each lesson's text editor contents;
- how useful they found it to see the work of other members of their own group and of other groups;
- how useful they found three types of lesson activity;\(^{14}\)
- any other comments they wished to make.

The questionnaire, with all responses aggregated, is appended (Appendix 7).

<table>
<thead>
<tr>
<th>Area discussed in focus group</th>
<th>Subject of query in ratings</th>
<th>Purpose/reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Degree of involvement and enjoyment</td>
<td>Enjoyment of lessons, change in attitude over time</td>
<td>See consensus view: See how far whole group agrees with statement made by one or two in focus groups</td>
</tr>
<tr>
<td>2. The differences between this and classes without a computer</td>
<td>Communication – quantity</td>
<td>Clarify: lots of disagreement in focus group discussion</td>
</tr>
<tr>
<td>3. What the shared text editor is and how it helps language learning – things that work well and don’t work so well</td>
<td>Organisation of student activity: Same thing simultaneously vs different thing simultaneously</td>
<td>See consensus view: See how far whole group agrees with statement made by one or two in focus groups</td>
</tr>
<tr>
<td>4. Effect of sharing data</td>
<td>Being seen by other students – awareness and effect</td>
<td>See if individuals respond differently when not in a group situation</td>
</tr>
<tr>
<td></td>
<td>Seeing other students</td>
<td>Not clear from focus groups</td>
</tr>
<tr>
<td></td>
<td>Ability to identify other students' actions</td>
<td>Additional question, not asked previously</td>
</tr>
<tr>
<td></td>
<td>Being seen by teacher</td>
<td>Confirm focus group views</td>
</tr>
<tr>
<td>5. Sharing a computer</td>
<td>Effect on learning, effect on enjoyment of lesson</td>
<td>See consensus view: how far whole group agrees with statement made by one or two in focus groups</td>
</tr>
</tbody>
</table>

Table 6.8: Focus group/ratings relationship

7. Students also completed, anonymously, a set of ratings\(^ {15}\), expressing their degree of agreement/disagreement with 25 statements. These statements were derived from points made in the focus groups. Table 6.8 summarises the relationship between this exercise and the focus groups. Students rated statements on a 5-point scale and responses were scored from 5 (Agree Strongly) to 1 (Disagree Strongly). The ratings were devised in Year 1, because of a concern that the focus groups might be dominated by stronger voices. The aim was to obtain data in which individual variations were visible and from which it was possible to gain a better sense than in the focus groups of the class consensus on certain points. The same exercise was conducted in Year 2. All those present

\(^{14}\) The teacher was consulted about the questions. She requested that this and the previous area be included in the inquiry. She also asked that the questionnaire and ratings be administered earlier in Year 2 than had been intended, in order that she could act on findings.

\(^{15}\) The word, "ratings" is used to distinguish this from the questionnaire, which was completed by Year 2 students only.
completed the exercise, in each year, but student absence and some late arrivals at the class reduced the number of responses (15 in year 1 and 28 in year 2). The teacher’s perceptions and experience were elicited through interviews at the start (short, unstructured) and half-way points (a longer, semi-structured interview) and thereafter through written comments. See Appendix 7 for notes and transcripts. The teacher was also extremely helpful in explaining the learning activities that took place.

8. The teacher was relied on for assessment of the impact on key tasks and on learning. External examiner assessment of student performance (as reported by the teacher) was also noted. It should be stressed that no general conclusions are based on the examination results of these two years, in view of the variations that occur between classes, but they did prove reassuring to the teacher.

6.13 Problems Arising
This section lists problems which either interfered with the conduct of the research or might have complicated interpretation.

6.13.1 Problems affecting Trials 1 and 2
2. The network connection was not completely reliable and led to the suspension of two classes.
3. Audio quality was sometimes poor and this interfered with the work on occasion. Teachers reported switching to written activities from oral work when this happened. The student questionnaire and
interviews, at the mid-point of Trial Two, were preceded by three weeks in which network problems had interfered with lessons.

4. Offering a choice of shared workspace, in Trial 2, was not completely successful. Not unexpectedly, users tended to stick with the tool they first learned to use, in this case wb. As a result, more data was collected on the whiteboard than on the text editor. The occasions when it was used did, however, yield information about the features users found desirable and, fortunately, the ancillary investigations all used mte.

6.13.2 Problems affecting ancillary investigations

The PIPVIC trials took place just after the suite of conferencing tools had been ported to Windows from UNIX. This involved introducing a new shared whiteboard tool, which was being developed specifically for the PIPVIC project (Watson & Sasse, 2000a). When the trials took place, the development work was coming to an end but it did affect them. In the earliest courses, the integrated interface was not available, since the newest versions of tools had not been incorporated. There were some incompatibility problems between the UNIX and Windows versions and between tools in the integrated interface and the same tools working individually. New versions of the tools were released frequently throughout the period of the trials. The interview with the Russian student reflects this.

The Spanish course was affected by three different kinds of problems:

- restricted use of the tool;
- constraints on the role of the researcher;
- the level of the course in relation to students' linguistic competence.

The main problem was that the shared workspace was rarely used interactively. The PIPVIC project team attributed this to lack of confidence on the part of the teacher. This problem might have been alleviated with a training programme before the course began but the course itself was not long enough to enable the teacher to develop the confidence to experiment. The shared workspace tools were, however, used to display texts and sufficient student activity took place for students to form opinions about some aspects of the whiteboard and text editor.

The teacher's lack of confidence made it difficult for the researcher to conduct observation in the same room. Notes were made but not as systematically as intended because of the teacher's need for frequent reassurance and intermittent technical assistance. The notes have largely been disregarded.

The third is a different type of problem but it particularly affected the teacher's satisfaction with the experience. This was a Law course in Spanish. The focus was on key differences between the Spanish and UK legal systems. It was intended for advanced language learners. The students' proficiency in the Spanish language was not sufficient to enable them to cope with the course as originally designed. The teacher had to modify the content for these students and consequently felt dissatisfied at what she perceived to be their lack of success. The problem was compounded by the fact that the two students' proficiency levels were significantly different from one another. Of course, as Chapter Two suggests (section 2.5.3), the fact that the course was difficult should have made it a good test bed. The students, however, were not dissatisfied; they said they enjoyed the course and expressed satisfaction with the amount they had learned.
6.13.3 Problems affecting Trial 3

The computer room was set up to encourage students to use the computers for language learning only. This meant that, in Year 1, the students' machines were configured so as to deny access to the floppy drive, to all applications other than those designed specifically for language learning, and to network applications other than the text editor and the session announcement tool, sdr, through which the teachers and students started their nte teaching session\(^{17}\). The teacher's machine did have the floppy drive enabled but had a similarly restricted set of software applications.

The result of this was to limit the use of nte. Students had to rely on the teacher's saved copy of the file, for instance, rather than saving their own. This might have affected their responses to focus group or questionnaire questions about saving editor contents. The same constraints also limited data collection during the early part of Year 1. Only after some negotiation was it possible to obtain screen shots, for example.

In Year 2, the disc drives were enabled and students began to save files. Unfortunately, they encountered problems on the university computers, which were unable to display the Cyrillic fonts. By the time this was resolved, the students had come to rely on the printout of the teacher's saved copy. These difficulties may well account for the students' apparent indifference towards being able to save text editor contents.

Finally, the teacher requested that a printer be available in the teaching room, so that students could print workspace contents, but this proved not to be possible.

In view of the difficulties the distributed students had experienced with the Russian keyboard layout (see student interview, Appendix 6), keyboard overlay stickers were ordered. Unfortunately, these did not arrive until half way through Year 1. The keyboard layout was therefore initially given to students in the form of a diagram on paper, so that they had to look up the position when they were unsure. This extra reference process slowed their typing and led to frustration in the first few weeks of the course. This problem did not affect Trial 2.

For Year 1 students, better initial training and induction were needed, including practice typing in Russian. When introducing an innovation such as this, preparation should also make sure students understand why they are using the computer and how it fits the purpose of the course. Otherwise they are likely to attribute all problems to use of the computer. Year 1 students, for instance, initially blamed the text editor for the fact that they were not writing extended pieces in Russian; in fact this was due to the nature of the course, which a number had misunderstood.

In both years, student attendance fluctuated and some students arrived a few minutes late for lessons. This affected the number of responses to questionnaires and ratings, since they were administered at the start of the lesson and time was limited.

6.14 Conclusion

This chapter has described the conditions for three field trials and three ancillary investigations. The next chapter presents the findings. It covers these questions:

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\(^{17}\) *sdr* (Handley, 1998) enables a series of multicast sessions to be pre-arranged. To participate, users simply select the session and click. This was a convenient way to organise the Russian classes over a whole term.
1. How well did the text editor support teaching and learning in each course? This includes: support for key tasks; what the teacher and students did with the shared editor; student response.

2. What did each study contribute to knowledge of design requirements for a shared workspace to support text-based teaching and learning?

3. What did each study contribute to understanding of how a shared workspace tool can contribute to text-based teaching and learning?
Chapter Seven – Results of Field Trials

This chapter presents the results from the three field trials and three ancillary studies. The findings of each study are presented separately but are similarly structured. For each trial there are three main sections: how the teacher and students used the shared workspace tool; how the trial contributed to knowledge of specific design requirements; how the trial contributed to understanding of the role and contribution of a shared workspace in text-based teaching and learning. The trials with distributed groups (Trials 1, 2, ancillary investigations), enabled design requirements to be identified. More flexible restructuring of text, and a facility to hide objects, were needed to support the full range of learning tasks in these courses. Evidence of how the shared workspace tool fostered desirable lesson attributes also resulted. Trial 3, with co-located groups, clarified and extended findings about design features, confirmed and extended the list of shared workspace contributions, and showed that students also valued most of these. All the trials demonstrate that four shared workspace attributes combine to benefit teaching and learning in these disciplines: sharing, persistence, manipulation and accessibility.

7.1 Introduction

The research aimed to investigate both design and usage requirements for shared workspace tools and the decision was to do so through a series of field trials. Having explained in the previous chapter how these trials were conducted, this chapter shows how the findings build up.

The trials with distributed groups established that the prototype conferencing system offered good support for foreign language learning. It could support a range of activities listed by teachers but not quite all the activities observed in classrooms (see section 5.3.3.). The shared workspace was valued highly by teachers, students and expert evaluators. A number of lesson attributes that teachers and students valued were fostered by use of the shared workspace tool. A list of design recommendations could be drawn up as a result of these trials. They also raised a question about the need for partially shared space and private student-teacher dialogues. Some students felt they received more individual teacher attention working with the conferencing system than in a classroom.

Trial 3, with co-located groups, added to the list of design recommendations and expanded knowledge of how a shared workspace can contribute to lessons. It did not support the need for private dialogues, but did show that some students felt anxiety as a result of all activity being public.

7.2 Findings – Distributed Classes

This section incorporates findings from Trials 1 and 2 and the ancillary investigations.

7.2.1 System support for teaching and learning foreign languages

As stated in section 6.3.1, Trial 1 aimed to establish whether the desktop conferencing system as a whole could support small group teaching and learning in foreign languages. The broad answer was that it could. Support for this comes from observer checklists, expert evaluator reports and teacher and student questionnaires and focus groups.
Expert evaluators (see Appendix 7.8) describe the learning as "effective and rapid" and the system as:

"A valid, multimedia tool for language teaching" and "ideal for small group tutorials".

They say it offers:

"The potential for profound and accurate learning from tasks set during an individual learning session and for development and consolidation of communication skills over an extended period of teaching sessions."

The teachers had identified a list of tasks to be supported (see section 6.9.1). Evaluators stated that these were all seen:

"A variety of language tasks was used during the trials, including reading comprehension, explanation and practice of grammar, gap-fill exercises, oral practice and development, vocabulary building, writing and spelling."

This is supported by analysis of observers' checklists (see also the sample completed checklist in Figure 6.8). Table 7.1 shows that the system was able to support all the activities on the teachers' list. The table also shows the frequency of their occurrence during Trial One. Language teachers might be surprised by the proportions here but the results are affected by the fact that Latin is not a modern foreign language and that the course was in reading Latin. Although words were spoken, conversation in the language did not take place. Another possible surprise is the fact that "Writing" appears to have taken place in only about half the sessions. This is because observers did not record every act of writing in this category. When single words were written, this was often recorded as "Spelling" or "Vocabulary". As has been stated already, the list is flawed as an analysis tool in that the categories are not mutually exclusive.

<table>
<thead>
<tr>
<th>Activity</th>
<th>No. of sessions in which activity was observed to take place</th>
<th>Total number of sessions observed</th>
<th>Percentage of sessions in which activity was observed to take place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversation</td>
<td>24</td>
<td>29</td>
<td>83</td>
</tr>
<tr>
<td>Grammar</td>
<td>19</td>
<td>29</td>
<td>66</td>
</tr>
<tr>
<td>Spelling</td>
<td>8</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>Gap-filling</td>
<td>5</td>
<td>29</td>
<td>17</td>
</tr>
<tr>
<td>Reading</td>
<td>20</td>
<td>29</td>
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<tr>
<td>Writing</td>
<td>15</td>
<td>29</td>
<td>52</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>25</td>
<td>29</td>
<td>86</td>
</tr>
<tr>
<td>Pronunciation</td>
<td>29</td>
<td>29</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 7.1: Teaching Activities - Teachers' list (Coded T1-T8, Figure 6.8)- Trial One

Further support comes from students in the Advanced French class (Trial 2). They regarded the system as being as good as, or better than, their face-to-face experience for reading, discussing texts, gap-filling exercises, grammar and writing - but less good for oral work because of fluctuating (sometimes poor) audio quality.

The above should be qualified, however. All participants considered that the system needed improvements. In particular, fluctuating sound quality and dependence on the network were cited as problems. The physical working area needed to be redesigned to give more space for books and papers,

1Note: Some observers attempted to count instances but analysis just recorded whether or not an activity took place during a lesson.
which teachers and students still used. They disliked the heavy headsets and some found the headset cable restricting. Lighting was not always considered adequate and "sudden disappearances" when users moved out of the camera’s field of view, were disconcerting.

It should also be said that not all activities were carried out with ease. The sample screenshots (Figures 7.3 and 7.6, for example) indicate this. Both the objective and subjective data show that the lack of text wrap, the crudeness of the mouse as a drawing tool, an awkward page-changing mechanism and what was described as the "phantom click" made some activities awkward.

The final qualification concerns the way in which such a system is used. First, expert evaluators, teachers and students were all aware that the small group size had a mainly positive impact on the learning. They also raised the question of how large a group such a system could support. Secondly, evaluators and teachers stress the need to develop appropriate teaching resources and methodology, in order to make best use of the system, in the longer term.

Of the named, target activities, based on classroom observation (see section 5.3.3), only Caption activities were not seen. However, the range of "other activities" used in the remote lessons was narrower than in the face-to-face Spanish class. First, the virtual space in which the tutorials took place was not one in which participants could physically move around. This cut out activities which involved moving round the room. Second, it was not possible to split into pairs or change partners for activities involving speech, because all the participants shared a single channel and all speech was heard by everyone. Another aspect of sharing also reduced the range of activities: it was not possible for text to be concealed and then revealed, using the shared workspace. This eliminated a group of activities which seemed, in the face-to-face Spanish classes (section 5.3.3), to be important. Finally, although almost every activity-type was seen, activities were unevenly dispersed with, for example, a very large number of tabulating tasks observed in Trial 2.
rythme différent, le temps du ramadan, quand ce ne sont pas

l’opinion des idéels et le régime qu’il leur faut. La deuxième est que
l’islam maintient la femme dans un statut d’infériorité insupportable à
nos murs et à nos lois. La troisième est qu’il a développé dans
certaines de ses traditions un langage abominable. Ce n’est pas tout à
fait un hasard si aucun pays musulman ne pratique encore, à notre
manièrè, la démocratie libérale. Un connaisseur, V.S. Naipaul, met le
dégoût sur l’essentiel. 'La religion, pour un musulman, écrit-il, n’est pas
affaire de conscience et de pratiques privées comme la chrétienté peut
l’être pour un Européen. Accepter l’islam, c’est accepter (...) un certain

Figure 7.2: Sample workspace page (wb)

The students are working on the use of pronouns (moi, lui, elle, nous etc.),
listed by a student in yellow, with an addition from the teacher, whose text
is blue.
The page has been divided with a
line, to give separate working areas
but this is simply a matter of
organising space, unlike the use of
tables, in which position carries
meaning.

There are three students. They have
written their own examples of
pronoun usage. Corrections to
syntax and spelling have been made,
mainly by the teacher.

Figure 7.3: Sample workspace page (wb)

This is an example of the use of the
shared workspace to post
reference material, which students
can use as they work. The page
was also used as the basis for an
explanation by the teacher.
The teacher has displayed and
explained a set of simple rules
governing use of conditional
phrases in different sentences (eg.
If I do this I will .... If I did this I
would .... If I had done this I would
have ... etc.)
The yellow underlining is to
reinforce a point about the number
of parts to the verb (It is the same
in both parts of the sentence: 2 in
example 3 but 1 in the others). The
(R) at the end of each example is to
remind students that the correct
form of the verb contains that
letter.

Figure 7.4: Sample workspace page (wb)
2. Exigé.

Nous exigeons la fin d'un enseignement illusoire et archaïque, la fin du patriarchat primaire, la fin de la facilité des « âmes souveraines ». Nous exigeons la naissance d'un réel dialogue, d'une véritable coopération entre les professeurs et les étudiants. Nous exigeons que la vie, l'ordre, la recherche, le vrai travail en commun prennent enfin la place et la légitimité des amphithéâtres. Nous exigeons que les bloquages soient remplacés par un vrai dialogue et une véritable coopération profondes.

In this example, the text on the left hand side is being used to teach grammar points. The text contains examples of use of the subjunctive. Teaching and reference points (subjunctive verb endings and irregular forms) are written opposite the text. Lines are used to draw attention to two of these. The phrase that introduces these uses of the subjunctive is underlined in blue (Nous exigeons que) with the need for "que" highlighted on the right of the text. This is compared with the use of "nous exigeons" (without "que"), which is followed by a noun rather than a verb.

In the lower right hand corner students have extracted and adapted parts of the text to make use of the subjunctive verb.

Figure 7.5: Sample workspace page (wb)

Prior to this activity the group had read an article about disputes relating to Muslim girls’ wearing a veil.

The teacher has drawn the table with two main headings: tolerance and intolerance of the wearing of the veil. Under the subheadings, the students write what they think the implications of each attitude are for Muslims and non-Muslims.

This was followed by work on language use.

Figure 7.6: Sample workspace page

This is quite a long article, taking a historical and sociological approach to the role and position of women in society. It was imported into the text editor but students had also been asked to read it prior to the lesson.

This is an early stage in the work on this text. Students have been asked to go through it and mark anything that they would like to have explained.

On the right hand side is evidence of vocabulary work (the word, “röter” (It means, to burp), marked by a student, has two associated nouns typed at the side. Similarly, a student has marked the verb, "gérer", to manage. The noun meaning “management” (gestion) is typed close by.

Figure 7.7: Sample workspace page (nte)
7.2.2 What teachers and students did with the shared workspace

7.2.2.1 Whiteboard Functionality Used

In Trial 1, five functions (type, draw, erase, select colour and change page) were used in virtually every session (see Appendix 6). Text and postscript files were imported prior to the lesson and occasionally during the lesson. Other tools and facilities were used quite rarely and, in the focus groups, students suggested these were not needed or that they might be hidden behind drop-down menus.

The range of functions used in Trial 2 was similar, but the World Wide Web was used as a new source of shared text. This caused some difficulties, which are discussed in Section 7.2.2.4.

7.2.2.2 Student use of the Shared Space

In Trial 1, the amount of student use of the shared workspace varied. In 62% of the sessions observers characterised student use of the whiteboard as "frequent". However, there is a noticeable difference between courses (see Appendix 6). There is not enough evidence to attribute the differences to one cause. Possible reasons are differences in teacher confidence, learning objectives, languages, levels and teaching method. The differences could, of course, result from observer unreliability. However, two opposed categories (as opposed to a graduated range) were used, in an attempt to obtain clear distinctions, and the observers met regularly and observed one another's sessions, as stated in Chapter Six, section 6.10.1.

The observers' view of student use of the shared space does not accord with the views of participants. Using the shared workspace appeared to change students' perceptions of roles and relationships; they viewed their relationships with tutors as "more equal" than in a face-to-face class. This was strongly stated and agreed by students across the different courses. They cited their access to the shared workspace as a reason for this. This is interesting, since teachers still directed students' use of the tool and in many classes made more entries in it than the students did. However, Fulford & Zhang (1993b) suggest that it is the expectation of activity, not the actual level of their own activity, that affects students' perceptions of a learning experience and keeps them involved. To explain it, they use the analogy of a sports game, where participants must stay alert throughout, in case they receive the ball.

7.2.2.3 Use of Text Editor (nte)

Screenshots and observation showed that Nte was used for importing longer text files, to be read on screen, aloud or silently. The pointer was used to refer to the text during discussion. Words and phrases that were not understood were marked. Underlining was not possible, so the teacher and students developed alternatives. This is shown in Figure 7.7; the teacher has double-spaced the text to enable keyboard characters to be used underneath words, as a substitute for underlining. Notes were made at the side of the text, recording vocabulary and other points. Like the whiteboard, it was also used to exchange messages, particularly location information or instructions from teacher to students. Figure 7.7 illustrates these points.

Students wrote mainly short sentences or phrases. With this tool, too, it was common for the teacher to create a table-like structure so that students could fill in different columns simultaneously (see example in Appendix 7). The editor was also used for making corrections (moving text to a more appropriate place or correcting spelling/vocabulary). Corrections were made by both tutor and students; the more flexible
control mechanisms of nte, compared with wb, made it possible for corrections to be made by editing, rather than annotation, by both teacher and students.

When they switched from the whiteboard to the text editor, Trial 2 students stated in the focus groups that they missed being able to draw and underline but valued the fact that they could save the text. They also liked being able to edit one another's text and, especially, the fact that the teacher could correct theirs. The tutors noted that the shared editor, with its smaller font, enabled a longer text extract to be displayed in the window than with wb. They felt this enabled students to relate elements of the text to one another more easily and allowed them to scan a larger amount of text. However, the smaller font was generally not liked; teachers and students wanted also to be able to "zoom in".

The text editor's greater flexibility also led to some navigation problems (e.g. Figure 7.7: "nous sommes ici" [we are here]), particularly when students had been working on different parts of a text. This was noted by observers and discussed in the Trial 2 focus groups; one of the expert observers describes the students' problems:

"This is, for example, if a student is asking for something in the text, they are not necessarily on the same page as the tutor, whereas (in the past) when they want to ask about something, when they move onto the page, everyone is on the same page. That was the main reason because sometimes last time they took a long time. They were very frustrated looking for something in the text"

The teacher usually chose not to display the participant information or document map, preferring the extra space that this left for writing notes and vocabulary (see Figure 7.7).

7.2.2.4 A Third Shared Workspace - Web Browser Experiment

In the second term of Trial 2, the tutor began to explore and experiment. As he discovered the wealth of French language material available on the World Wide Web, the teacher wanted to import this into the whiteboard and/or text editor. This was frustrating, since the text editor did not preserve images and images could only be imported into the whiteboard as postscript files. It was also confusing to be forced to confront the issue of file formats.

Not surprisingly, the teacher sought a way to avoid the conversion process. Having used Netscape as an individual user, the teacher was convinced that it should be used as the shared space in language lessons and eventually used it as such in two of the sessions. The tutor would tell the students which web page to open and together they would browse from there. In focus groups, the students' opinions about using Netscape as a shared viewer were mixed. One found it interesting because it gave access to new and topical resources. However, the consensus was that it was not successful, mainly because of uneven delays in loading pages and the difficulty of verifying that all were looking at the same thing at the same time. Much time was wasted trying to resolve whether all participants were looking at the same page.

This experiment underlined the importance of integrating the software tools that teachers use. It also showed that a shared display alone is not enough; as a minimum, some means of common reference is needed. The experiment also reinforced the need for long field trials. It was only after many weeks that this teacher began to experiment. This suggests that in order to find out about "mature" use of a new
technology long trials are needed. The final study, described in Chapter Seven, shows the teacher gaining confidence and modifying teaching methods over an even longer period.

7.2.3 Specific design requirements

The findings about the features and functions required come from: specific suggestions and requests made by students and teachers in focus groups and/or questionnaire responses; observation of difficulties and inability to perform certain tasks; reports from expert evaluators; study of saved screen shots; talk from teachers, students and expert evaluators, in focus groups. Table 7.2 summarises the main findings and the degree of support for each one, using the headings introduced in Chapter Three (Table 3.1, section 3.3). The same headings are used in the text, below, to explain findings. The reader may also wish to refer to Table 6.2, which compares the features of \texttt{wb} and \texttt{nte}.

7.2.3.1 Space and Navigation

Pages and canvas are both acceptable. The tools need to support shifts between individual, simultaneous working and whole group working. As Gutwin \textit{et al.} (1995) showed, individual working may be with a shared view or with different views. When the students in these trials completed tables, or annotated a single paragraph, they shared the same view. When they worked on different parts of a long text, or carried out writing activities on separate pages, their views were different.

Whatever kind of space is provided, it is essential to provide a way to locate fellow group members working in different parts of a longer document. These teachers and students, as other users have done, found it worrying and confusing if they could not find one another's location. This involves not only support for finding other people but support for knowing one's own location. \texttt{Wb}, with its numbered pages, gave individuals information about where they were, which could be passed verbally to others. This proved more difficult with \texttt{nte}, and its document activity map, when used, appeared not to help them with navigation.

As well as allowing students to have their own working spaces, an efficient re-uniting mechanism is needed. This would reduce time-wasting and also facilitate teacher monitoring of individual student working (see sections 7.2.4.2 and 7.6.3.1); when students work in different areas the teacher needs to move easily between them. In this particular conferencing system, which incorporates video images of participants, one possible mechanism might be to attach a \texttt{FIND} button to the image window. When pressed, it would take the user to wherever that person was working.

Although it was not requested by the teachers or students, observation suggested that support for managing student use of the space would be useful. In particular, support for dividing up a page into columns, or creating a table framework is needed; the sample screen shots (Figures 7.1, 7.3, 7.6) illustrate this. In addition, the teacher in Trial 2 requested an additional shared space, perhaps for shared reference material. Expert evaluators suggest a larger screen area might sometimes be useful.

7.2.3.2 Objects and Operations

Text: Both file and keyboard text entry are required. The shared workspace should not only be able to display plain text but also preserve layout, where this carries meaning, in poems or advertisements, for instance. The formats for input files should be compatible with those used by other tools, including web
browsers. Another aspect of display is the font. International character sets are needed. A wide range of font sizes is probably not required but font size is important: comfortable on-screen reading is the priority; size should also be sufficiently flexible to allow both the scanning of longer texts and close focus on a few lines.

**Graphics:** It should be possible to sketch with the mouse. Ideally a pen and graphics tablet would also be available as input devices. Freehand drawing plus some graphics primitives (line, ellipse, rectangle, arrow) are needed and the shared workspace tool should support the importing of image files in common graphics file formats.

According to the teachers and expert observers, the graphical features of the whiteboard supported the use of a wide range of learning materials, including photographs, drawings and cartoons. The expert evaluators state that drawing contributed to textual study, feedback on errors, and the teaching of linguistic or grammatical points. Drawing was an aid to reference and emphasis, helped to convey information and added to participants' enjoyment of lessons. Expert evaluators state:

"The value of the drawing tool to underline linguistic or grammatical relationships, to point to a specific word, enabling others to locate it quickly, to indicate an error prior to removing it, helped give the classes interest, dynamism and a sense of concentrated and efficient learning and teaching. This tool was also used to teach, discuss and practice use of accents and other linguistic signs." "Drawing was frequently a very valuable additional asset in the teaching/learning process: a simple sketch was often informative and amusing, bringing not only an answer but also a moment of relaxation." Appendix 7

The screen shots in Table 6.6 provide evidence of drawing actions being used to illuminate the text. For instance:

- Position is used to define student working areas (Figures 7.3, 7.6), to organise ideas (Figure 7.6) and as a means of reference (Figure 7.1).
- Colour was used to distinguish individuals (illustrated in all the sample screen shots).
- Drawing actions are also used to convey relationships between elements of a text (Figure 7.2), to emphasise or identify elements within a text (Figure 7.2, 7.5), to explain the meaning of words (Figure 7.1).

**Operations on objects:** There are two aspects to editing objects. Firstly, to provide a fully interactive learning experience, ownership of objects must be shared; all participants need to be able to edit all objects. This supports both students' learning from one another and teacher intervention in student writing. This is the priority but, ideally, a facility to make certain objects un-editable would also be available (see also 7.2.3.4) and this should be at object level.

The second aspect of editing is that the teaching and learning activities used in these language courses need more sophisticated text re-structuring than either of these tools offered. Being able to delete only single characters or the whole object is not sufficiently flexible to support gap-filling and re-ordering exercises; although these were done in the trials, this was with some effort by the teachers and support staff. The EFL teacher explains to the students:
Student 1: The colours were good. Everybody had different colours. So when we moved the words I think you knew who was doing what - and we can know every student's reaction.

Tutor: When you can move things around like that it saves a lot of time. The only trouble is I have to come in early to prepare the lessons - physically type things in but not only that, you know things are separated into blocks... [yes]... well, you have to type each block in separately. So all the different sentences I have to type in individually. Not only that, I'd find myself typing many lessons twice, once at home when I was preparing it, then coming in again and typing in individual words so you could move them around. So that was quite time-consuming but I think that was just a technical thing that they can sort out - if anyone is listening! Extract from EFL focus group, Appendix 6.

7.2.3.3 Floor Control

In these small groups, no problems were observed to result from the lack of system-imposed floor control. These trials did not address the question of whether this would be the case with a larger group. However, the teachers did direct student use of the space to a considerable degree. This was done either by defining an area of screen for each student or by asking them to work on separate pages. A question was therefore raised about how important the management of the shared space was, to teachers. Trial 3 later showed that this was very important (see section 7.6.2.1).

7.2.3.4 Other Controls

Flexibility is required. The default should be that all participants can modify all objects. It should be possible for a lock mechanism to override this and the lock should apply, ideally, at object level. The default would enable the full benefit, to students, of interacting with each other's writing. A lock mechanism would prevent accidental erasing, as happened occasionally using nte.

There was no evidence that it was necessary for the system to control the working process or the roles of participants. In fact, quite the reverse; both students and teachers valued a sense of equality (see 7.2.4.2).

7.2.3.5 Shared view: WYSIWIS

More misunderstandings were observed when nte was used than with wb. This was partly because documents were longer and the screen looked more uniform (being only text and not having any graphical landmarks). It was harder for participants to be sure they were all looking at the same paragraph, for instance. The default behaviour of wb, to enforce a page change on all participants when one person changes page, reduced confusion; the default should be to preserve a shared view of the shared object for all participants. However, there were frequent occasions when participants worked in different areas, particularly with the more advanced classes. Greater freedom allows this but increases the need for navigation aids (see 7.2.3.1).

The integrated interface prevented the studies from addressing the question of whether the shared view should extend to the rest of the windows on the desktop.

7.2.3.6 Reference

As previous research has shown, a shared pointer is useful for clarity of reference. Students who used nte (Spanish for Lawyers, Russian, Advanced French) liked this feature. However, wb had no shared pointer
and users found their own ways to make reference to objects, using either small free-hand marks (dots or short lines) or the arrow tool (e.g. Figure 7.1).

7.2.3.7 Activity Feedback

Individuals' actions should be distinguishable, both as they happen and in a more persistent way. The groups studied here found colours adequate for this and such a mechanism would support groups of up to about 8 people. Most participants liked the named icons offered by nte but the Russian student felt they were too large and found them distracting.

People also need to know where they, themselves, are in relation to everyone else and in relation to the objects they are studying. Very visible page or place indicators are needed. The document map offered by nte was not found helpful as implemented, although the idea was considered potentially useful by participants in the focus groups.

7.2.3.8 Public and Private

The trials showed that, whilst the shared workspace tool performed more than adequately as replacement worksheet and whiteboard, it did not replace the student notebook. This resulted in some problems of physical space management for students; they all mentioned difficulties with note making. Better support for saving and printing workspace content might go some way towards solving this. In one of the ancillary studies (Spanish for Lawyers), both teacher and students said they would have liked a private note-making area to be available for students. The teacher felt it should be possible for a student to share this with the teacher, but not necessarily with the whole class. This is a hint that part-sharing might be desirable.

The teacher on this course also wanted students to be able to switch between working independently and as a whole group, but she felt this was difficult to manage with the tools available. A fuller training programme could have shown the teacher how to achieve this, since it can be done with both shared workspaces. What is important is that this need was re-stated.

The third aspect concerns interpersonal communication. Given two students at very different levels of competence, it is likely that at times one of them will struggle with a task. The Spanish for Lawyers teacher found this situation very difficult to manage via the conferencing system. In a classroom, she stated that she would have had a private conversation with the student who was struggling, or would have provided individual hints or support. In this wholly public environment, that was not possible. This is a common teaching and learning situation. The teacher wants to intervene in order to stop the student feeling frustrated but doing so publicly interrupts others and may be embarrassing to the student concerned. This adds another dimension of complexity to the shifting patterns of interaction that take place in teaching and learning. Whether the shared workspace is the appropriate channel to support this particular aspect of non-public working is a separate question.
<table>
<thead>
<tr>
<th>Design Questions</th>
<th>Requirements</th>
<th>Trial 1 sources</th>
<th>Trial 2 sources</th>
<th>Support from ancillary studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPACE &amp; NAVIGATION</strong></td>
<td>Either multiple pages or scrollable canvas are acceptable BUT:</td>
<td>Observation</td>
<td>Observation</td>
<td>EFL, Spanish</td>
</tr>
<tr>
<td></td>
<td>Navigation aids essential</td>
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<td>[blank]</td>
<td></td>
</tr>
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<td></td>
<td>Space management support needed</td>
<td>Observation</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td><strong>OBJECTS &amp; OPERATIONS</strong></td>
<td>Text, images, text with specified layout</td>
<td>Observation + focus groups</td>
<td>Observation + focus groups</td>
<td>Russian</td>
</tr>
<tr>
<td></td>
<td>Import text files and common graphics file formats.</td>
<td>[blank]</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draw with mouse or pen/graphics tablet; type blocks of text with keyboard.</td>
<td>Observation + focus groups</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some graphics primitives (line, ellipse, rectangle), arrow.</td>
<td>Observation + focus groups</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To be able to restructure text after object created;</td>
<td>Observation + focus groups</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Choice of font size.</td>
<td>Observation</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>International character sets.</td>
<td>Observation</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td><strong>FLOOR CONTROL</strong></td>
<td>System controls not needed for groups of this size; social protocols adequate.</td>
<td>Observation + focus groups</td>
<td>Observation + focus groups</td>
<td>Russian, Spanish</td>
</tr>
<tr>
<td><strong>OTHER CONTROLS</strong></td>
<td>Flexibility required. Default – all participants can modify all objects.</td>
<td>Observation</td>
<td>Observation + focus group</td>
<td>EFL, Russian</td>
</tr>
<tr>
<td></td>
<td>Lock mechanism can override this. Lock should apply, ideally, at object level.</td>
<td>Observation</td>
<td>Student focus group</td>
<td></td>
</tr>
<tr>
<td><strong>REFERENCE</strong></td>
<td>Shared pointer useful</td>
<td>None available. Use of substitutes observed</td>
<td>Observation + focus groups</td>
<td>EFL, Spanish</td>
</tr>
<tr>
<td></td>
<td>How can users draw attention to something?</td>
<td>[blank]</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td><strong>ACTIVITY FEEDBACK</strong></td>
<td>A means of locating oneself and group members in long documents.</td>
<td>Observation</td>
<td>Observation + focus group</td>
<td>Russian: Shared cursor may be distracting</td>
</tr>
<tr>
<td></td>
<td>Allow different participants’ contributions to be distinguished, both</td>
<td>(Note: only Wb available)</td>
<td>Observation + focus groups</td>
<td></td>
</tr>
<tr>
<td></td>
<td>when entered and persistently. Provide enough selectable colours to enable</td>
<td>Observation</td>
<td>Observation + focus groups</td>
<td></td>
</tr>
<tr>
<td></td>
<td>them to be used to identify participants.</td>
<td>[blank]</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not essential for insertion point (cursor) to be shared</td>
<td>Observation</td>
<td>[blank]</td>
<td></td>
</tr>
<tr>
<td><strong>OTHER FEATURES</strong></td>
<td>Saving workspace contents required - in editable format</td>
<td>Focus groups</td>
<td>Focus groups, student questionnaires</td>
<td>EFL, Spanish (Russian student requested Print).</td>
</tr>
<tr>
<td></td>
<td>Part sharing or hiding</td>
<td>Observation</td>
<td>Focus groups</td>
<td>Spanish (to support communication)</td>
</tr>
<tr>
<td></td>
<td>Note-making/replacement for some paper materials</td>
<td>Observation</td>
<td>Focus groups</td>
<td>Spanish, Russian</td>
</tr>
</tbody>
</table>

Table 7.2: Required design functions and features

### 7.2.3.9 Other features

A relatively small set of functions is adequate to support these teaching and learning tasks. The full functionality of a word processor or image editor is not needed, although making shared workspace operations consistent with familiar tools would enhance usability.

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The spoken and written data from teachers and students supports the need for a means to share homework assignments with the teacher. This was already possible in a number of ways, for instance by e-mail, but there was support for integrating it into the system.

There were also requests for the provision of plug-in reference tools, in the form of drop-down grammar tables, vocabulary lists and a dictionary.

7.2.4 How the shared workspace contributed to teaching and learning

The source for the points made in this section is the expert observer comments and reports, and the student and tutor focus groups. Table 7.3 summarises the main points, and the nature of the data that supports them. Whereas the findings in the last section were about feasibility, whether the target activities could be supported by the system, the ones in this section are more qualitative.

The shared workspace was agreed by tutors, students and expert observers to be a key factor in the success of the language courses. It was consistently rated by all participants as one of the best features of the conferencing system. Many of the perceived benefits resulted from the sharing of data. The ways in which the shared workspace contributed to lessons are explained below. The points are summarised in Table 7.3.

1. Facilitates teacher monitoring: It facilitates instant intervention and feedback by the tutor, in the process of writing, whilst students are working. This was stated strongly in Trial 2 but this only involved one teacher. Further support came from teachers and students in two of the ancillary studies. The tutor in Trial 2 reflects on the advantage of the shared workspace tool over traditional classroom equipment:

"... because what they write is beyond the teacher's control during a class - unless the teachers all the time look at what they're writing, all the students, which is [difficult]"

2. Preserves process record: The persistence of interactions around the text enabled a record of the process to be kept. Observation and screen shots show this use of the workspace. Trial 2 teachers' focus group comments show the teachers and expert observers valued this. In the early part of Trial 1, teachers in three of the courses tended to erase the whiteboard contents once the page had been filled, rather than selecting a new page. However, in Trial 2 the teacher would create a page of reference material or points for revision and return to it, as needed, during the lessons. Figure 7.4 is an example of this.

3. Supports students' learning from one another. With a shared workspace tool, writing, as well as speaking, is shared. This enables students who are not confident talkers to contribute to the class through their writing. This was considered a key benefit of sharing data, by both expert observers and teachers. It was also a gain over work on paper and classroom whiteboard.

TEACHER 1: ... the example of the shy student (...) His writing was very good and that part of his contribution was very good for the other students because his written production was always very clear, ideas were clear, it was well expressed, [...] so there are various ways of participating.

TEACHER 2: ... But his writing skill is actually very good and the others actually could benefit from his written accuracy and like he has benefited, he can benefit, from their [speaking].

TEACHER 1: I basically feel that there is a great deal of exchange going on
TEACHER 2: In a classroom situation its a bit difficult for [?students?] to benefit from written accuracy because you've got that shared whiteboard and everybody is writing and the other person can actually benefit from whoever is writing. Extract from transcript of teacher focus group, Trial 2.

4. Facilitates close textual study: The shared workspace facilitated close textual study. Expert observers and tutors agreed on this point and the saved screen shots provide additional support. Marking and pointing at text, so that these actions were visible to all participants made textual study active and was an economical way of sharing difficulties, solutions and alternative vocabulary.

5. Promotes a sense of play/fun: There is strong support for this from students, teachers and expert observers, across courses. It was felt that being able to move elements around the screen was useful in the language classes. An example is described in the Trial 2 teachers' focus group:

   TEACHER 1: Yes, one of the things that was - you introduced this a little bit later (to TEACHER 2) was when they put something in the wrong column and they could actually transport it (referring to picture of students' typed text in columns) to the other column. That was, I found it, that was interesting.

   TEACHER 2: .. shifting anything on the board helps using it in different contexts.

   TEACHER 1: Yes

   TEACHER 2: and what you're saying for example is that we changed the heading (...). Again I think this playful aspect makes students forget that they are participating in a class, they are at school. Extract from transcript of teacher focus group, Trial 2.

The shared workspace also helped to make error correction and grammar agreeable activities for students. Its use appeared to enhance the students' sense of engagement and involvement. This was stated by both participants and expert observers, but it is important not to attribute all of the effect to the shared workspace. These were small groups, using a novel system and being given considerable attention. All these factors might also contribute to an increased sense of engagement.

6. Promotes a workshop atmosphere and sense of shared endeavour: This was stated by teachers and students and by expert observers. The main reason given was the greater accessibility of the shared workspace to students, compared with a classroom whiteboard. However, the fact that the teachers were, like the students, learning to use the system was also cited as increasing the sense of equality.

7. Facilitates integrated language skill development: According to the expert observers, the shared workspace played an important part in enabling simultaneous development of the four key language skills: reading, writing, speaking, listening. They saw this as desirable and not easy to achieve.

8. Enables the use of a range of learning materials: the context is important here; for distributed groups the range of materials is increased by use of the shared workspace, as expert observers point out.

9. Teacher interacts more with individuals: this suggestion, from students in the Spanish ancillary study, was identified as needing further investigation (see Trial 3, section 7.6.3.7).

---

4 Teachers often referred to the shared workspace as "the board".
### Table 7.3: Shared workspace contribution to teaching and learning

<table>
<thead>
<tr>
<th>How a shared workspace contributes to lessons</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Ancillary studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Facilitates teacher monitoring, instant response, feedback, intervention</td>
<td>Teacher focus group</td>
<td>EFL, Spanish, Russian</td>
<td></td>
</tr>
<tr>
<td>2. Preserves process record</td>
<td>Observation, screen shots</td>
<td>Observation, screen shots, teacher focus group</td>
<td>Russian</td>
</tr>
<tr>
<td>3. Supports students' learning from one another</td>
<td>Observation</td>
<td>Teacher focus groups; expert observers</td>
<td>Russian (limited support)</td>
</tr>
<tr>
<td>4. Facilitates close textual study</td>
<td>Observation</td>
<td>Observation, student questionnaires, teacher focus groups</td>
<td></td>
</tr>
<tr>
<td>5. Promotes a sense of play/fun; student sense of being active, concentration and involvement</td>
<td>Focus groups, expert observers</td>
<td>Teacher and student focus groups; Expert observers</td>
<td></td>
</tr>
<tr>
<td>6. Promotes workshop atmosphere, sense of shared endeavour</td>
<td>Observation, student and teacher focus groups</td>
<td>Focus groups</td>
<td></td>
</tr>
<tr>
<td>7. Facilitates integrated skill development</td>
<td>Expert observers, focus groups</td>
<td>Expert observers, focus groups</td>
<td></td>
</tr>
<tr>
<td>8. Enables use of a range of learning resources</td>
<td>Observation, screen shots</td>
<td>Observation, screen shots</td>
<td></td>
</tr>
<tr>
<td>9. Teacher interacts more with individuals</td>
<td>Suggested by Spanish students</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Observation and screenshots show that the whiteboard also acted as an *extra communication channel* on occasion. Messages were left, as with a post-it note, taking advantage of the persistence of the medium (Figure 7.7). On a few occasions when audio quality deteriorated seriously, the shared workspace was used as a supplement or replacement. The shared whiteboard was also used to replace the video channel in an exercise where a teacher (Trial 1, Advanced French) wanted to base discussion around items taken from her handbag and shown to students; instead of holding items in front of the camera, which did not transmit a clear enough picture, a still image of the items was captured and imported into the whiteboard.

### 7.3 Accounting for the Benefits of Using a Shared Workspace

The main benefits of using the shared workspace in these language classes, appeared to arise from four attributes of the tools:

1. the sharing of data;
2. the persistence of data;
3. the 'physical' manipulation of on-screen objects;
4. the accessibility of the shared space.

**Sharing:** Being able to see a pointer and all marks and annotations means students can work actively and co-operatively. Since writing, as well as talking, is shared, students can contribute to the group in more ways than if data were not shared - and they can learn from one another's writing as well as talking. The tutor can monitor students' writing, and intervene instantly in the process. However, sharing data all the time, with everyone, did make some frequently-used language learning tasks impossible or pointless.

**Manipulation + sharing:** Expert observers believed that actually moving objects, and seeing others moving them, added to the students' sense of engagement and might have an effect on learning (although this was only suggested tentatively by the teachers and expert observers). This was a feature that was not used extensively and whose benefits would need further exploration. It appeared to be a combination of
this ability to manoeuvre objects and the shared visibility of actions and objects, which made grammar learning tasks more enjoyable for the students.

**Accessibility of space**: The workspace was more accessible to students than a classroom whiteboard and this might be a reason for students to feel their relationships with the teacher were "more equal". However, these were also much smaller classes than they were used to and group size may well have had a more significant impact on the relationships than did any attribute of the shared workspace.

**Persistence**: In the early stages of Trial 1, teachers tended to erase whiteboard contents, as one does in a classroom, in order to create more space. As they became more used to the tool, they began to create new pages and the focus groups showed that this ability to preserve a record of the process and of key vocabulary, which could be revisited, was valued. Being able to preserve it beyond the end of the lesson, which could be done in Trial 2, appeared to increase the value of this attribute further. In these distributed teaching sessions, where network congestion could affect audio and video quality, the persistence of the data was an added advantage because it allowed the shared workspace to supplement the audio channel.

### 7.4 Contribution of Ancillary Investigations

The findings from the ancillary investigations have been incorporated in the results already described. Table 7.5 shows how the three studies reinforced the findings from Trials 1 and 2 and raised further questions. These studies also did not undermine any of the earlier findings.

<table>
<thead>
<tr>
<th>Area of Investigation</th>
<th>Findings from Trials 1 and 2 reinforced</th>
<th>New questions raised</th>
</tr>
</thead>
</table>
| Impact of a shared workspace on lessons | Positive:  
Being able to see one another’s work (Russian)  
Working simultaneously (Russian)  
Moving objects (EFL)  
Saving the workspace contents (EFL)  
But:  
Sharing restricts some activities (Russian) | Students get more individual attention (Spanish)  
A sense of being on view (EFL)  
Possible need for part-sharing of communication - for efficiency and tact (Spanish).  
Possible need for part-sharing for student notes (Spanish) |
| Specific features and functions | Drawing as well as writing needed (Russian)  
Text restructuring needed (EFL, Russian)  
Flexible ownership and locking of objects/text (EFL, Russian)  
Students need to save and/or print contents (EFL, Spanish, Russian)  
Navigation: quick, easy mechanism for locating people in different areas of longer texts (EFL, Spanish)  
Note-making should be supported (Russian, Spanish) | Students like to be distinguishable by the teacher (Spanish, EFL)  
[Consistency of behaviour with other applications needed (Russian) – this aspect of usability was not investigated in the later trial.] |
| Other | Very small group size increases pressure to participate (Spanish)  
Unfamiliar keyboard distracting (Russian)  
Insufficient training might lead to problems in very short courses (Spanish, Russian) | |

Table 7.4: What the ancillary investigations contributed
7.5 Interim Conclusions

The conferencing system, with its integrated user interface, proved easy to learn and usable. It supported the language learning tasks which teachers considered essential and the textual study activities which had been identified in classroom observation (Chapter Five, section 5.3.3). This gave confidence that it was a suitable system within which to test a shared workspace for language learning.

As a result of the research reported so far:

1. It was established that a shared workspace tool could function as a replacement for most of the physical shared spaces used in a classroom. This made language tutoring at a distance feasible.

2. It was possible to make recommendations about the design features required in a shared workspace for text-based teaching and learning (section 7.2.3). The needs of this work situation, in relation to space and navigation, objects and operations, floor control and other controls, WYSIWIS, pointers, and activity feedback were clarified. A few tasks could not be supported with the shared workspace tools used in the field trials; the ability to hide objects from one or all participants and a text restructuring capability would enable these. Text restructuring would also make some other tasks easier for the users. The activities seen in Trial 2 suggested that support for managing student use of the space would be helpful (dividing pages and creating tables when students work close together, making it easy to locate individuals and to re-unite after a period of working in different areas).

3. Another aspect of "hiding" seemed possibly to be important. It had been suggested in one class that asides, private dialogues, as well as public activity, should be available. This was to enable the teacher to discuss homework assignments with individual students and to enable the teacher to support students who were having difficulties with the work during lessons. In the case of homework, one class requested part-shared work space in addition to the public shared workspace.

4. A picture was building up of how the shared workspace contributed to what teachers valued in language lessons. In fostering these attributes, the shared workspace tools had a significant impact on the teaching and learning. The contributions are summarised in Table 7.3. It is suggested that four attributes of the shared workspace tools gave rise to the benefits experienced: the sharing of data, the persistence of data, the accessibility of the space and the manipulation of objects.

These findings created a need to deepen understanding of how and why a shared workspace tool benefits text-based teaching and learning. Such an understanding should not only enable the benefits to be articulated to potential users but could also inform design decisions and enable designers to offer new solutions.

Both of the shared workspace tools imposed some user problems, reported by Watson (2001) and Hughes & Sasse (1997). Appendix 6 contains details of usability problems observed. However, the tools were stable and had sufficient functionality to support a range of teaching and learning activities. They also excited the users. Nte was developed in house, so it would be possible to influence its functionality for future trials. For these reasons, wb and nte were considered suitable tools to use in future studies.

The trials also showed the importance of evaluating the shared workspace over an extended period, since teachers took some time to gain confidence and, in the case of Trial 2, it was only after a term's working that the teacher began to take the lead in exploring possibilities.
7.6 Findings – Co-located Lessons

This section presents the results of Trial 3. It has a broadly similar structure to section 7.2, which presented the findings from Trials 1 and 2. It covers these questions:

- How well did the text editor support teaching and learning in this course? This includes support for key tasks; what the teacher and students did with the shared editor; student attitudes; performance in relation to the teacher’s targets.
- How did this study contribute to understanding of required design features?
- How did this study contribute to understanding of the contribution a shared workspace tool can make to text-based teaching and learning?

Reference is made, throughout the section, to illustrative screen shots, Figure 7.8 and Figures 7.10 to 7.14, and also to Tables 7.5 and 7.6. Most of these illustrations are sufficiently large to enable text to be read but those in Tables 7.5 and 7.6 are intentionally small, because they are illustrating a changing pattern of use; the small size was intended to draw attention to colour, quantity and shape of text, not its content. A reader who wishes to consider details of language use might well find the screen shots in Appendix 7 more comfortable to read than those in the text of the thesis.

7.6.1 Supporting the Written Russian course

7.6.1.1 What teacher and students did

In both years, each lesson consisted of three to five different activities. Not all activities used the text editor. In Year 1, the teacher would usually begin by importing a text file, which would be used for the first part of the lesson. In Year 2, it was more usual to begin with an empty canvas. The teacher saved the contents of the text editor after every session. She edited these files outside lesson time and distributed them to the students. These are referred to by teacher and students as "the handouts".
A change was observed over time. Year 1 began with ambitious use of the text editor, student problems with the keyboard (section 6.13.3) and the teacher’s realisation that the editor did not support all the desired text construction activities (see section 7.6.2.2). This was followed by teacher retrenchment - a period during which she did virtually all the typing and treated the editor as a classroom whiteboard (Table 7.5, October 24). During this phase, the teacher did ask students to use the pointer frequently. Some activities were carried out using paper. This phase was followed by increasing confidence and a period of experimentation.

In the first term, students wrote mainly single words and phrases in response to teacher instructions (Table 7.5, October 24, December 05) and quite often wrote one at a time. In the second term, the students became increasingly autonomous until they were spending most of the lesson writing and interacting with one another's writing (Table 7.6, March 13). Over this time, the quantity of writing the students produced also increased as they moved from writing single words to longer pieces of text. In Year 2, the teacher built more student writing into the lessons from the beginning. The saved text files show that more text was created in nte in the second year.

7.6.1.2 Observed activity types

As section 6.12 explained, written descriptions of activity observed in the video recordings were analysed using a simple framework. It was found that there were only a small number of variations. The activity
types that were observed in Year 1 also took place in Year 2. The difference between the years was in
distribution of the activities, not in activity type. The activity types have been named: No shared
workspace activity; look and point; teacher scribe; writing workshop; student writers. They are explained
next. Paper played a significant part in the teaching and learning activities.

1. No shared workspace activity

This activity was used to review work done by students, on paper, outside class and to explain work that
students were to do for homework. The teacher would usually distribute paper materials to the students in
association with this activity. Students might make notes. It is probably best illustrated with a still from
the video recording, Figure 7.9.

![Figure 7.9: No activity in shared workspace](image)

2. Look and point

This activity was usually used for teacher exposition and to review student writing in the text editor. The
activity occurred in every lesson that was observed. Figure 7.10 illustrates the use of this activity
following a period during which the students have been typing individually. The teacher's talk included
explanation, questions, prompts and other kinds of initiation of discussion. The students answer questions
or respond to specific requests from the teacher, one at a time. Some students make notes on paper.

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5 NOTE: date/time stamp on video recorder faulty.
In the participant list, numbers are distinguishable. 197 is the observer's machine. 97 is the teacher's. 131-138 are student machines, numbered in ascending order, clockwise round the room, starting on the teacher's right. The teacher usually (as here) allocated numbered spaces, starting with the student at machine 131.6

Figure 7.10: Look and point

3. Teacher scribe

In this activity, illustrated in Figure 7.11, the teacher types and the students talk. It was used to review written work done by students outside class. Typically, the teacher would ask students in turn to read items from their own homework. The teacher would write the answer down, then might ask supplementary questions, the responses to which she would also type. A variation on this was when students read out longer extracts from their work on paper and the teacher typed selected points and words, as they did so. This activity was also used to explain linguistic points. The pointer was used by the teacher to draw students' attention to elements of the text. The teacher also asked students to point at items.

6 This also applies to Figure 7.8 and 7.10-7.14.
3. Writing workshop

This activity-type was very varied in content, as illustrated by Figures 7.12, 7.13 and 7.14. It always involved simultaneous activity in the shared workspace by all students and the teacher. In the early lessons, students might write a series of short words and phrases. Later, this activity was used to get students to practise variations in written expression, or to write with different purposes: to express a point of view, to narrate or to describe, for instance. An example was when students were asked to write a narrative, using as many verbs of motion as possible. Sometimes students were asked to write in pairs, or to begin a piece of writing that would be augmented by other students. Sometimes students were instructed directly to "have a chat". Students were almost always allocated spaces for their writing. These would be numbered (e.g. Figure 7.12) or named (e.g. Figure 7.13). Sometimes the teacher would have written a starter sentence or question, to which students would respond. On one occasion, students were observed giving frequent spoken responses to one another’s writing ("Yes", "No" and laughter). This activity was a game.

The teacher’s role was quite complex during these sessions. She would introduce the session and instruct students individually as to where they were to type. As the students wrote, the teacher was observed to scroll, point, delete and type. While doing this, she would talk to individual students and occasionally to the whole group. As well as carrying out the usual teacher’s role of introducing the topic, explaining and illustrating, at various times, she acted as:

- **Prompter**: Typing prompts or supplementary questions to encourage students to expand on what they had written. (Table 7.7, B2)
- **Co-writer**: Entering into a dialogue with students about the content of their writing; contributing to the content. (Table 7.7, A2)
- **Monitor**: Intervening as students were writing, to point out errors or suggest improvements or alternative expressions. (Table 7.7, B1, C1, C2)
• **Consultant:** An individual student might ask a question about, for example, customary Russian language use (oral interaction).

• **Reference point:** To answer straightforward questions about word endings, for example (oral interaction, sometimes accompanied by typing).

• **Co-ordinator:** She organised students to write in individual or shared slots. She was observed to manage student time, directing a student who finished early to a further activity, for instance.

A written comment from the teacher is:

"In case of collaborative effort to create texts [...] In the traditional classroom the teacher is an authority showing the students how to create a text, with shared electronic board the learners are working/creating/collaborating, the teacher is just one of the participants/helpers."

This activity concerns the use of two Russian words, both of which could be translated into English as "different". In red at the top of the page is the end of the teacher’s explanation.

Students, having listened to the explanation, are asked to make up their own examples of usage of these words.

Students are given numbered spaces to work in. The teacher types in the numbers, leaving an appropriate amount of space, then allocates them to individual students, usually starting on her right and moving round the room (see room layout, Figure 6.4).

Students have selected their own colours.

All except student 4 have given two examples of their own. Student 4 has only been able to write one.

The teacher is interacting with student 5 but not pointing out a mistake; she is discussing a point with the student.

**Figure 7.12: Writing workshop, Year 2, December 04, Group 2**
Five lines at top of page – end of previous activity.

Teacher suggests topic for discussion: a question about students’ plans for Christmas.

Teacher has previously typed students’ names in pairs, leaving a space for each pair.

The dialogue is very informal, even affectionate (the girl is addressed as, “Sun”).

Students adopt a chat room style, using lower case for the start of sentences and no full stops. Slang words are used.

They also use multiple exclamation marks and conventions of electronic communication, such as a smiley face.

The teacher had to create a large space for each pair because spaces cannot be inserted into existing text.

Figure 7.13: Writing workshop – dialogues, Year 2, December 11, Group 1

Students are working in pairs, in spaces created by the teacher and labelled with their first names.

They have been given a starter topic and have been asked to discuss it with one another. They are asked to agree and disagree with one another.

The teacher is using the darker yellow colour, not red.

Figure 7.14: Writing workshop, Year 2, December 04, Group 2.

4. Student writers

This activity is distinguished from the writing workshop activity, in that the teacher does not intervene at all during the writing process. It was observed only in one week’s classes, at the end of second term of Year 1. The stimulus for writing was another group’s work, done in the previous week, saved and edited by the teacher and re-imported into nte. The students wrote additions and reactions to the existing text. This was followed by a discussion.
7.6.1.3 Impact on key tasks

This is based on the teacher's assessment and is amply supported by the saved lesson outputs. Reference is made to Figures 7.10 to 7.14, and to the close-up views of small portions of the ntc window in Table 7.7. See also Appendix 7, which contains the teacher's written comments on these activities. The account in this section is a close paraphrase of her comments.

The *paraphrasing* task was significantly more successful with the shared editor. The teacher reported orally that the students' end of year examination performance appeared to confirm this. While using the editor, all students worked simultaneously on the same original text, being monitored and corrected on the spot, with the help of the shared pointer, by either the teacher or another student. Issues and language difficulties could be discussed as they arose, while the texts constructed on the computer remained objects of the lesson rather than a medium of communication. Students talked in the language, about the language. After the class, each student had all possible versions of the original paragraph printed out as a handout.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Work on participles and cases. A noun is given, in a certain case, and students must type in the participle that agrees with it.</td>
<td>Students are typing their own examples of usage of two Russian words for &quot;different&quot;. See Figure 7.12 for more information.</td>
</tr>
<tr>
<td>2</td>
<td>This is a game. The teacher is a participant. The teacher has typed a description of a famous person (Elizabeth Taylor). Students have to work out who it is by asking questions. One has guessed correctly. They are now working on their own examples and questioning one another, with the teacher joining in.</td>
<td>This is the same game as in A2, showing another part of the page. The teacher is in conversation with two students (lower right). According to her explanation after the lesson, she is trying to distract them from a discussion about whether Bill Clinton is attractive.</td>
</tr>
</tbody>
</table>

Table 7.7: Teacher's activity when students write (see p 132-3)

The creative written task was also improved. As hoped, students were able to switch seamlessly from their own writing to reading and responding to other people's work and there was no need for quicker workers to wait until others had finished. During one class, a hot discussion over content arose. The students began to "converse" (or "correspond"?) with each other in Russian, agreeing and disagreeing with one another's ideas, as if using synchronous text chat. Comments in one of the focus groups had
suggested that some students associated the shared editor with a chat tool. This discussion happened spontaneously. The teacher stated that she decided not to stop the interaction but to shift the focus of the task from accuracy to fluency of communication.

Using the text editor extended this creative work as well as making it more efficient. Co-operation and collaboration proved possible not only within but between groups. One group’s work would be saved and edited by the teacher between classes. It was then re-imported into the editor as a text for consideration by another group. Once the students’ writing skills had developed to the point of constructing paragraphs, they were interested in and responded to the work of other groups, similarly to the way they interacted with individuals in their own groups. Having observed these effects, the teacher made specific efforts to encourage chat and other interaction in the shared editor in subsequent lessons. This changed lessons in the second year because the teacher deliberately created activities to encourage informal as well as formal use of language.

7.6.1.4 Student attitudes
In both years, the majority said they would use such a tool again for language learning. In Year 1, however, some students’ reactions to using the text editor were hostile at first. There seemed to be three main reasons for this, as revealed by the focus group contributions and comments reported by the teacher. Firstly, the keyboarding problems made typing slow and frustrating. Secondly, they had different expectations of the course; they expected a course called “Written Russian” to be one in which they wrote extended pieces in Russian, whereas, for much of the first term, they worked on single words and phrases and on grammatical and syntactical points. Thirdly, unlike the distributed students, who had accepted that computer tools were needed in order to conduct language classes at all, these students were quite reluctant to accept a change from what they thought a language lesson ought to be like. One or two (as seen in the focus groups) were hostile to the presence of computers in a language lesson, rather than to the text editor specifically. One, for instance, used the words, “fiddling around with a computer” when discussing this in the focus group. Their questionnaire responses show that they had rarely used computers before for language learning.

By the end of term 1, however, there was clear agreement in the group with the statements:

<table>
<thead>
<tr>
<th></th>
<th>I enjoy the lessons.</th>
<th>3.64</th>
<th>Mode - 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>I enjoy the lessons more now than I did at the start of the year.</td>
<td>4.07</td>
<td>Mode - 4</td>
</tr>
</tbody>
</table>

During Year 2, there was no evidence of hostility at the start of the course and, given the same questions, at the same point in the course, they responded:

<table>
<thead>
<tr>
<th></th>
<th>I enjoy the lessons.</th>
<th>3.75</th>
<th>Mode - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>I enjoy the lessons more now than I did at the start of the year.</td>
<td>3.27</td>
<td>Mode - 3</td>
</tr>
</tbody>
</table>

The difference between years could be attributed to a number of causes, the most likely being: an initial training session was offered before the course began; the keyboard overlays were available; the teacher’s attitude was more confident. The teacher believed the last two were the key factors. One should also remember that students vary; differences between individuals may have been influential.

---

7 They complained outside the lessons. The teacher reported this.
7.6.2 Design features and functions

7.6.2.1 Space.

The teacher stated that the teacher's role included managing student use of the space. Observation and screen shots support this. This confirms findings in Trial 2 (section 7.2.3.1) and, as well as having design implications, it should be addressed in guidelines for teachers using such tools.

In almost every session in Year 2, the teacher asked students to write in spaces she had set aside for them. Sometimes she used numbers to label the spaces (Table 7.7: A1, B1, C1), sometimes the names of individuals or pairs (Figures 7.13, 7.14). Sometimes the students worked close together, so that they could see all other students' work (Figure 7.7; Table 7.7: A1). At other times, when longer texts were being written, they were allocated larger spaces and could only see one or two other students' work. Observation notes and screen shots show that when this was first done, students ran out of space, because the text editor did not allow the insertion of blank lines. After this, the teacher created much larger working areas for the students. Students often began writing in one space and then moved into another student's area, either to comment or make some other addition (Table 7.7, B2).

7.6.2.2 Text restructuring

This study adds weight to the findings of Trials 1 and 2. Because blocks of text could not be broken up into smaller units, student activities were limited. The teacher explains that the editor as it stands does not allow enough "playing with" text. For this reason, she feels it is not "a teaching program". When interviewed, the teacher explained:

"I would like to give them paragraphs and they put them together or like [...] sentences and they put them together or play with the conjunctions or prepositions, again putting them in the right place."

"so you'd like to do this and do the other, filling in gaps exercises, etc. Lots of things that you normally could do with a teaching programme."

"But if you want to work on the level of a paragraph, on the level of making a text, I don't think it will work because everybody should see bits of the text and play with bits and construct a paragraph or a text and this sort of programme doesn't give you the potential to do that".

Like the EFL teacher (section 7.2.3.2), this teacher also found gap-filling exercises difficult with rne. After her first attempt, she used paper for these.

7.6.2.3 Use of shared pointer

The teacher believed that using the shared pointer added an element of fun and interaction even to simple activities. As already stated, the pointer was used a lot, by the teacher and by the students in response to teacher prompts. It was needed for reference, since all the lesson participants faced their screens. It was also used to enable the students to give feedback and demonstrate understanding and participation in an activity, where otherwise their role might be passive. The teacher initiated pointer "races", for instance. She would ask all students, not just one, to point at an element, simply because this was active, as opposed to listening only, which appears more passive. Students occasionally used the pointer unsolicited.
7.6.2.4 Private teacher-student dialogues

A question had been raised in the Spanish for Lawyers course (see section 7.2.3.8) about the need to support *asides*, to provide a part-shared communication channel, through which the teacher could help a student who was struggling with the work. The video-recorded material provided no evidence that non-public talk between teacher and students was essential in this class. Very little non-public interaction took place between the teacher and individual students. A number of the video-recorded samples contained no instances (see Appendix 7). The maximum number logged in one sample was three. In most cases, the student initiated the interaction by asking a question about the work.

No. Statement                                      Yr1 Mean Yr1 Mode Yr2 Mean Yr2 Mode
1. There is less talk between students than in other language lessons. 2.33 2 3.5 4
2. I talk less to other students than in other language lessons. 2.47 2 3.39 4/3
3. There is more contact between the teacher and individual students than in other classes. 3.64 4 3.61 4
4. There is less contact between the teacher and the class as a whole than in other classes. 2.53 3 2.18 2
5. I concentrate more in these classes. 2.92 3 3.21 3
6. The computers make you focus on what you are learning. 3.00 3 3.26 4
7. It works well when students are all typing different things, simultaneously. 3.87 4 3.52 4
8. It works well when students are all typing the same thing, simultaneously. 2.87 3 2.62 3/2
9. Using the shared editor forces you to be precise about spellings and endings. 3.87 4 4 4
10. I enjoy the lessons. 3.64 4 3.75 3
11. I enjoy the lessons more now than I did at the start of the year. 4.07 4 3.27 3
12. Getting a printout of the whole lesson’s work is useful. 4.47 4 3.97 5
13. It’s good that the teacher can check what you are typing, as you are doing it. 4.47 5 4.48 5
14. Sharing a computer is less good for learning than having one to yourself. 3.87 4 3.39 4
15. Sharing a computer is less enjoyable than having one to yourself. 1.73 1 3.39 4
16. I would have benefited from learning to type with the Russian keyboard before the course started. 3.62 4 3.61 3
17. Using a shared editor (shared board) allows students to be more active than in a class with a conventional whiteboard. 4.07 4 3.93 4
18. Typing things helps you to understand. 3.20 3 3.68 4
19. I look at what other students are typing. 3.93 4 3.56 4
20. I am aware that other students can see what I type. 3.87 4 3.82 4
21. I feel anxious that others can see what I type. 3.00 3 2.5 2
22. I always know who is doing what, from the colours they use. 2.60 2 2.46 2
23. I would like to learn to use more of the features that the shared editor offers. 2.93 3 3.37 3
24. I would be willing to use this type of computer tool in future language classes. 3.60 4 3.61 4
25. I would have liked to be able to save the work on my own disk at the end of the lessons. 2.86 3 2.93 3

Table 7.8: Summary of ratings, Year 1 and Year 2

Some qualification is needed. Leaving out the first fifteen minutes of each session meant leaving out instances where a student had a problem starting *nte* or getting the correct settings, such as the Cyrillic font. In these cases the teacher would usually go and check the student's computer. Secondly, individual students often had short conversations with the teacher as they entered or left the room at the start or end
of a lesson. Interchanges that were more sensitive than enquiries about a linguistic point might well have
taken place then, rather than during the lesson.

This does not suggest that a private channel is essential. However, the question was raised in a distributed
group, in which casual interaction before and after class is less likely. Secondly, student needs and teacher
approaches do vary. Individual teachers may have different ways of managing situations: this teacher,
when asked in the initial interview (Appendix 7) stated that she would not be concerned at having to
address a student's difficulties with the work in the hearing of other students. Individual students also
vary in their capacity to feel embarrassed when having difficulties. The conclusion reached, on the basis
of these studies is that this is not an essential requirement in a shared workspace tool but that some
teachers and students might value it, particularly in a distributed teaching group. If a private channel were
to be provided in a conferencing system, this could be text based but previous research (e.g. Chalfonte et
al., 1991) suggests that speech is a better mode of communication for interactions requiring tact. This
would not, therefore, be a design requirement for the shared workspace but for a multimedia conferencing
system.

7.6.2.5 Save and print

The earlier trials, reported in section 7.6, suggested that a facility to save workspace contents, in an
editable format, and to print workspace contents, were desirable design features. Observation showed
these functions were used in every lesson during the Written Russian trial The subjective data (student
questionnaires and focus groups, teacher interviews) showed they were valued by the teacher and students
and they are considered essential. Section 7.6.3.2 discusses how the saved contents of the text editor were
used by teacher and students. Section 6.13.3 reports how environmental factors affected use of these
features.

7.6.3 How the shared workspace contributed to teaching and learning

7.6.3.1 Teacher monitoring: immediacy, feedback and intervention

The Year 1 student focus groups, Year 2 student questionnaires, ratings and teacher interviews show this
to be important to participants. At the simplest level, it was reassuring for teachers and students that the
teacher knew exactly what students were taking away from a lesson. The fact that all writing was in the
view of the teacher was also agreed to be beneficial because it enabled instant teacher intervention – "Her
immediate pointing out and correcting it" – during the writing process. As in Trials 1 and 2, immediate
feedback, particularly from the teacher, was valued by teacher and students. Without the shared editor,
"The teacher wouldn't be able to make immediate corrections to your work, or while you are present."

An interesting additional effect of this was that students perceived there to be more individual interaction
between them and the teacher, compared with a traditional lesson, supporting the suggestion from the
ancillary investigations (section 7.4).

Finally, one of the teacher's targets had been to increase her control over students' revision material. She
stated that this was achieved and that this was a very positive benefit. Students also valued the "High level
of teacher control" and certainty that their notes were correct and the same as other students' notes.
7.6.3.2 Process record preserved

1. The persistence of text means that it can be revisited during a lesson. This happened frequently during lessons (see sections 7.4.1.2 and 7.4.1.3) and was cited by the teacher as a valuable result of using the shared editor (Appendix 7). Whereas in Trial 2, this was used in order to review and revise linguistic points, in this course it was used to examine the language that students had used in their own writing. Observation, teacher written and spoken comments support this.

Another extension of the earlier findings is that it was useful to use the preserved record after the lesson. In this course (a) the saved text was used every week as a handout to the students and (b) lesson contents were treated as texts for re-use by other groups of students (see section 7.4.3.2). The printout of the work of the whole lesson was felt to be useful by all parties. Focus groups in year 1 suggested that students valued this. The individual ratings in both years endorsed this:

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Yr 1 mean</th>
<th>Yr 1 mode</th>
<th>Yr 2 mean</th>
<th>Yr 2 mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Getting a printout of the whole lesson's work is useful.</td>
<td>4.47</td>
<td>4</td>
<td>3.97</td>
<td>5</td>
</tr>
</tbody>
</table>

In Year 2, students were asked what use they made of the printout. The complete list of responses is in Appendix 7. The key actions that were mentioned were: revise, check, refer, learn (i.e. memorise), reinforce, find examples. The questionnaire responses show that the printout supported elements of the whole Russian language course: oral presentations, essays, vocabulary, phrasing, grammar, spelling. Two students expressed interest in other students' writing (see section 7.6.3.6). One student had not used the printout. The students showed little interest in being able to save their own copies of the workspace contents (see also section 6.13.3).

7.6.3.4 Integrated language skills: speaking and writing

This both reinforces and extends the findings of Trials 1 and 2, in which expert evaluators praised the integration of speaking and writing (Table 7.3). Teacher interviews and student focus groups indicate agreement that the shared editor was beneficial because it forced students to commit to what they believed was correct. The teacher explained that Russian is an inflectional language and its unstressed endings are difficult to catch from the spoken word. In focus groups, students agreed that writing in a shared area helped, for example:

"Sometimes the teacher says something and I write it down and I'm never sure if I'm right."

If you just have to speak a word, "you can just muffle the endings when you're not sure" but, when you have to write it as well and the teacher can see, "you can't do that, you have to spell them out".

7.6.3.5 Increased production of language

According to the teacher; production increased; that is, she considered there was an increase, compared with the previous years' classroom lessons, in the quantity of written language which students produced. This is not a conclusive finding; no information was available about the quantity of writing done in previous years. However a high level of production of the language was also mentioned and stated to be of value by expert evaluators in Trials 1 and 2 (Evaluators' Report, Appendix 7).
7.6.3.6 Students learn from one another

Findings in this area are more complex, with apparent contradictions. It may be a sensitive area for a number of reasons, not least a culture that sometimes equates looking at other students' work with cheating.

Beginning at the simplest level, this study reinforced earlier findings by showing that certain tasks commonly found in language learning classrooms work less well when all writing is in public view. When all students were asked to write a single word or phrase, for instance, you could "wait until one person had done it right and then copy". This had been found in the earlier, distributed Russian class.

When asked, in the focus groups, Year 1 students tended to say that they did not look at one another's work - or only when finished. "otherwise I concentrate on what I'm doing". However, this is contradicted by statements, such as: "Immediately, without any movement, being able to [ ] see what all your classmates had written - that was great." There is evidence in the lesson output (screen shots, saved text files) that they not only looked but commented on each other's work. In the Year 2 questionnaire, students give a neutral rating to the usefulness of knowing what other students are doing (Mean 3, Mode 3 - Appendix 7), yet voluntarily mention looking at other people's work several times in response to other questions. Taking the two years' questionnaire ratings together, 72% agreed that they looked at what other students typed.

The other side of this is being aware that other people can see everything that you write. Again, there are contradictions in the data. 79% say in the questionnaires that they are aware others can see what they are typing. This is borne out by some of the comments made while students are typing during lessons. The effect of this on students was of interest, since teachers need to know whether to take account of it in lesson management.

In focus groups, students said they were indifferent to it:

"Of course I knew but I didn't care." "Sometimes you're aware of it, but then [ ] I forgot." "I wasn't that much [aware]." "Just slightly. I didn't have this, like, anxiety about it." / "Neither did I." This seems broadly to agree with individual responses. Both mean (3.0) and mode (3.0) values for the statement, "I feel anxious that others can see what I type." place the Year 1 response as neutral. In Year 2 the overall result was to disagree with the statement. However, 8 students overall agreed with the statement, 2 of them strongly. It is reasonable to conclude that the public nature of writing in the shared workspace does bring some feeling of being exposed, for some students. For a minority of this group, it provoked anxiety.

Whilst statistically this is not persuasive, there is evidence from the teachers' talk throughout the period of this research that they are concerned with individuals; indeed an awareness of the needs of the individual student seems to be considered essential by teachers. It is therefore likely that teachers will want to be aware of the possibility of this effect on a student - but not that they would be dissuaded from using a shared workspace tool on this account.

However, the responses also suggest that a degree of anonymity arises from the fact that colours, not names, distinguish participants. This might temper the feeling of exposure. There may be a sense of being watched, but only three students said they could always identify who was doing what. This is borne out by the video recordings and observation; in most lessons there is at least one instance of a request for identification, such as, "Who's green?" "Who's blue?"
7.6.3.7 Communication and classroom interaction

The teacher stated in the second interview that the classroom atmosphere was not changed by use of the text editor.

Collecting data on conversations between students was made difficult by the sharing of computers, which still happened if students swapped groups. In any given recorded sample, students who shared computers talked frequently to their partners, while those who had a computer to themselves spoke very infrequently. It was therefore necessary to rely on student perceptions about talk rather than more objective evidence. However, interpretation of what they say is complicated by the students' differing attitudes towards talk in lessons. Findings are therefore not unanimous.

Most of the students agreed, in focus groups, that interactions were different from those in a traditional lesson, but they did not agree about the way in which the two differed.

"It's different because everyone has their individual blackboard so there's less general contact."

This was one focus group comment. However, the teacher's awareness of what individuals were doing was perceived as bringing,

"More individual contact [ ] when we have to write stuff, because then we've all got our own colour and she points to it."

This was supported by the ratings (Table 7.8). The ancillary investigations (see Table 7.4) had previously suggested that students might perceive this increase in individual communication with the teacher.

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Yr 1 mean</th>
<th>Yr1 mode</th>
<th>Yr 2 mean</th>
<th>Yr 2 mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>There is more contact between the teacher and individual students than in other classes.</td>
<td>3.64</td>
<td>4</td>
<td>3.61</td>
<td>4</td>
</tr>
</tbody>
</table>

Year 2 students seemed to agree that there was less communication between students in these lessons than in lessons without the computer. In Year 1, sharing computers appeared to increase the amount of talk and this may explain the difference between the years.

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Yr 1 mean</th>
<th>Yr1 mode</th>
<th>Yr 2 mean</th>
<th>Yr 2 mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There is less talk between students than in other language lessons.</td>
<td>2.33</td>
<td>2</td>
<td>3.5</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>I talk less to other students than in other language lessons.</td>
<td>2.47</td>
<td>2</td>
<td>3.39</td>
<td>4/3</td>
</tr>
</tbody>
</table>

Year 1 students, in the focus groups, disagreed about the amount of talk between students in these lessons. The presence of computers affected them in different ways:

"I talk more in a computer class than in an ordinary class."
"I'm the opposite."

"We talk about what we're doing, while we're doing it, when we're on the computer and when we're in a class and the teacher's asking us to do something, one person's doing it and the others are sitting and listening - OK they talk to each other."
“I think you focus on the teacher in class and when you get distracted, you like to focus somewhere else. So when you’ve got the computer, you’ve got two things to focus on already and maybe that’s why we’re quieter in the computer class.”

However, the picture is complicated by the fact that the students also disagreed about the value of talk in lessons. Some saw it as a distraction, so that lack of talk meant you were more “focused”. Others used words such as “subdued” and “limiting” to describe a reduction in the amount of talk. At one extreme was the view: “Either there’s a good atmosphere or you learn a lot.” On the other hand, when you talk to other students:

“You build on each other’s ideas.” “And you also get confidence from other people.” “And you get reassurance, you feel not the only one that doesn’t know the answer.”

Because of variations in group composition and size, intermittent sharing of computers, and differing student attitudes towards talk in class, this study has not shown conclusively that use of the shared editor brought about a difference in interactions between students. It does, however, lend support to the finding that students perceive it to bring about more individual interaction between themselves and the teacher. It also suggests that, unless they were sharing a computer, using the text editor (or perhaps just the computer) led to a reduction in spoken interaction amongst the students.

7.6.3 Impact: student concentration and engagement

Focus groups show a number of students feel they concentrate more than usual in these lessons:

“You’re more focusing on what you’re doing, really, what’s being written”.

Ratings offered only very slight support for this:

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Yr 1 mean</th>
<th>Yr1 mode</th>
<th>Yr 2 mean</th>
<th>Yr 2 mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>I concentrate more in these classes.</td>
<td>2.92</td>
<td>3</td>
<td>3.21</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>The computers make you focus on what you are learning.</td>
<td>3.00</td>
<td>3</td>
<td>3.26</td>
<td>4</td>
</tr>
</tbody>
</table>

It is not clear that a higher level of concentration arose from use of the shared workspace tool. Perhaps anything on a computer screen would have had the same effect. High student concentration had been observed by expert evaluators in Trials 1 and 2. Using a computer might be isolating and/or a focus; both would tend to reduce distraction.

Another possibility, however, is that because, when using a shared workspace tool, all student activity, written as well as oral, is visible to all, the students perceive the overall level of activity and interactivity to be higher than usual. According to questionnaire responses, students felt that, without the shared editor, they would lose: "everyone participating" and "simultaneous work" (see Appendix 7). Since participation and simultaneous work occur in language classrooms without a computer tool, it may be that the effect of the text editor was to make students more conscious of class activity, rather than actually to increase it.

Fulford & Zhang (1993b) show that such a perception would tend to increase student satisfaction.
In focus groups and questionnaire responses some students describe the lessons as "fun". However, asked to state how useful they found three types of classroom activity (Year 2 questionnaire, Appendix 7), students give the highest rating to the activity in which they appear to be least active:

<table>
<thead>
<tr>
<th></th>
<th>Activity Description</th>
<th>Rating</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When the grammar is explained by the teacher and she does the writing on the shared editor</td>
<td>4.1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>When you are asked to produce grammar forms on the computer</td>
<td>3.5</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Creative: when you write your own paragraphs</td>
<td>3.6</td>
<td>3.5</td>
</tr>
</tbody>
</table>

7.6.3.9 Accessibility and control

This adds to the findings from Trials 1 and 2: the accessibility of the shared workspace and individual control brought benefits. This element of control distinguishes a computer-based shared workspace tool from the interactive whiteboard products now available, so it could be a useful finding. It makes sense if there are:

"3 Cs of effective learning: construction, conversation and control." Sharples (forthcoming).

Sharing a computer was not considered effective for learning, by the teacher or by students who experienced it (in Year 1). Once they had experienced both situations, students felt strongly about this:

"Today I was by myself and I feel I learned more".

"Having your own space – like, mental space – you’re in control. You know you can control it, you can scroll up."

"Today was the first day I’ve been on my own and it was really great [being able to] choose where you go."

7.7 Contributions of Trial 3

The main aim of Trial 3 was to deepen knowledge about how a shared workspace can contribute to teaching and learning. Section 7.6.3 explained what the Trial showed to be the tool’s impact on the lessons and showed that students valued many of the same lesson attributes as teachers. Trial 3 also added to knowledge about the specific design features needed to support text-based teaching and learning. The substantive contributions that this final trial made to the research are summarised in Table 7.9. In order to show how Trial 3 built on the earlier work, the Table uses the same headings that were used to summarise the findings from the trials with distributed groups (Tables 7.2 and 7.3).

---

*Question included at the teacher’s request.*
<table>
<thead>
<tr>
<th>How a shared workspace contributes to lessons (Trials 1 and 2 – see Table 7.3)</th>
<th>Extension and reinforcement from Trial 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Facilitates teacher monitoring, instant response, feedback, intervention</td>
<td>Teachers can monitor writing and be certain about quality of student notes. (7.6.3.1) Students know they all have the same notes and that these are correct. (7.6.3.1) – see also 2. Individual, immediate feedback from the teacher is enabled and greatly valued by students. (7.6.3.1)</td>
</tr>
<tr>
<td>2. Preserves process record</td>
<td>Supports students' reflection on their own use of formal and informal written language (7.6.1.3) Students know they all have the same notes and that these are correct. (7.6.3.1)</td>
</tr>
<tr>
<td>3. Supports students' learning from one another</td>
<td>Supports students' learning from one another. (7.6.3.2, 7.6.3.6) Facilitates collaborative text construction and student interaction with one another's writing (7.6.1.3)</td>
</tr>
<tr>
<td>4. Facilitates close textual study</td>
<td></td>
</tr>
<tr>
<td>5. Promotes a sense of playfulness; student sense of being active, concentration and involvement</td>
<td>May increase student sense of engagement and active participation. (7.6.3.8)</td>
</tr>
<tr>
<td>6. Promotes workshop atmosphere, sense of shared endeavour</td>
<td>Teacher becomes co-writer. (7.6.1.2) Can increase student sense of working alongside others – shared endeavour. (7.6.3.8)</td>
</tr>
<tr>
<td>7. Facilitates integrated skill development</td>
<td>Integration of speaking and writing improves linguistic accuracy. (7.6.3.4)</td>
</tr>
<tr>
<td>8. Enables use of a range of learning resources</td>
<td>Students perceive increased individual interaction with the teacher. (7.6.3.1)</td>
</tr>
<tr>
<td>9. Teacher interacts more with individuals</td>
<td></td>
</tr>
<tr>
<td>10. New</td>
<td>Enhances and changes tasks in classrooms as well as for distributed groups. (7.6.1.3) Teacher's role is described (7.6.1.2). Production of written language can be increased. (7.6.3.5) Supports re-use of student writing as learning resource. (7.6.3.2) Individual control increases the value of workspace accessibility for students. (7.6.3.9) Complex effects on classroom interaction (7.6.3.7) Writing in public view causes some students anxiety. (7.6.3.6)</td>
</tr>
</tbody>
</table>

**Table 7.9: Summary of Trial 3 contributions to the research**

### 7.8 Summary

This chapter has presented the findings from three field trials and three ancillary studies. It has shown what functions and features are needed in a shared workspace, to support interactive teaching and learning activities in text-based disciplines. It has also shown that a shared workspace makes a valuable contribution to teaching and learning in these disciplines and fosters a number of qualities in lessons, which are valued by teachers and students. The findings from the trials are summarised in Tables 7.2, 7.3, 7.4 and 7.9.
Chapter Eight – Conclusions and Recommendations

This chapter reviews critically the contributions of the thesis and discusses its implications for designers of shared workspace tools, for teachers in text-based disciplines and for those carrying out research in the CSCW field. It shows how the findings can translate into practical recommendations. Finally, it makes suggestions about research that might build on the work reported here.

8.1 Summary of Research

8.1.1 Aims and approach

Despite the availability of shared workspace tools and potential uses for them, and despite interest in computer-mediated communication, shared workspaces are not being used regularly to support mainstream teaching and learning, in text-based disciplines. The research addressed this possible missed opportunity. Its aims were:

1. To find out what design features were needed in the shared workspace tool, to enable it to support interactive teaching and learning in text-based disciplines.

2. To find out how using a shared workspace tool could contribute to teaching and learning in text-based disciplines, in order that potential benefits could be communicated to teachers.

The problem was treated as CSCW research, investigating support for teachers' work. Previous research had shown the importance of the teacher's role in ensuring effective use of computer-based communication tools to support learning. There is also increasing recognition (see, for example, Hinostroza & Mellar, 2001) that the teacher's work has been neglected as a basis for design of educational tools. In addition, the nature of shared workspace tools suggests that their use in teaching and learning is more likely to be led by teachers than by students, unlike use of web browsers or e-mail, which are part of personal, as well as educational, computer use. The teacher's work was assumed to involve concern for the student experience and perceptions, and this proved to be the case. Collecting data on these was considered essential.

The research aims were interpreted as investigating the design features and functions that were needed to support the teaching and learning tasks used in these disciplines and also finding out how a shared workspace could contribute to "good lessons". The intention was that the understanding of requirements that resulted could translate into recommendations for designers and for teachers.

A participatory approach, which originated in the Participatory Design movement, was considered to suit the nature of the problem, the user group and the technology, a novel groupware tool (Chapter Four, section 4.3.5). Such an approach has been used to find design requirements in an educational setting, though less often in relation to a groupware tool than to stand-alone educational software. To give teachers time to explore and to enable learning to develop, extended field trials were used as the basis for evaluating two prototype shared workspace tools, in use, in a variety of real courses.
8.1.2 Results of literature review

A review of relevant literature suggested that flexible control (of views and floor) was needed, and that the system ought not to impose controls over working process or participant roles. It was also clear that mechanisms to help users maintain awareness of one another's actions were needed. These findings seemed likely to apply to interactive, text-based teaching and learning but this needed confirmation.

Existing research was limited in relation to supporting synchronous, interactive teaching and learning in text-based disciplines (Chapter Three, section 3.7). It was necessary to know more about the kind of material shared in the workspace, and the way in which it would be used. Information about the interpersonal communication between teachers and students, using a shared workspace interactively, was not available for text-based lessons in which the teacher was an active participant.

The literature review suggested that methodology developed in CSCW research could be used to investigate technology support for interactive teaching and learning (Chapter Four, section 4.3).

8.1.3 Field studies

The research was carried out through a series of iterative and formative field studies, each one building on the results of its predecessors, with the degree of control over conditions varying according to the questions being addressed.

Two exploratory observational studies were conducted, in co-located classes. A list of types of activity around shared, printed material resulted. Similar activity types were seen in both foreign language classes and English language and literature classes. Given the range of new learning resources now available electronically, one might speculate that this list of activities represents an outdated picture of language teaching. However, evidence from observation of lessons and discussion with teachers suggests it is still relevant to current practice.

Following this, two extended field trials and three ancillary investigations were undertaken, in which the use of a shared whiteboard and a shared text editor was studied, in distributed foreign language courses. A further longitudinal study, with co-located groups, aimed to deepen understanding of how shared workspace tools can contribute to teaching and learning and to account for the benefits that teachers and students perceived.

Care was taken to ensure a consistent approach. In all the trials, structured observation was combined with the use of focus groups, questionnaires and interviews. The use of a number of observers, with checklists and other mechanisms to structure and standardise observations, added to reliability. Interpretation of findings in Trials 1 and 2 was helped by the availability of data on audio and video conditions; reference to this ensured that effects were not wrongly attributed. The participatory approach meant that teachers, students and pedagogical experts, who were involved in the research, were able to validate the findings. Within the studies, there was a variety of different learning situations, which makes the findings more likely to generalise within text-based disciplines.

8.1.4 Overview of contributions made by the thesis

The research has made the following substantive contributions:
1. Information, for designers of shared workspace tools, about functions and features required in order to support text-based teaching and learning activities and to support what teachers consider to be attributes of good lessons (section 8.2).

2. Information, for teachers using a shared workspace tool, about the nature of the tool, the contribution it can make to text-based teaching and learning, the kinds of activities that it can support (section 8.3).

3. Information, that was previously not available in the CSCW literature, about design requirements particular to text-based teaching and learning and about the impact of using a shared workspace tool on the teaching and learning in the courses studied (section 8.4).

The research has made additional, methodological contributions:

1. Confirmation that participatory methods constitute an effective way to investigate design requirements for a tool to support synchronous, interactive teaching and learning (section 8.4.4).

2. Confirmation of the value of a programme of field studies, to carry out research into design requirements in an educational context (section 8.4.4).

These contributions are important and timely. Chapter One suggested that opportunities were being missed, because shared workspace tools were not being used in text-based teaching and learning. When the scope of the research was defined (the process was described in Chapter Two), a primary goal was to establish the kind of teaching and learning contexts, within text-based disciplines, in which shared workspace tools could be useful. The research has shown that these tools do offer something different from the Internet tools already in use to support teaching and learning. The recommendations to teachers (section 8.3) explain both the differences and the benefits offered by shared workspace tools.

The final study (Trial 3, Written Russian) attracted considerable local interest. This has already led to plans to use nte, the shared text editor, in three other courses. This supports the view that, once the benefits are known to them, teachers will want to use shared workspace tools.

However, the benefits may have wider application than originally envisaged. Although the research limited itself to text-based disciplines, and has found requirements specific to these, it has also found that use of a shared workspace can foster: immediate feedback; security about the quality of student notes; individual student-teacher interaction; tutor-supported interaction with learning materials; a sense of shared endeavour amongst students, and between students and teacher; active student participation; students’ learning from one another. There is no reason to think the usefulness of these is confined to text-based subjects, so the contribution of the research may well extend beyond these.

### 8.2 Shortcomings of the Research

A number of lessons have been learned from carrying out the research and, with hindsight, it is recognised that it could have been improved. First of all, it is acknowledged that, despite its advantages in leading to acceptable and useful designs, some limitations do arise from focusing so firmly on the actual practice of teachers. As stated in Chapter Four, there was a strong desire to derive from the research design recommendations that would be practically useful to designers and potential users. This led to decisions that could be seen as having limited the research. One such decision was to locate the research firmly in the CSCW domain, with its tradition of studying the ways in which people carry out their work. Within this, the scope of the reading was also influenced by this desire for practical outcomes. There is strong emphasis on activity and task support, on what users do and want to do and on empirical
approaches. This, combined with the use of field trials and prototyping, did lead to confidence in the findings, and a belief that following the resulting design recommendations would create a tool that was useful and acceptable to teachers and students. However, it is recognised that other dimensions, which might have emerged from an enquiry based on learning theories or processes, or on learning objectives, were not always explored. The initial studies, described in Chapter 5, exemplify this. Following methodology from the CSCW field, the focus is firmly on the actual classroom practice of teachers. The educational literature might have suggested goals and ideals that were outside everyday practice at the time, yet still desirable. Although this limitation is acknowledged, the research does still show that actual practice can change because of opportunities offered by technology, and teachers taking part in field trials and focus groups were always encouraged to think beyond supporting their current tasks.

This leads to consideration of the use of the screen shots collected throughout the trials. These provided valuable reinforcement of data from observation and focus groups but if the research were to be repeated, one might also consider coding this data with reference to learning objectives, derived from the literature and/or from teacher and student talk.

Now that it is possible to look back at the series of field trials it becomes clear that data collection throughout was to some extent governed by the circumstances of the first set of trials and, specifically, by the resources that were available in an externally funded project. Another contributory factor was conducting the research part-time while working as a Research Fellow and lecturer. In this situation, one has to adopt an opportunistic approach and to seize chances to collect data as they arise, without always being in control of the timing of events. It is acknowledged that this may have led to a belief that data should be collected "just in case". Trial 3 was affected because of a perceived need to maintain consistency with Trials 1 and 2. This led to the assumption that all lessons should be studied and hence to the collection of a very large amount of observational and video-recorded data. Whilst this did enable patterns of activity to be identified, it could be argued that, in a study of such long duration, a sample, rather than every week's lessons, would have generated similar results.

Having said this, however, the quantity and variety of data did have benefits. Each field study had clear objectives, but the intention was also to collect sufficient data to allow new and unexpected findings to emerge and to enable findings to reinforce one another. On the one hand, the large amount of varied data enabled triangulation, which strengthened the findings. On the other, it presented a problem in determining relevance to the research and made analysis very time-consuming.

The decision to videotape so many of the lessons in Trial 3 was, in retrospect, mistaken. The need to answer questions about interpersonal communication and the impact of using the tool made the decision to use such a rich medium appear reasonable at the time. However, with the benefit of more practical experience of videotaping in such situations, it would have been realised that the resources to do it well were not available. In addition, even had they been available, the intrusiveness of using more than one camera in the teaching room concerned would have argued against doing so. In the end, the outcomes did not justify the effort made to collect the data or the time taken to analyse it. Close observation of the teacher over sample periods of lessons would have led to equally reliable findings about teacher-student communication. The data from the structured observation developed for the second year of the study proved at least as valuable as the video data, in terms of understanding patterns of activity, and was easier to analyse. The video recordings did, however, contribute to the research; the design of the observation
sheet used in Year 2 was informed by watching the videotaped lessons from Year 1. If the research were to be repeated, some use would still be made of video recording of lessons in this Trial. Instead of recording all lessons, a small number would be recorded, in the first term. The resulting rich data would be used to gain an understanding of what was going on, and as an aid to conducting more goal-focused, structured observation.

8.3 Contribution to Design of Shared Workspace Tools

As a result of the research, it is possible to make recommendations to designers of shared workspace tools to support text-based teaching and learning. These recommendations are useful because:

1. They cover not only the functions and features needed to support text-based teaching and learning tasks but also information about lesson attributes that teachers and students value. This will help designers to determine priorities and make decisions about trade-offs.

2. They are informed by observation of the tool's use in real courses, over an extended period of time, by nine different teachers and more than 80 students. This makes it likely that resulting designs will be useful in real teaching and learning situations. It should also enable designers to provide support for teachers and students as they progress from novice to more expert user.

It appears (see section 8.3.2) that the shared workspace tools most easily accessible to users in Higher Education do not have all the features that the research has shown to be needed, if they are to support interactive teaching and learning in text-based disciplines.

8.3.1 Recommendations to designers

The features and functions required to support teaching and learning tasks used in text-based disciplines are listed. In addition to this, the recommendations cover support for attributes of good lessons. It may well be that these apply more widely than in text-based subjects. These are listed first. It should also be noted that a shared workspace tool can benefit both distributed and co-located groups working interactively in text-based disciplines. It should not be viewed just as a replacement tool, for use in distributed classes.

Support for good lessons

Design should be informed by an understanding of what teachers and students of text-based subjects value and what they want to do. This understanding will help to determine priorities, if there is a question about design trade-offs. In interactive, text-based disciplines, teachers value:

1. Being able to monitor and intervene in individual student writing immediately, as it happens;
2. Control over the quality of student notes;
3. Being able to revisit and re-use workspace contents;
4. Enabling students to learn from one another and to contribute to the class through their writing as well as by talking;
5. Being able to organise collaborative writing, both close focus text construction and parallel writing;
6. Support for collaborative reading of difficult texts: collaborative exploration including both close textual study and scanning and other activities on longer texts;
7. Active, engaged students.

Students in interactive, text-based lessons value:
1. Being recognised individually by the teacher;
2. Getting immediate feedback on their work;
3. Being certain that their lesson notes are correct;
4. Being certain that their lesson notes are the same as those of other students;
5. Being in control of where they work and focus;
6. Working simultaneously with other students;
7. Seeing and interacting with each other's writing;
8. Being active.

Requirements to support text-based teaching and learning tasks

1. Space and navigation
   - Provide navigation aids, so that individuals know where they are, and so that group members can find one another. This also supports awareness.
   - Support the teacher's role as manager of the space. Support for division of an area into columns or tables would be useful. Make it easy for teachers to create individual student working areas, of flexible size.

2. Objects and operations
   - As well as writing and drawing with keyboard and mouse, allow file input of text, WWW material and common graphics file formats. Layout is sometimes a part of meaning in these disciplines, so formats that preserve layout should be supported. Make formats for imported files compatible with web browsers and word processors.
   - Consider providing a facility to hide, or part-hide, objects, which can later be revealed.
   - Provide a flexible way to break text objects into sub-units. Many text-based learning activities involve the re-structuring of pieces of text. A paragraph, for example, may be broken into sentences for an activity that involves sequencing. Another learning activity may require that individual words are manipulated. A further activity may involve constructing a text from smaller units, which may be combined in different ways.
   - Drawing operations are useful to support textual study.

3. Control mechanisms
   - Previous findings about the need for flexible control mechanisms in the shared workspace also apply to interactive text-based teaching and learning. Teachers and students value equality and a workshop atmosphere, rather than a controlling-instructor model.
   - Teachers and students should be able to configure controls over objects, including, ideally, to lock and release individual objects.
• A shared view (WYSIWIS) should be the tool’s default behaviour but this should not be enforced at all times; close focus, separate and mixed focus working (Gutwin et al., 1995) need to be supported.

4. Activity feedback

• Provide for different levels of participant identification. In some situations it may be useful to enable individuals to be distinguished but not immediately identified.
• A means of distinguishing contributions both while they are being created and afterwards, is extremely useful.
• The need for awareness of location has been mentioned under Space and Navigation.

5. Other features

• Provide ways for students to be active and to show participation, other than through writing and drawing. This could include use of shared pointers.
• Take account of paper. Students and teacher may, in addition to the shared workspace, use notebooks, dictionaries and literary and reference texts. It may be appropriate to replace some of these with electronic equivalents that plug into the shared workspace tool but, in that case, the transition from paper to electronic media should be supported. We do not yet know what role hand-held devices will play in the working environment.
• Consider enabling asides (private dialogues) for distributed groups. Support for these is probably more appropriately provided through audio communication than in the shared workspace tool.

8.3.2 Current shared whiteboard tools

The design requirements resulting from this research were used in an evaluation of three shared whiteboard tools that are currently available, and thus might be considered by teachers in higher education. All are shared whiteboards because the research showed that drawing actions were useful for textual study. The three tools were chosen to represent a range of software sources and, in this respect, they are different from the two that were the vehicles for the research. Nte and wb were developed as computer science research tools, although they are now used much more widely, including in educational applications. Their features were described in Chapter Six (section 6.6). Originally, Wbd1 (Figure 8.4), a shared whiteboard from a similar background, was considered for inclusion in the evaluation but it is described by its developers as a "wb clone" and its features are very similar to those of wb. The WebCT2 whiteboard (Figure 8.2) is part of a virtual learning environment (VLE) widely used in higher education. Microsoft's NetMeeting3 whiteboard (Figure 8.1) is freely available, part of a suite of conferencing and communication tools from a major developer. The third whiteboard (Figure 8.3) is linked with a popular text chat tool, mIRC4.

1 Wbd: http://www-inice.cs.ucl.ac.uk/multimedia/software/wbd/
2 WebCT: http://www.webct.com
3 NetMeeting: http://www.microsoft.com
4 mIRC: http://www.mirc.com/
Figure 8.1. Microsoft NetMeeting Whiteboard

Figure 8.2. WebCT Whiteboard

Figure 8.3. mIRC Whiteboard
Each of the tools was tested against the design requirements listed in this section. Testing of each requirement followed the same procedure. An attempt was first made to find out what was possible with each shared workspace tool, by investigating menus, buttons and other features on the interface. This was followed by consultation of the tool's on-line documentation and Help menu to verify and amplify the results. Most of the testing was done by the researcher alone, but colleagues in the Department of Education and Professional Development assisted with the investigation of the extent to which the tool enforces a shared view.

The text restructuring capability was investigated with reference to the activities that teachers had mentioned in the course of the research (section 7.2.3.2: Operations on Objects; section 7.6.2.2: Text Restructuring). An attempt was made to assess how easily teachers could create (1) a gap-filling exercise and (2) an exercise in which a paragraph was first subdivided into separate units - sentences in this case - and then recombined into a single unit again. However, two of the tools offered so little flexibility in their treatment of text objects that testing of the second (subdivide/recombine) exercise was not really possible.

Performance (stability, speed, accuracy) was not evaluated and the outcome of this function check should not be mistaken for software testing or usability evaluation of these tools. The tables below summarise the results of this process and the general conclusion follows.

1. Space and navigation

Type of space:

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A (depends on navigation aids provided)</td>
<td>Single canvas, scrollable vertically and horizontally. Size seems to vary according to user's set-up; 2 instances had co-ordinates 0.0 to 1682.1282 and 0.0 to 1093.838</td>
<td>Separate pages. Each can be scrolled horizontally and vertically.</td>
<td>Single page within mIRC window. Can be resized within this limit. Can be scrolled if necessary.</td>
</tr>
</tbody>
</table>

Navigation aids:

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals know where they are</td>
<td>Very precisely; co-ordinates of user's cursor displayed in box, lower left of window</td>
<td>Page numbers displayed, lower right of window</td>
<td>No.</td>
</tr>
</tbody>
</table>
Navigation aids (continued):

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group members can find one another.</td>
<td>The only mechanism is to ask other participants for their coordinates, and to try to find the place represented by these.</td>
<td>The only mechanism is to ask other participants what page they are on. However, the tool's default behaviour is to enforce the same view and page on all. Can invoke a page sorter which displays thumbnail images of all individual pages.</td>
<td>No mechanism to support this, but the limited size of the whiteboard page may limit navigation problems.</td>
</tr>
</tbody>
</table>

Support for space management:

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division of an area into columns or tables</td>
<td>Can be done manually (drawn) or by importing a table as an image file.</td>
<td>Can be done manually (drawn) or by pasting in an image of a table, from an open file. Attempts to paste a table from a Word document were not successful (If the table was an outline structure only, columns were lost. If the table contained text, separation into cells was lost)</td>
<td>Can be done manually (drawn) or by importing a table as an image file.</td>
</tr>
<tr>
<td>Easy to create individual working areas, of flexible size</td>
<td>Not straightforward. The canvas is large, so individuals can find space in which to work.</td>
<td>Yes. Separate pages can be allocated to individuals. Individuals can add pages before and after the one where they are working. Within a page, can create individual text boxes, or spaces inside a single text box.</td>
<td>No support for this and limited space available.</td>
</tr>
</tbody>
</table>

2. Objects and operations

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing: keyboard entry</td>
<td>Yes – but limited length. No automatic line wrap and does not start new line in response to keystroke. Some choice of font, size and style.</td>
<td>Yes. Must select typing tool and text automatically appears inside a text box. Varied range of fonts, sizes and styles.</td>
<td>Yes – but can not type directly into whiteboard page. Text is entered into dialogue box, after specifying font size in points. Enter keystroke causes it to be displayed in whiteboard but placing is not easy to predict. No automatic line wrap. No choice of font.</td>
</tr>
<tr>
<td>Drawing: mouse or pen</td>
<td>Yes (tested with mouse only).</td>
<td>Yes (tested with mouse only).</td>
<td>Yes (tested with mouse only).</td>
</tr>
<tr>
<td>Drawing: graphics primitives</td>
<td>Straight line, free line, ellipse, rectangle. Can fill and unfill, select colour and line thickness.</td>
<td>Straight line, free line, ellipse, rectangle. Can fill and unfill, select colour and line thickness.</td>
<td>Straight line, free line, ellipse, rectangle. Can fill and unfill, select colour and line thickness.</td>
</tr>
<tr>
<td>File input of texts: Formats compatible with web browsers and word processors</td>
<td>No. Can only load a previously-saved whiteboard file, in its proprietary format.</td>
<td>No – but can paste contents of an open file into whiteboard or into a text box but not open a word processor or html file within the whiteboard. If into text box, can edit but pastes text only, not images. If into whiteboard page, includes pictures but cannot edit. Pasting does not always preserve line breaks.</td>
<td>No. Attempts to paste contents of file pasted only the first line.</td>
</tr>
<tr>
<td>File input of graphics: Common graphics file formats</td>
<td>Yes GIF and JPEG files</td>
<td>No – but can paste a window or an area of screen into the whiteboard.</td>
<td>Yes. Windows bitmap (.bmp) files.</td>
</tr>
</tbody>
</table>
## 2. Objects and operations (continued)

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text restructuring</td>
<td>No. Once created, typed text becomes a single graphical object. Gap-fill exercise can be loaded as an image.</td>
<td>Limited. Text must be entered/pasted into text box to enable editing. Can be edited using word-processor type actions, i.e., cut and paste, rather than drag and drop. Can create re-ordering and gap-filling exercises, either directly in the whiteboard or in a file which is pasted in. No automatic functions to support this, however, and it would be time-consuming. Actions to fill gaps and re-assemble text must be done by cutting and pasting—unless the teacher creating the exercise follows a similar process to that required by nte – create each element as a separate object. Doing so enables drag and drop but there are still spacing problems and the elements remain separate objects.</td>
<td>No. Once created, typed text becomes a single graphical object.</td>
</tr>
<tr>
<td>Hide or part-hide objects</td>
<td>No</td>
<td>No but a participant can deselect &quot;synchronize&quot;, which prevents all other participants from seeing the page s/he is working on.</td>
<td>No but, as part of a chat tool it offers the potential to communicate with selected individuals, rather than all participants.</td>
</tr>
</tbody>
</table>

## 3. Control mechanisms

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible floor control mechanisms</td>
<td>No. Only one participant at a time can make entries in the whiteboard.</td>
<td>Yes. Simultaneous work possible and all objects can be edited by all.</td>
<td>Difficult to assess – concept of floor control not really applicable.</td>
</tr>
<tr>
<td>User can configure control mechanisms</td>
<td>No.</td>
<td>Yes. Lock mechanism can be selected to prevent whiteboard contents from being modified. No.</td>
<td>No – but user does have some control over who can see the whiteboard. Objects cannot be edited by anyone, once created.</td>
</tr>
<tr>
<td>At object level (e.g., lock/unlock objects)</td>
<td>N/A</td>
<td>Yes.</td>
<td>N/A (single page canvas)</td>
</tr>
<tr>
<td>WYSIWIS as default</td>
<td>N/A (single page canvas)</td>
<td>Yes.</td>
<td>N/A (single page canvas)</td>
</tr>
<tr>
<td>Page-change</td>
<td>No</td>
<td>Yes.</td>
<td>No</td>
</tr>
<tr>
<td>Scroll</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Re-size</td>
<td>No</td>
<td>Yes.</td>
<td>No</td>
</tr>
<tr>
<td>Can be over-ridden</td>
<td>N/A</td>
<td>Yes. Individuals can de-select &quot;Synchronize&quot; to stop others seeing the page they are working on.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

## 4. Activity feedback

Awareness of location:

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals know where they are</td>
<td>See Space and Navigation</td>
<td>See Space and Navigation</td>
<td>See Space and Navigation</td>
</tr>
<tr>
<td>Group members can find one another.</td>
<td>See Space and Navigation</td>
<td>See Space and Navigation</td>
<td>See Space and Navigation</td>
</tr>
</tbody>
</table>
Participant and activity identification:

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinguish contributions while being made</td>
<td>Colours can be used.</td>
<td>Colours can be used.</td>
<td>Colours can be used.</td>
</tr>
<tr>
<td>Distinguish contributions after they have been made</td>
<td>Colours can be used.</td>
<td>Colours can be used.</td>
<td>Colours can be used.</td>
</tr>
</tbody>
</table>

5. Other features

<table>
<thead>
<tr>
<th>TARGET</th>
<th>WebCT</th>
<th>MS NetMeeting</th>
<th>mIRC Whiteboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save workspace contents In editable format</td>
<td>Yes. No. Only in proprietary WebCT whiteboard format, which can be re-imported.</td>
<td>Yes. No. Only in proprietary format, as whiteboard file. Can be re-imported.</td>
<td>Yes – has a Save function No – bitmap. Should be possible to re-load as an image.</td>
</tr>
<tr>
<td>Print workspace contents</td>
<td>No.</td>
<td>Yes.</td>
<td>If previously saved as a bitmap, via another application.</td>
</tr>
<tr>
<td>Ways for students to show participation</td>
<td>No.</td>
<td>Shared pointer (hand icon) can be selected and is displayed, in the user’s current colour, on all screens until cancelled. Highlighter can be selected.</td>
<td>No</td>
</tr>
<tr>
<td>Possible paper replacements (notemaking and reference tools)</td>
<td>Part of a virtual learning environment (VLE) which has notemaking and glossary tools.</td>
<td>Not included.</td>
<td>Not included.</td>
</tr>
<tr>
<td>Provision for asides (part-shared communication)</td>
<td>No but could be operated alongside WebCT’s chat tool.</td>
<td>Audio channel available in NetMeeting.</td>
<td>Text chat channel allows users to select those with whom they will communicate.</td>
</tr>
</tbody>
</table>

It is clear that none of these tools provides the support that this research has shown to be needed, although NetMeeting has more of the necessary features than the other two. All the tools would be of use to support the viewing and discussion of an object but none would support the interactive work on texts that has been the subject of the research. This is largely because of the limited range of operations that can be carried out on text objects; the findings related to Objects and Operations may therefore be of particular use to designers of future shared workspace tools to support text-based teaching and learning. Commercial multicast conferencing tools are now on the horizon, offering new opportunities in education - provided that their design supports what teachers and students, on real courses, need.

8.4 Contribution to Teaching and Learning

The research has shown that a shared workspace tool can enhance teaching and learning in text-based disciplines. In distance learning it can enable activities that could not be supported in any other way. For co-located groups, it offers new opportunities. The research has shown why a shared workspace tool is useful in this teaching and learning context. Recommendations can now be made to teachers about the use of shared workspace tools. Benefits for text-based teaching and learning will be maximised by following these. The recommendations are useful because:

- They cover not only information about activities and teaching strategies but information about the nature of the tool, so that it can be compared with other computer-based communication tools and used where it best supports the learning objectives.
- They are grounded in observation of the tool’s use in real courses, over an extended period of time, by nine different teachers and more than 80 students. All the field trials were in foreign language
classes but, as stated in Chapter Four (section 4.3.5), the courses studied were sufficiently wide-ranging as to make the findings generalise to other disciplines that deal with reading and writing texts, and with the study and development of written and/or spoken language. The fact that so many activities observed in English and Spanish lessons could be described similarly (Chapter Five, section 5.3.3) lends support to this.

8.4.1 Recommendations to teachers

1. Teachers need to understand the nature of the shared workspace tool in order to make decisions about how to use it. As stated in Chapter One, a shared workspace is:
   - A tool to support two or more people working together;
   - A sketching tool;
   - A tool to support synchronous group working.

The attributes that benefit teaching and learning, in text-based disciplines, are:

- **Sharing**: the teacher can always see what the students are writing. This means that the teacher can intervene instantly, and provide immediate feedback and correction to individuals, not just general feedback to the whole group. It enables teachers to give the appearance of interacting simultaneously with a number of students. The students can see each other’s work, which enables them to learn from one another and to interact easily with one another’s writing. Learning activities should capitalise on this. The students are also aware of other students working alongside them, which may contribute to motivation and a sense of shared endeavour (Whitelock *et al.*, 1995).

- **Persistence**: whatever kind of language students use, it can be revisited at any time during the lesson. It can be discussed. Changes can be made to it. This supports the public review of all students' writing done during a lesson. Saving the contents of the shared workspace at the end of the lesson expands the possibilities. The teacher can edit the work, prior to distribution to students. It is also possible to re-use student work, in a later lesson, which expands the possibilities for student interaction. The fact that entries in the shared workspace are persistent also supports the provision of memos and reference material in the shared space.

- **Accessibility**: A shared workspace is equally accessible to students and teacher, unlike a classroom whiteboard. This is one factor that helps to create a workshop atmosphere and perhaps change the role of the teacher. The teacher can be a partner in students' writing. Students, when working on individual computers, can control their own movement in the space and this may promote their sense of being in control of their own learning.

- **Manipulation**: A shared workspace is a tool for activity, not just display. A shared pointer, and drawing actions, give students new opportunities for active participation. Physically moving objects is engaging and fun for students. Teachers should encourage the use of drawing and explore ways to give students a sense of being active.

Making the most of the attributes of shared workspace tools means changing some ways of working. For instance, all the students can see each other's writing at all times. When they are working simultaneously, it may not be effective to give them all the same writing task, as is commonly done using traditional classroom equipment.
Teachers may well want to begin by using some learning tasks that were originally paper-based. However, as they move beyond "translating" activity from paper to computer, it is important to consider how best to exploit the attributes of the shared workspace. The shared workspace offers something different from what is offered by other tools that might appear similar, such as text chat tools or electronic whiteboard products. Teachers might find it helpful to consider the differences:

- **Text chat tools**: These are synchronous communication tools but they do not offer space. More explicit reference is needed in conversation than when using a shared workspace tool. For instance, in a shared workspace, a single word, "Yes?" can be placed next to the item to which it refers, which is more economical, and perhaps closer to spoken conversation, than when the item has to be referred to explicitly. If a shared whiteboard is used, drawing operations can enrich expression. Another difference is that text chat tools do not try to guarantee that everyone sees the same thing at the same time. Finally, although it is possible to save the results of a chat session, no manipulation or editing can be done during the session.

- **E-mail**: E-mail offers communication at a distance, using one of the most widely available and long-established Internet tools — but it does not offer synchronous communication. Asynchronous communication is particularly useful for collaborating across time zones or to accommodate different institutional timetables. Organised as a mailing list or bulletin board, e-mail can be shared and revisited. E-mail offers time to think about content, structure and language, rather than quick-fire exchanges. It also offers the chance to draft in private before sharing the results, unlike a shared workspace. Explicit reference to previous messages is needed to make meaning clear so, again, dialogues will be probably further removed from spoken conversation than those in a shared workspace.

- **Electronic whiteboard products**: These large display surfaces support application sharing and hence a wide range of useful teaching and learning activities. However, they do not offer students individual control. Unlike a computer-based shared workspace tool, the view is controlled by one person, probably the teacher, and the same view is always shared by all participants. Individual students have less control than with a computer-based shared workspace tool. Switches between individual, whole class and subgroup activity may be less easy to support.

- **Word processors and drawing packages**: These products offer a very sophisticated range of functions and features, to support the production of a polished end product. Experience of such tools should make a shared editor or whiteboard easy to learn but these are tools to support individual work or asynchronous co-authoring activities. Shared whiteboards and editors support short periods of synchronous collaboration, suited to sketching, drafting and planning rather than the production of finished products.

2. **The teacher’s role when using a shared workspace**

The teacher’s role, when using a shared workspace during a lesson, can involve monitoring, checking, correcting, consulting, co-authoring, prompting and managing. Outside lessons, preparation and follow-up...
up may be time-consuming, but the facility, which a shared workspace offers, to save and re-use files can also save some time.

3. The students' experience of using a shared workspace
Students value individual interaction with the teacher, their own work being recognised, immediate feedback, awareness that others are working simultaneously with them, including the teacher, seeing each other's writing, dialogue with one another. All these are supported by the shared workspace. The teacher should also be aware that some students feel anxious that all their writing is in public view. Finally, sharing computers reduces students' individual control and thus does not help learning.

8.5 Contributions to CSCW Research
This section refers back to the review of the literature (Chapter Three), in order to determine what is known now that was absent from the CSCW literature. The thesis adds to knowledge in three of the categories used to analyse the literature (section 3.2, Table 3.1): about design functions and features, about a shared workspace as communication medium and about working in groups with a shared workspace tool.

8.5.1 Function and features
This research confirmed that some previous research findings also applied to text-based teaching and learning. It has confirmed the need for flexible control mechanisms, configurable by users. It has shown that these are needed in this application area (a) in order to encourage a workshop atmosphere, in which teacher and students have a sense of being partners and (b) to support students' learning from one another and interacting with one another's writing. It has confirmed previous findings about the need for awareness in the shared workspace and underlined the need, in text-based study, to support navigation in long documents. It has shown the usefulness of drawing operations in text-based subjects. It showed that the application area has specific requirements for text and imported files. It has generated new information about the need to conceal objects and about the need for flexible text-restructuring, in order to support learning activities. It showed the use that teachers and students can make of saved workspace content. User-selection of colours, and a shared pointer were shown to have uses specific to this context – as semi-anonymous "identifiers" and to promote active participation, respectively. However, it has not shown that a shared pointer is the best way to encourage students to be active; further investigation of mechanisms to encourage this could be undertaken. Related to this is a possible tension between what teachers and students value in lessons. Although in focus groups and questionnaire responses, several students did describe their lessons with a shared workspace as "fun", having fun in lessons did not emerge as being one of the students' priorities. All the teachers, however, considered the "playful", "play" and "fun" aspects of the shared workspace as extremely positive. This is an area that might also be the subject of further investigation.

The question of whether private student-teacher dialogues were needed (see 8.2) drove the decision to video record the lessons, in Trial 3. The video recordings enabled instances of private teacher-student interaction to be identified but anyone wishing to undertake a more fine-grained analysis of classroom interactions, using the same recordings, would be advised to focus on one or two participants.
8.5.2 Communication media

As a medium for interactive, text-based teaching and learning, the persistence of the shared workspace data is important (sections 7.3 and 7.6). The shared workspace tools were also able to perform as communication channels in order to (a) post messages and (b) replace the video channel, when clarity of image was more important than movement.

The research also showed that paper was still used, in both the distributed and co-located classes. The shared workspace tools did not replace the student notebook or reference tools, such as dictionaries. In Trials 1 and 2, text books were sometimes used, although teachers agreed that, in the longer term, a bank of electronic materials would replace these. Students generally continued to make notes on paper, although this was awkward for the distributed students. Designers can rely on the findings as a basis for providing some plug-in support tools, such as dictionaries and grammar reference tools. One can only speculate about how the role of paper will change over time. Further investigation of this would be worthwhile. It should consider not only desktop computers but also the role of hand-held devices, which is already of great interest (Sharples, 2000; Sharples, forthcoming).

8.5.3 Working in groups

The shared workspace tools were seen to support groups of about ten people, working face-to-face, and up to five in a distributed class. Using the shared workspace had an impact on the working process in both distributed and co-located classes. As has been observed previously (Hearnshaw, 1999a), distributed groups found sessions intense and tiring, and reported high levels of concentration. Students in the co-located classes tended to think that using the shared workspace reduced the amount of talk between them. Students also perceived use of the shared workspace to increase levels of individual interaction between themselves and the teacher. There was some evidence that they were also more conscious of others working alongside them than if they had been writing on paper. This might, as Whitelock & Scanlon (1995) showed, increase their persistence and motivation.

The research has also shown what the tutor's role involves, when working with students in these courses (section 8.3).

8.5.4 Additional methodological contributions

The work of teachers is complex and can be illuminated by research methods used to study other fields of work. Teachers are concerned about their students' learning and about their enjoyment of the experience. Teachers and students in these disciplines value similar lesson qualities. Supporting a teacher's complex role in interactive text-based study can improve the student experience.

Existing frameworks for describing activity in shared workspaces do not account fully for group interactions that involve both a teacher and students as active participants. Such frameworks tend to generalise about "group members" or "participants". Some leave room for differing roles but not for differing jobs – which is closer to the situation for teachers and students, despite their shared goals. Existing frameworks also tend show the shared workspace as the only working area. In this teaching and learning context, paper is still an important tool. Future work should examine its role, not just assume that it should be replaced. As stated already, the implications of recent research (e.g. Sharples, forthcoming) into the use of hand-held devices should be considered in this context.
Insights that would not have arisen in laboratory studies resulted from the use of field trials for the research. The need to re-use student work only arises when one lesson builds on another, as part of a course. Only in a real course does it matter what students take away from lessons; or how one element reinforces others. The implications of sharing have emerged as important and complex in this application area and some of these could not have been explored in depth without extended study in a real teaching and learning context. The real working context also provided motivation for the teachers, especially in Trial 3, to explore use of the shared workspace.

In every one of the trials, what happened in the lessons was governed by teachers and students, not the research agenda. Assessment of learning quality has been done by experts in the field. The result is that findings are firmly grounded in the real work of teachers and students. It is rare to use extended trials, including a longitudinal study, in order to capture design requirements for synchronous groupware tools. The fact that new design requirements were seen to emerge after teachers had been working with the new technology for a long time, is seen as validating this choice.

Using participatory methods involved teachers and students in the research. The use of a prototype excited the participating teachers and prompted them to explore. These methods have also suggested how to communicate the research findings. Another strength of the approach was that, especially in Trial 3, it was possible to share results of observation, questionnaires and focus groups with the teachers and confirm that findings had validity in their terms, as well as to the researcher.

Some light has also been thrown on the process of teacher-researcher collaboration, which might be followed up in a further study. It was only in the second year of Trial 3 that the teacher assumed ownership of the research, as well as the teaching; it is likely that an observer would see the researcher gradually adopting a greater sense of ownership of the teaching. Finally, it is believed that the length and nature of the trials will carry conviction when information about shared workspace tools is communicated to teachers.

### 8.6 Building on this Research

It would be possible to build on this research in a number of ways. Some have been mentioned already (8.5.1). The following suggestions have been selected to give an indication of the possibilities:

#### 8.6.1 Seeing, and being seen, in electronic learning environments

Two of the studies reported here suggested that students were conscious of, if not worried by, the constantly public nature of interactions in the shared electronic environment. The EFL students had a sense of being in "a live show" (Appendix 6). For some of the Russian students, the fact that all their writing was in view of others caused anxiety. Yet, for the participating teachers, this ability to see what the students were doing at all times, was seen as a big advantage. Students, too, saw some aspects of writing in public view as very positive.

Electronic environments create many opportunities for observing others. It is therefore not surprising that privacy is a hot research topic (see, for example, Adams & Sasse, 2001), or that legislation now offers

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6 Enabling teachers to overhear students has long been considered an advantage; language laboratories offered this but did not enable the simultaneous monitoring of a whole group of students.
some protection against violation of privacy in electronic environments. Problems in this area need to be resolved through policy as well as design and implementation of software. Privacy is also an important issue with respect to learning environments, and, as this research has shown, the student and teacher viewpoints may differ.

The research would investigate the implications and effects of *seeing, and being seen*, in both synchronous learning environments, using a shared workspace tool, and asynchronous learning and assessment environments, which record student performance and behaviour. It would:

- Probe attitudes (of teachers and students);
- Observe behaviour;
- Assess the implications and make recommendations about how to achieve desirable effects without undesirable consequences.

### 8.6.2 Computer-support for collaborative reading

There is a large body of research into computer support for collaborative writing and co-authoring but collaborative reading has received less attention. Reading collaboratively, with computer support, has been considered in relation to very young children, who are learning to read, and also in relation to recreational or life-long learning, though the development of reading groups. However, throughout educational life there is a need for students to grasp the meaning of difficult texts and to learn through reading. A shared workspace tool might well play a useful part in supporting students' development of strategies for reading difficult texts. The project could well be a cross-disciplinary study. Such a project might:

- Investigate the reading demands of two or more subject disciplines. This investigation would include objective information, from reading lists, for instance, objective assessment of reading difficulty, using expert assessors and/or established instruments for measuring reading difficulty and subjective teacher and student accounts of the reading requirements for their courses.
- Identify key reading texts in the target disciplines.
- Review recommended reading strategies, including collaborative activities to explore texts.
- Review existing computer support for reading, including interactive tutors.
- Design and implement studies to evaluate the capacity of a shared workspace (and other tools, depending on the project's scope) to support student development of collaborative reading as a learning tool.

### 8.6.3 Comparing language use in shared text editor and text chat tool.

Text editors and chat tools have been compared elsewhere for their capacity to support grounding (Dillenbourg & Traum, 1999). This research has suggested that, despite some similarities between text chat tools and shared workspaces, students using a shared workspace tool can communicate more economically and perhaps more conversationally, with a shared workspace than with a text chat tool, because they can use location in space and, in the case of a shared whiteboard, drawing actions. A controlled study, perhaps in a language learning context, could examine differences in language and dialogue when text chat and shared editor are used.
8.6.4 Other ideas

Other possible extensions of the work described here include:

1. **Re-use of student dialogues**: Trial 3, in the *Written Russian* class, showed the re-use of one group's writing as material for another group to study and interact with (section 7.6.1.3). A small study is suggested, to contribute to the growing body of knowledge about *vicarious learning*.

2. **Re-visiting the data collected for this research**: Possible tensions between student and teacher attitudes have been suggested by this research. These might be explored through discourse analysis of the teacher and student talk. Another exploration would be to look again at the data using Activity Theory, in order to find out whether this could offer new insights (see Chapter Four, section 4.4). This is envisaged as a study that would look particularly at the Trial 3 data and consider the effect of the context and changes over time.

3. **Using a shared workspace tool to support the teaching of very advanced language learners**. A university language teacher was asked to comment critically on the list of contributions a shared workspace could make to teaching and learning. The response was that all the list items were of value, some of them particularly so at different stages in language learning. Singled out for particular attention was the fact that the tool seemed to offer support that is very difficult to provide in a classroom: the potential to monitor the progress and identify the difficulties of very advanced language learners. This is envisaged as research, in which a language teacher would collaborate, to investigate the potential of a shared workspace in this context.
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APPENDICES
## APPENDIX 2.1 - VDML Student Survey: Degree Programmes of Students

### A.7 What subject(s) are you studying (Main)?

<table>
<thead>
<tr>
<th>Subject</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scandinavian Studies</td>
<td>8.7</td>
</tr>
<tr>
<td>Combined Languages</td>
<td>6.6</td>
</tr>
<tr>
<td>French and Spanish</td>
<td>6.0</td>
</tr>
<tr>
<td>French</td>
<td>6.0</td>
</tr>
<tr>
<td>Modern European Languages and European Union</td>
<td>5.8</td>
</tr>
<tr>
<td>Scandinavian Studies with Management</td>
<td>4.7</td>
</tr>
<tr>
<td>Modern European Studies</td>
<td>4.5</td>
</tr>
<tr>
<td>German</td>
<td>3.9</td>
</tr>
<tr>
<td>Dutch</td>
<td>3.4</td>
</tr>
<tr>
<td>French and German</td>
<td>2.6</td>
</tr>
<tr>
<td>French and Business Studies</td>
<td>2.4</td>
</tr>
<tr>
<td>Scandinavian Studies with Management</td>
<td>2.1</td>
</tr>
<tr>
<td>German and Scandinavian Studies</td>
<td>1.8</td>
</tr>
<tr>
<td>Spanish and Portuguese</td>
<td>1.6</td>
</tr>
<tr>
<td>Dutch and German</td>
<td>1.6</td>
</tr>
<tr>
<td>English</td>
<td>1.3</td>
</tr>
<tr>
<td>French and Dutch Studies</td>
<td>1.3</td>
</tr>
<tr>
<td>French and Law</td>
<td>1.3</td>
</tr>
<tr>
<td>French and European History</td>
<td>1.3</td>
</tr>
<tr>
<td>German with Management Studies</td>
<td>1.3</td>
</tr>
<tr>
<td>English and French</td>
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</tr>
<tr>
<td>German and Swedish</td>
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</tr>
<tr>
<td>German and Italian</td>
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<tr>
<td>Dutch with Management Studies</td>
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<td>Norwegian</td>
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</tr>
<tr>
<td>Jewish Studies/History</td>
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<tr>
<td>French and Danish</td>
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<td>French and Scandinavian Studies</td>
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<tr>
<td>French and Philosophy</td>
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<td>Viking Studies</td>
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<td>Scandinavian Studies and Swedish</td>
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<td>Spanish and Italian</td>
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<td>Spanish and Arabic</td>
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<tr>
<td>Swedish and Finnish</td>
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<tr>
<td>Polish and History</td>
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<tr>
<td>Hebrew and Politics</td>
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<tr>
<td>Hebrew and Social Anthropology</td>
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<tr>
<td>Hebrew and Arabic</td>
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<td>Swedish and Psychology</td>
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<td>French, Maths and Chemistry</td>
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<td>German, Czech and Slovak</td>
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APPENDIX 2.2 — VDML Survey: Computer Applications Used by Language Students, in Addition to E-mail, Web Browser, Word Processor.

B.1 Other applications mentioned

<table>
<thead>
<tr>
<th>Application</th>
<th>Percent</th>
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</thead>
<tbody>
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<td>Merlin</td>
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</tr>
<tr>
<td>French language learning programme</td>
<td>2.4</td>
</tr>
<tr>
<td>Transit Tiger</td>
<td>1.3</td>
</tr>
<tr>
<td>German and Swedish language exercises</td>
<td>.8</td>
</tr>
<tr>
<td>Photoshop</td>
<td>.8</td>
</tr>
<tr>
<td>CALL (Swedish)</td>
<td>.8</td>
</tr>
<tr>
<td>CALL</td>
<td>.8</td>
</tr>
<tr>
<td>KCCALL?</td>
<td>.8</td>
</tr>
<tr>
<td>Pagemaker</td>
<td>.5</td>
</tr>
<tr>
<td>Director</td>
<td>.5</td>
</tr>
<tr>
<td>Microsoft project</td>
<td>.5</td>
</tr>
<tr>
<td>Danish CD Rom</td>
<td>.5</td>
</tr>
<tr>
<td>Encyclopaedic dictionaries eg Langenscheidt</td>
<td>.5</td>
</tr>
<tr>
<td>Transit and CALL</td>
<td>.5</td>
</tr>
<tr>
<td>First Class and Danish for Ducklings</td>
<td>.5</td>
</tr>
<tr>
<td>Linux applications</td>
<td>.3</td>
</tr>
<tr>
<td>Chinese characters dictionary</td>
<td>.3</td>
</tr>
<tr>
<td>Gramex and Luisa (Italian)</td>
<td>.3</td>
</tr>
<tr>
<td>First Class</td>
<td>.3</td>
</tr>
<tr>
<td>Danish for Ducklings</td>
<td>.3</td>
</tr>
<tr>
<td>Ruslan (Russian)</td>
<td>.3</td>
</tr>
<tr>
<td>Grammar exercises to NY I Norge</td>
<td>.3</td>
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APPENDIX 2.3 - Interview with Open University Arts student

This was a semi-structured interview. It was recorded using a digital audio recorder and transcribed by the interviewer. The subject was sent, by e-mail, about 2 hours before the interview, a list of areas that would be covered. This was because she was to be asked about the past and it was felt that recollection would be fuller if she were given some time to think about the questions before the interview. At the start of the interview, she was given the actual questions, shown below.

Questions for Interview

Thank you for agreeing to the interview. If you agree, the interview will be recorded on audio tape. This is to ensure that an accurate record is available for reference. What you say will be used only for the purpose of research and you will not be referred to by name in any publication or presentation of the research findings.

1. Please could you explain briefly the nature of the course you were taking?
2. What study materials did you use and in what form(s)?
3. Were these materials used on your own or with other people?
4. When you did communicate with other people:
   • With whom did you communicate?
   • For what purpose?
   • Through what medium?
   • How important was this communication for your success on the course?
5. In your opinion, was there enough opportunity for interpersonal communication on the course?
6. Do you have any other comments related to the questions we have discussed?

Transcript of interview

Thursday 6th Sept 2001

I= Interviewer (JH)
S=Subject (former OU student)

I: What was the course we are going to be referring to?

S: OK. This was a 60-credit module, at 3rd Honours level, which was part of an Arts degree at the OU. The particular Module was in Literature in English. As far as I can remember, it was confined to the 20th C.

I: Next – get a picture of the whole course. Presumably a lot of it was individual study?

S: Yes, it was by and large individual study. The whole thing is set out for individual

I: What materials did you use and in what form. You know, book texts, what else?

S: Just before the course started, in Feb. of that year, a parcel arrived which contained probably a dozen course books, relating to each aspect of the course. These acted as a tutor. There might have been some texts that arrived as well but I bought texts – poetry, drama …. To supplement the course books. Also some video tapes came – of various works of literature. They also had some commentaries on various aspects of theory, and interviews and I think there were some audio tapes as well as video tapes.
As far as study materials, taking that on a bit further there were also regular TV broadcasts and some on radio. I suppose I should include the one-week summer school?

I: Yes – but perhaps we should talk about the summer school separately, since that’s a part of the course where you were working with other people, presumably. So... everything arrived by post. Could you then be completely self-sufficient? Was this package with the addition of the bought texts you bought sufficient to do the course?

S: Yes, that was all the basic stuff you needed. You needed to have a television in order to listen to the broadcasts. But that was everything and if you didn’t have any interaction with anyone else, you could complete everything.

I: OK. What was on the tapes. Was it lectures?

S: The video tapes?

I: Yes.

S: There were some plays. Endgame was one, which was very boring.

I: So. Dramatisation of the texts.

S: Yes. Usually, they would put the dramatisation first and then there would be some sort of discussion between actors and directors and anybody else.

I: How did the audio tapes differ from the video.

S: I remember, not for this course, but for another one, there were Shakespearean dramatisations. And discussions with people involved in literature from other universities, talking about points of theory, hoping to get points of theory across to us.

I: I know you said the course books act as tutor. By that do you mean they suggest what you should do in what order, they guide ...

S: They guide you through. Because when you start you’re not sure what you’re doing. You’ve got a book, a text book, maybe something like Dickens in front of you, although that’s not 20th Century, you’re not quite sure what to do with it and you have to be guided to reading the things through and what you’re looking for and then you’re guided through looking for the references – say, for example, to Englishness or End of Empire, colonialism – in place of having a lecture, having regular seminars, which you would have at a conventional university.

I: When you were working through activities in the course book, was there any way of testing yourself, or could you get feedback? For instance, if you were looking for references to Empire, as you were suggesting, was there any place where you could find out whether you’d found the key ones, or ...

S: I think there probably was quite a lot of guidance in the course tutors. It probably wouldn’t be quite as straightforward as saying, Now look for this!

And at the end of giving you something to work on there would be a couple of paragraphs of illustrations on this point.

I: All of these materials, did you use them on your own, or were any of those studied with other people?

S: I think they were, by and large... I used them on my own. Occasionally I met friends, other students, or we would have tutorial sessions and discuss them. There were tutorial sessions and Saturday (?) school. They were not compulsory. If you wanted to attend them you went.

I: Were they local? I mean were they face-to-face tutorials?
S: They were tutorials in that they were the tutor plus one or many students. They weren't individual tutorials. They were divided up into regional centres and you go to the one that is most convenient to you. You would go to the local centre and usually, the tutor who marked your assignments would be the person to lead the tutorial, so that's one way of having actual face-to-face interaction with the person who marks your work. I thought they were a good idea?

I: So did you go to them?

S: I went to most of them. With this particular course, I came to a point where I had so much reading to do, so much work, so many essays to get in, that I decided it wasn’t worth taking that time out. So I didn’t go to them all.

I: OK. We've started looking at the next question, which is about when you communicated with other people. This is a fairly factual thing. If you can try to think of all of them. You’ve mentioned a tutor. This was face-to-face {Yes} and there was face-to-face contact with other students. What else, in terms of communication with people, related to the course … whether it's course admin or study?

S: The OU is divided into regional centres and there’s always a regional centre with an answering service, or someone answering the phone, who can direct you to the person who can help you.

I: Was the phone the main medium of communication with people who were at a distance? When you were contacting a tutor or someone at the OU?

S: Yes, I think so. It’s slightly more immediate than e-mail, which … if you’re having a problem, you’re not very good at explaining what the problem is, it’s very difficult to put that into an e-mail.

I: OK

S: Especially when you want the same points re-iterated three of four times.

I: OK so you’re saying speech is better than e-mail?

S: I think in some instances, definitely, unless you’re asking for a specific answer rather than an interpretation.

I: Yes. Did you use e-mail at all?

S: Yes.

I: And what sort of communications was that used for?

S: That was just for occasional communications with my tutor, say, can I have an extra two days to complete this essay, if I’ve got problems. She also set up - well she took details from interested people - and she set up an e-mail circulation list … and that works up to a point but people really haven't got the time to do that.

I: When you say, “circulation list” does that mean you would discuss topics of interest related to the course?

S: Yes.

I: OK. So basically, e-mail was used for organisation and negotiation plus there was this list which you didn’t use particularly because it was time-consuming.

S: No. That’s right. I used to phone a couple of people I knew quite well, who were also on the course – these were students – that was probably more effective than e-mail.
I: OK. You said earlier, the pack that was delivered was everything you needed. Do you think ..um .. the question I've got written is "How important was communication with people for your success on the course. Do you think ..

S: Yes.

I: You think it was?

S: I think it was absolutely vital, otherwise it would have .. there's a huge tendency to feel totally isolated, and also you can go through nine months of the course thinking you're going the right way and then suddenly discover you haven't quite got the right idea about one particular point .. If you can bounce ideas off somebody else, hopefully off a lot of other people, you can get some idea of perhaps where you should be heading.

I: Right, and I said .. We mentioned summer schools before. Did you attend one every year?

S: No. There isn't one for every course but there was a whole week for this one, which was a very very useful experience, for a number of reasons, and I think the main one was because I would have thought that almost everyone studying at the open university has got a lot of responsibilities at home and at work, so this week is a very special week when you can leave all those responsibilities at home and just concentrate on yourself and learning.

I: I hadn't really thought of it as having that purpose, but I can imagine ..

S: Definitely, because everything is done for you. You have a room provided, you have your meals cooked, the beer is cheap in the student bar and you leave off .. when you leave home, when you arrive there, you leave all your old preconceptions and inhibitions behind and you become yourself.

I: Yes. Do you think the social side of it is as important as .. you mentioned two things, one's the beer in the bar and .. the other things .. do you think that's as important as the..?

S: I think so, yes, because I think when you're sitting talking in the bar you're also discussing the course. You're meeting people you probably have never met before, you never will see again, you're there for a specific purpose, which is to further your studies, So you just make the fullest attempt to get everything out of it ..OK, it's a bit superficial, drinking in the bar, but it's a way of talking to a larger number of people. Because you tend to be kept at the summer school within a small group of people. There are lots of small groups.

I: So you're formed into working groups?

S: Yes.

I: And do they structure your working together? Did you feel that tasks were given to you that were designed to make you talk and work together?

S: Oh, yes. It wasn't just all lecture-type presentations, there was a lot of interactive stuff there. Because it was a literature course, we did all sorts of things, such as we produced small segments of plays that we'd studied. We worked together on a lot of things and something like, I think, drama and poetry particularly need to be given a presentation. I think you get a totally different view from reading them from the book.

I: Yes, in fact that's an important, discipline-specific thing, isn't it. In fact I'm going to write that down, just to remind myself to bring it out. OK. That's all the main questions that I wanted to cover, except I put a final question: do you have anything else to say, do you have any other comments, related to what we've discussed, that you think I should have asked you about

S: I think the idea of interpersonal communication is quite important and I'm sure that probably in different circumstances a lot of people would have preferred to have gone to conventional universities,
where they could have had a lot of, well, further communication with fellow students and so on. But I do have to stress that people are at the Open University because that time is not available to them and so that part of it is not quite as obvious as in other contexts.

I: Yes. OK. Thanks very much. I appreciate your help and I will stop the recorder.
APPENDIX 2.4 – JISCMAIL Teaching & Learning Lists Searched

1. CLASSICS-TEACHING
   This list is intended to provide a forum for classicists wishing to discuss the development of learning and teaching in their subject, as part of the work of the LTSN Subject Centre in History, Classics and Archaeology.

2. Distance and Open Learning (0)
   TLTP (The Subject Centre will promote high quality in the learning and teaching of ADC in HE by enabling knowledge exchange, innovation and enterprise.

3. DISTANCELEARN-LANG
   The list discusses language issues in Distance Education. It covers language teaching, language teacher education and general areas (e.g. intercultural communication). It works from a broad definition of DE (i.e. managed DE courses, educational broadcasting and technologies).

4. DISTANCELEARN-RESEARCH
   This list is a forum for the wider discussion of research in distance learning, from a wide range of theoretical perspectives, as well as practical, technical and administrative issues. The list is eclectic in scope and actively welcomes contributions.

5. DELIBERATIONS-FORUM
   Deliberations is an interactive, electronic web-based resource on teaching and learning in higher education. The deliberations-forum list acts as a platform for the higher education community to discuss a wide range of issues on teaching and learning and to disseminate, request and share relevant information.

6. ED-ARCH-UK
   A discussion group for teachers of archaeology in HE, FE and schools. It will: share information discuss teaching and learning, link FE and HE to assist guidance, co-ordinate training events and conferences. Key words teaching archaeology studying archaeology A Level archaeology

7. ED-HIST-UK
   A discussion group for those engaged in teaching, researching and teacher training in History post-It focuses on sharing good practice and information. Keys: History Teaching A level Undergraduate History

8. ESCALATE
   Discussion list for the LTSN Subject Centre for Education; will include academic and academically related staff in Education, Continuing Education & staff development centres in the UK.

9. FLEXIBLE-LEARNING
   This list has been established to provide a network for staff in higher education who are involved in flexible learning developments. We hope it will facilitate the building of contacts between practitioners by encouraging the free exchange of information, direct communication and group discussion.

10. ICT MA
    A discussion list to support collaborative research and development for distance learning resources support work on ICT, language, culture and education at Masters level.

11. ILT-GENERAL
    The Institute for Learning and Teaching in Higher Education is a membership organisation aiming to enhance the professional status of teaching and learning support and encourage innovation in higher education. This list exists to promote and foster discussion of the ILT and related issues.

12. ITIL
    Discussions relating to computer, IT, technological and information literacy issues in HE/FE.

13. ITE-OLE-PROJECT
    This list is a forum for members of the OLE project and other interested teacher educators. This project is about the development of Open Learning and Distance Teaching in Initial Teacher Education [ITE] to Promote the European Dimension.

14. JISC-MLE
    An open discussion list to support educational institutions in issues regarding implementation of VLEs and MLEs
15. JISC-RSC-NW-TECHNICAL
The aim of this group is to promote collaboration between Northwest FE technical Practitioners involved/interested in online learning. This may include Network Managers, technicians, ILT Managers and National ILT associations.

16. JISC-TSW
The aim of Technology and Standards Watch is to keep track of developments in information technology and communications that can be expected to have high impact on the core business of Further and Higher Education in the next few years.

17. LANGUAGES
A discussion list for those in the HE community interested in the learning and teaching of languages

18. LEARNLING
A discussion list for those in the HE community interested in the learning and teaching of linguistics

19. LIS-OLF-ELRG
List for Open Learning Foundation: Electronic Learning Resource Group to discuss aspects of electronic learning resource use & development for on camp us and distance learners, to identify good practice and to establish standards through national and international research or collaborative projects.

20. LLAS-ADVISORY
This list will be a closed list for the members of the Advisory Board for the Subject Centre for Languages, Linguistics and Area Studies. The Director of the Subject Centre, the Centre Manager and the Academic Coordinators are also members of the list

21. LTSN-GENERIC-CENTRE
A discussion and information network for those staff involved with educational development in HE. This include L&T co-ordinators, staff developers, educational grant holders, LTSN contacts, curriculum developers, learning technologists and individuals who take on such roles without title or recognition.

22. LTSN-ICS-MULTIMEDIA
A list for the cross fertilisation of ideas between the LTSN Centre for Information and Computing Sciences and the Centre for Art, Design and Communication.

23. MALT
This list is intended to facilitate discussion between individuals involved in the design and operation of higher degree courses on Learning and Teaching in Higher Education.

24. MEDIA-GROUPWORK-ASSESSMENT
This list aims to discuss problems surrounding the assessment of group working in media production, especially where students work collaboratively on projects or artefacts.

25. ONLINE-EVALUATION
List will be used to get feedback from subject matter experts within UK FE/HE about the work of the OWLATEL (Open and Work-based Learning in Advanced Telecommunications) project, which is looking at Online Evaluation of students in a Distance Learning environment.

26. OPEN-EBONI
An open list for all those interested in the EBONI (Electronic Books ON-screen Interface) project.

27. PBL
A mailing list for the discussion of Problem Based Learning within HE/FE establishments.

28. RBL
To enable discussion in the context of UK HE of issues related to Resource Based Learning.

29. SGLANGUAGES
Specialist Advisory Group for Languages, giving advice on the learning and teaching needs of the subject area

30. SLTN
This mailing list is used to support the discussion of activities related to investigations into and experiences of learning technologies within HE and FE in the Central Southern area of England, as well as to plan events for the wider HE/FE

31. TEACHER-RESEARCH
This network, based around the nucleus of the STRSN, is a forum for teacher researchers and professional educational researchers. It provides an opportunity for the exchange of ideas,
findings, and questions and answers, as well as for feedback on methodology from 'critical friends'.

32. **TEACHERS-RESEARCH-FORUM**
The Teachers' Research Forum provides an on-line forum for students involved in MA Education studies.

33. **TLNT-TALENT**
The TALENT list is to enable members of the TALENT project to collaborate, disseminate and network with each other regarding the implementation of network technology.

34. **VATS**
VATS is for staff involved in visual arts technology staff development, lecturers in the visual arts and all relevant support staff in Scottish HE. It is for communication by the Visual Arts Technology Staff Development project and discussion within the Scottish arts sector on C&IT topics.

35. **VIDEO:** The video mailing list is for the discussion of the delivery, integration and use, of video content in education primarily via the JANET network. It is aimed at all of those interested in using video conferencing and video streaming in online teaching and learning.

36. **WEBCTUK:**

37. **WOLF:** The Wolverhampton Online Learning Framework. The WOLF environment is for students, tutors, administrators. The tutor in control of the learning the same way as in traditional methods. Options are enabled based on pedagogic requirements of the subject and the tutors teaching methodology.
APPENDIX 5.1 – Sample Shared Learning Materials

ENGLISH: Activities on a novel and a play

KNOWING THE STORY

Chapters 1 to 4:

(A) Mark the following statements about Okonkwo TRUE or FALSE?

1. He was a champion wrestler. TRUE/FALSE
2. He has a reputation as a tamer of wild cats. TRUE/FALSE
3. He has fought bravely in wars. TRUE/FALSE
4. He is a wealthy man. TRUE/FALSE
5. He has studied at the University of Nigeria. TRUE/FALSE
6. He has three wives. TRUE/FALSE
7. He is a hard worker. TRUE/FALSE
8. He is considered a successful man. TRUE/FALSE
9. He treats his family harshly. TRUE/FALSE
10. His father was a good talker. TRUE/FALSE
11. His father played the flute. TRUE/FALSE
12. His father was considered a failure. TRUE/FALSE

(B) Use the following names of people and places to fill in the blanks in the passage below:
Nwoye - Unoka - Umuofia - Mbaino - Ikemefuna - Obierika

Okonkwo's village is called . . . . (1) . . . . A young woman from his village has been killed in the nearby village of . . . . (2) . . . . and the tribe has to decide whether to go to war. They call a meeting and decide to send Okonkwo to negotiate. When he returns it has been agreed that a young boy and a virgin will be given to Okonkwo's people to make up for the crime. Then woman is to go to the man whose wife was killed, as compensation. The young boy, whose name is . . . . (3) . . . . is to be looked after by Okonkwo for the time being.

Okonkwo has a son called . . . . (4) . . . . and he is worried that his son may turn out to be lazy like Okonkwo's father, . . . . (5) . . . . Okonkwo has a friend whom he talks to, called . . . . (6) . . . .

Chapters 5 and 6: Read through the following passage. When you come to a choice between (a) and (b), decide which one you think is right.

The feast of the New Yam is about to happen and there will be a wrestling match. The feast of the New Yam celebrates (a) a new kind of yam imported from the USA (b) the harvest. Okonkwo does not enjoy feasts because (a) people eat all his yams (b) he hates sitting around just eating and drinking. He is therefore in a bad temper and shoots at his wife from quite close. (a) He is a very bad shot and misses her (b) The whole village comes to mourn her death.

Okonkwo's second wife is called Ekwefi. She fell in love with him when she saw him wrestling but could not marry him at first because (a) Okonkwo was too poor to be able to pay her parents for her (b) she was already married. Later she ran away to him. Her daughter, Ezinma, is one of Okonkwo's favourites and he wishes she were a boy. For the evening meal, all his wives cook some food. Then Okonkwo (a) eats . . . .
something from everyone (b) decides who will get the honour of feeding him. Another of his daughters is crying because she broke her water pot (a) because she was messing around (b) through no fault of her own. She is (a) really upset (b) trying to avoid getting into trouble.

At the wrestling match Okonkwo (a) beats everyone he fights (b) watches from a seat at the side. While they are watching, a friend talks to Ekwefi about her daughter, Ezinma. They say that they hope she will stay. This means that they hope (a) she will stay alive (b) she will stay on in the village after she gets married.

Chapters 7 and 8: Note down answers to the following questions or discuss them with a partner.

How has Ikemefuna settled down with Okonkwo’s family?
What is his relationship with Okonkwo?
With Nwoye?
Why does the clan decide to kill him?
Why does Okonkwo ignore Obierika’s advice not to go with the men who will kill him?
Can you explain why Okonkwo kills Ikemefuna?
How does this incident affect Nwoye?
What is the connection between the killing of Ikemefuna and the custom of putting twins in the evil forest?
How is Okonkwo affected by the death of Ikemefuna?

Note: first mention of white people. How do the people of Umuofia react?

Chapters 9 to 13: Put the following events in order as they happen in the book.

Ezinma is taken at night to visit the priestess, Agbala.
Ezinma is seriously ill but recovers.
Okonkwo is banished.
The egwugwu (spirits of ancestors) judge a dispute between a married couple.
Ekwefi tells Ezinma the story about Tortoise and the birds.
Obierika celebrates his daughter’s uri (part of the marriage ceremony).
Ezeudu dies.
Okonkwo accidentally shoots Ezeudu’s son.
MACBETH - ACT III - FINDING EVIDENCE FROM THE TEXT

Act III Scene 2:

Mark each of the ten statements below TRUE or FALSE - and then give a piece of evidence from the play to back up what you have said.

EXAMPLES (These are taken from another scene):

(a) Lady Macbeth thinks Macbeth is TRUE. She says he is, "Too full of too soft-hearted to kill the king. The milk of human-kindness To catch the nearest way."

(b) Macbeth never confides in his FALSE. He writes to her as soon as he's seen the witches.

IF YOU GET THE IDEA, GO ON. IF NOT, ASK.

TRUE/FALSE EVIDENCE

1. Lady Macbeth is not feeling secure and contented.

2. Since the murder, Macbeth Has become very sociable.

3. Lady Macbeth seems to want to make Macbeth feel better.

4. Macbeth feel threatened by something.

5. Macbeth is becoming more reckless and less afraid of the consequences of what he does.

6. Macbeth is sleeping well now.

7. Macbeth almost seems to envy Duncan.

8. Lady Macbeth is still able to tell Macbeth what to do.

9. Macbeth tells her the details of his plan to kill Banquo.

10. At the end of this scene Macbeth seems to have decided to carry on with his evil actions.
LECCIÓN 20: EXPERIENCIAS Y OPINIONES

1. Mira las fotos y responde a las preguntas.

¿Conoces estos lugares y monumentos?
¿Cómo se llaman?
¿Sabe dónde están?

2. ¿Has estado alguna vez en esas ciudades? Completa las siguientes frases con tu información.

He estado (una vez) en __________ y __________.
He estado (varias veces) en __________ y __________.
No he estado nunca en __________ (ni __________).

3. ¿VERDADERO O FALSO? Lee estas informaciones y pregunta al profesor qué significa lo que no entiendas. Luego escucha la conversación y señala verdadero o falso.

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<td>Ha estado en los cinco continentes.</td>
<td>✓</td>
<td></td>
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<tr>
<td>No ha montado nunca en camello.</td>
<td></td>
<td>✓</td>
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<tr>
<td>Ha comido carne de serpiente.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No le gustó la carne de serpiente.</td>
<td></td>
<td>✓</td>
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<td>Ha ido de safari.</td>
<td>✓</td>
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Relaciona con flechas las siguientes palabras y expresiones en español:

- falta de libertad
- la película estaba prohibida
- la misa
- la censura
- clandestinamente
- el régimen
- los exiliados
- los progresistas
- “progres”
- servicio religioso
- limitación
- a escondidas, no a la luz pública
- antifranquistas
- no permitida legalmente
- no hay libertad
- gente que no puede vivir en su país por razones políticas
- tipo de gobierno, la dictadura
LECCIÓN 14: ¿QUÉ TE PASA?

1 Completa las frases con las palabras del recuadro. Puedes usar el diccionario.

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<th>cansado/a</th>
<th>caído/a</th>
<th>sofá</th>
<th>enfermo/a</th>
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<td>contento/a</td>
<td>constipado/a</td>
<td>sueño</td>
<td>cómodo/a</td>
<td>asustado/a</td>
</tr>
</tbody>
</table>

- Está contenta
- Está causado
- Tiene hambre
- Está enferma
- Tiene calor
- Tiene sed
- Está preocupado
- Está triste
- Tiene sueño
- Está nerviosa
- Tiene fiebre
- Tiene miedo

2 Escucha estas palabras y escribe las en la columna correspondiente.

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<tr>
<th>ESTAR</th>
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<td>enfermo</td>
<td>hambre</td>
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102
APPENDIX 5.2 - List of Spanish Learning Activities

1. Estudiar espanol, toda una experiencia
   4 pic + quotes
   In pairs match pic-quote pairs
   Discuss questions (priorities in learning languages)
   (Opinions - creo que . . pienso que . .

2. Que to pasa?
   Tiene . . esta . .
   Box with list of adjectives
   Pics to match them
   Tiene . . Or esta . . below each picture
   Fill in eg tiene hambre, esta cansado etc
   Pairs or individual then compare

3. Cartoon
   One "photo-story" type picture with balloons blanked out.
   Pairs - fill in what they're saying
   Read out to class

4, 5.Revision on perfect tense
   Also nos 4a, 4b 4c - not described in detail.
   Homework - handbag with objects. Dates evident.
   Write an account of que ha hecho esta semana. . este mes ?
   Pairs - question/answer
   Given diary page: escribe las cosas que han hecho y las quo no han hecho
todavia

6. Pictures represent places (eg eiffel tower)
   Has estado (una vez) en . . .?
   and table to fill in (Verdad/falso) while listening to a tape

7. Pictures telling events in a person's day. Narrate in 3rd person
   what
   that person did today (ha hecho).
   Work in twos - as if gossiping about the person.

8. Como disculparse
   Fill in lines under pictures which illustrate what you have to excuse
   yourself for. perdona (tu)/perdone (usted)
   Compare answers

9. Role play - longer dialogue over making excuses
10 - revision of imperfect tense
Tape
Listen and then fill in checkboxes - tick the things that are mentioned
about the time of franco.
Compare answers with someone else.

11. Era Progre . . . es yuppie

Two sheets (a4) A and B
Each has two pictures (matching title era/es
Each picture has some blanks (eg Musica : . . . ) and some things filled in.
Work in pairs. Ask questions about now and the past to complete each of your sheets.

12. and revise preterito definido

Done with imperfect.

Fill blanks exercise

13. Similar idea to 11. This time each one of the pair has some information
(in the form of pictures) about someone's journey. They ask ?s to complete their information.

14. Matching exercise: vocab in a box to match with definition in another column (draw arrows)

15. Imperfecto/indefinido
Series of cartoon pictures (not a narrative - separate).
Captions contain blanks where the verbs should go. Insert the verb in the correct tense.
Individual and then compare notes.

16. Endings of imperfect
written out as table (tener, hablar, vivir, ver, tomar, preferir) with some parts missing for each verb. Complete the tables.
Individual, then compare.

17. Homework exercises on past tenses.

18. Future Quick revision of endings
Match drawing to name - Star signs
eg Acuario and picture of water

19. Horoscopes page from El Pais
Each read own. Whole class. Ask about vocab.
20? Out of place (belongs to lesson I missed?)
Listen to 5 people speaking about their childhood. Note the way they use the verb recordar.
Paper contains examples of expressions set out to highlight the way to begin the sentence:
Recuerdo ....
Recuerdo que ....
Tener buenos/malos recuerdos de ....

Follow-up

21. Future exercises - homework

Fill in blanks: put in the right form of the verb to go with Manana, esta noche etc.
Answer questions (eg que pienses hacer domingo?)
Given small cartoon pictures, r'escribe que haran los distintos personajes."

Plus two more sheets with similar kinds of exercises.

25. Preposiciones
Por y para
Explanation sheet - tells when each is used.
APPENDIX 5.3 – Notes on Interview with Spanish Teacher

The focus of the interview is on pair and small group activities in language learning but other subjects are also touched on.

The teacher teaches Spanish at UCL language centre and also in a secondary school. She has not been involved in the ReLaTe project, but was shown the interface (not the system in action) in order to explain the interviewer's interest in group and pair activities. She preferred not to have the interview recorded. This is a summary based on the interviewer's notes.

What is the ideal size for a language class?
Not as small as four - because you don't get as many ideas generated. Even numbers, ideally, so they can work in pairs. Really big groups (as in schools) are harder to organise. Maybe about 8 is ideal for language learning.

Why get students to work together?
Learning a language is about communicating - so you want to encourage communication with as many people as possible. Also some people tend to be afraid of making mistakes when asked to talk in front of a class; they are less inhibited working with just one other person. I tend to start by getting people to work in pairs and then as they get more confident I ask them to work in bigger groups. At the start you want to get them to get to know one another, too, so you try to get them to swap partners, work with different people.

Do you have favourite kinds of group activities? For example, are there certain things you always do - in a first lesson, perhaps?
Yes. Games are good. These three activities always seem to work well:
• Talk in pairs telling one another about yourselves (practise first and second person verb endings). Then report on what you learned about your partner to the whole group (practise using the third person). People do a lot without realising it and seem to enjoy it.
• Pin up pictures (photographs, paintings) on the wall. Get people to give opinions/reactions to the pictures. They have to get up and walk around to look at the pictures.
• You take some labels with names of famous people on them. You pin one onto the back of each person. They have to ask one another questions until they find out who they are. Games like this work well.
There are lots more. I could make a list.

What other kinds of teaching materials do you use?
I use pictures a lot. For the students to describe, or put in order, or to match up. Activities where people have to find things out or find out what to do from the others they are working with.

What sources do you use? Where do the materials come from?
Some things are photocopied from text books. Or things are from El Pais (using the web) - or magazines. Some I draw myself. Some activities I devise and some are ready-made from books.

Do you have a checklist of ingredients for a language lesson? Are there any things that you think a good lesson must include?
It isn't written down - but yes. Something like this:
Begin with an introduction - a little bit of text or a picture (something ready set up) that shows whatever you are teaching. Maybe you present something, like a verb. Some will know it already so that's good - they can explain it to others.
Then some practice, eg a dialogue/situation, in pairs.
Maybe something to fill in, in pairs.
Then perhaps some listening.
Then a group activity.
Then personalize it by getting people to have a real conversation in pairs - to talk about the things they would really say if they were talking to a Spanish person. This is good because it generates questions like, "How do you say . .?" People are thinking about what they really want to say in the language.
Then maybe something else - eg using pictures, doing something active that also gives an excuse to talk.

Timing. How can you tell how long to keep an activity going?
I don't time it. People work at different speeds so you can't get it exactly right. You can tell just from experience.

Can you use the same activities with adults and school students?
You can use the same materials. In a school, with a much bigger group you have more organisational problems and discipline can be a problem. And if you get them all talking in pairs there is just too much noise sometimes – so the actual activities may have to be changed.

What can students do working by themselves?
Writing, reading, reading aloud, practise saying things.

Other points mentioned
"You have to know the people". If you know something about them, what they're interested in, their hobbies, they are happy to talk about it. You can bring that into the lesson, tailor it a bit to fit the students. You can ask them to make a list of things they're interested in.

"You need to create a relaxed atmosphere". This was in response to a question about whether you ever get groups that just sit there in silence. The answer was that it hadn't happened yet - but the atmosphere was important and that the teacher can do things to generate the right kind of atmosphere.

There was also a brief discussion of ways to approach a lengthy literary or other text; how much reading would be done in the class? This question arose because not everyone likes reading extended pieces of text from a computer screen. The answer was that she would only read short extracts in class and then use the rest of the lesson to discuss the text.
APPENDIX 6.1 - Observation checklist results

Output file extracts. The very large number of comments has been cut to show only those concerned with the shared workspace, with a few examples of comments on other areas.

NOTE: Names removed (Teachers', students', observers' names all replace with numbers, eg Tut1, Stu1, Obs1, Expert-obs1 etc.)

CLASS:

01.11.95 Advanced French OBS1
01.12.95 Latin OBS1
02.11.95 Portuguese OBS1
05.12.95 Business French OBS2
07.11.95 Business French OBS1
07.12.95 Portuguese OBS1
08.11.95 Advanced French OBS1
08.12.95 Latin OBS3
09.11.95 Portuguese OBS1
10.10.95 Business French OBS2
11.10.95 Advanced French OBS1
12.12.95 Business French OBS2
13.10.95 Latin OBS3
14.11.95 Business French OBS1
14.12.95 Portuguese OBS1
15.11.95 Advanced French OBS2
17.10.95 Business French OBS2
17.11.95 Latin OBS3
19.10.95 Portuguese OBS1
20.10.95 Latin OBS3
21.11.95 Business French OBS2
23.11.95 Portuguese OBS1
24.11.95 Latin OBS3
25.10.95 Advanced French OBS1
26.10.95 Portuguese OBS1
27.10.95 Latin OBS3
28.11.95 Business French OBS2
30.11.95 Portuguese OBS3
31.10.95 Business French OBS2

TEACHING:

Activities:
Conversation: 24 out of 29
Grammar: 19 out of 29
Spelling: 8 out of 29
Gap-filling: 5 out of 29
Reading: 20 out of 29
Writing: 15 out of 29
Vocabulary: 25 out of 29
Pronunciation: 29 out of 29

VIDEO:

Frequencies:
Position: 6 out of 29
Out-of-shot: 20 out of 29
Poor light: 2 out of 29
Large picture: 3 out of 29
Loss/crash: 4 out of 29
Adjust camera: 1 out of 29

08.12.95: Tut said he preferred the smaller picture - didn't want to select larger Tut - "I've got your image permanently imprinted on my mind - I can't believe you're a real person!"
28.11.95: TUT1 uses gesture to illustrate "high" and "low" - but out of view of camera. While reading from the textbook, all three well positioned and seem to make an effort to stay in shot - particularly Stu1. Stu2 looks down but is clearly visible. TUT1 holds book above keyboard and faces camera. Video very useful in showing reactions during more jokey parts of the role play - helps to indicate how seriously a statement should be taken.

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AUDIO:

Frequencies:
- Adjust headset: 18 out of 29
- Mike-volume: 4 out of 29
- Headset-volume: 8 out of 29
- Request repeat: 42 out of 29
- Loss/crash: 3 out of 29

Subjective comments:

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WHITEBOARD:

Use of whiteboard functionality:
- Imported plain: 2 out of 29
- Lesson import: 2 out of 29
- Typing tool: 29 out of 29
- Drawing tool: 19 out of 29
- Eraser tool: 26 out of 29
- Select colour: 20 out of 29
- Blank page: 16 out of 29
- Change page: 23 out of 29
- Move text: 0 out of 29
- Imported PS: 11 out of 29

User problems with whiteboard:
- Loss/crash: 5
- Type failure: 97

Student use of whiteboard:

10.10.95  occasional
20.10.95  frequent
01.11.95  occasional
11.10.95  occasional
01.12.95  frequent
02.11.95  frequent
31.10.95  occasional
30.11.95  frequent
21.11.95  occasional
13.10.95  frequent
12.12.95  occasional
14.11.95  occasional
23.11.95  frequent
05.12.95 
occasional
14.12.95
frequent
15.11.95
occasional
24.11.95
frequent
25.10.95
frequent
26.10.95
frequent
17.10.95
frequent
07.11.95
occasional
27.10.95
frequent
17.11.95
frequent
08.11.95
frequent
07.12.95
frequent
19.10.95
frequent
09.11.95
frequent
08.12.95
frequent
28.11.95
occasional

Other comments on use of whiteboard:

10.10.95
Verbal comment that accent is needed but not every time. Sometimes 3 phantom clicks. Some reminders needed about how to change page and some difficulty scrolling as scrollbar seems to react very fast and sometimes several pages are turned by accident. Initial problems for students finding right page. Used page number and description of contents. TUT1 needed reminder about how to erase and twice to click before typing. Imported text used as homework to be read by next week. Typing mostly single words not phrases or sentences but this is similar to whiteboard use in face-to-face lesson. TUT1 a one finger typist and using a mouse for the first time.

20.10.95
TUT4 needs reminder of how to choose blank page. Teacher needed to put markers above typed text to indicate stressed syllables; had difficulty because the line was too thick. Also trying to tabulate text typed on the whiteboard and having no tab caused difficulties. This happened 3 or 4 times. TUT4 also tried to use cursor as pointer not realising student couldn't see it.

01.11.95
M still having great problems turning just one page instead of several.

11.10.95
Only underlining of imported text took place in this lesson - Tut3 didn't write anything at all. Tut had problems with the page forward tool - kept skipping forward two or three pages and then skipping back just as many in an attempt to go back one... Underlining of the text was done with the draw/write tool, rather than with the line tool. Erasing text written on an imported text page was problematic...

01.12.95
TUT4 draws a lot of ticks. Tut4 tried to write with yellow and green then changed colours. Stu4 having problems with draw-clicks and phantom-clicks so
wrote what Stu4 dictated. Tut4 uses new page facility rather than cram things in.

02.11.95
Stu3 made use of 'undo' function to correct erasing mistakes without any prompting from me. Teachers need to inform students what page the text is on - it is not always the case that teachers and students will be looking at the same page.

31.10.95
TUT1 needs to be shown backspace to erase last character typed. Uses right mouse button to erase all on wb instead of choosing blank page. TUT1 holding textbook in left hand and trying to type and use mouse with right. Needs more space? Typing first part of word enough to clarify meaning for student at times. (Wb being used to supplement audio?) some page-changing problems; twice the scrolling arrow results in one or two pages being skipped. TUT1 using paper to make notes during Stu1's talk.

30.11.95
Tut2 using freehand writing to correct Ch overshot screen on Rh side Ch overtyped Tut2's entry by accident

21.11.95
Students never asked to use whiteboard. One six-click phantom. Typing difficulties: TUT1 tends to start moving the mouse around the screen about 30 secs before he will need to type or erase. It looks as if he is searching for a place on the screen. Mostly single words and never more than two at a time. Drawing tool used to circle words. Eraser used rather than right mouse button. Still erases rather than get blank page. Now selects basic drawing and erasing tool without reminders. Once deletes whole phrase possibly in attempt to delete last few characters. Request for import during break and able to recognise filenames etc. Students annotate wb with vocab. queries.

13.10.95
Struggling badly to correct typing errors Must have been load on network - letters arriving out of order Wanted to write things in tabular format - spent a lot of time trying to line things Wouldn't use carriage return to get a new line

12.12.95
TUT1 uses drawing tool more extensively than in earlier sessions. Example: draws pyrimid to illustrate aspects of French strikes. Circles words and phrases. Also types longer pieces of text than usual Using words. Stul uses colour to underline parts of imported text. Some confusion over page changing, particularly scrolling left instead of right. Also accidentally choosing blank page sometimes moves mouse around as if searching for something. After text imported TUT1 searches for it - reassurance that it's all there? Blank page selected both with and without reminder. During reading exercise TUT1 navigates quite confidently between pages.

14.11.95
Attempt to erase text typed on imported ps page failed. Second Similar attempt made on Henry; erasure didn't show on Eliza. Both students underlined words on imported text and took initiative to do so. TUT1 drew accent in. Whiteboard unreliable at same time as poor quality audio aand video.

23.11.95
Plus 15 mins - Stu3 tried to erase the last thing she wrote, but ended up erasing the last thing she did, which was an accent. Tut2 drew a body so that names for parts of the body could be learned. Also typed in a Portuguese recipe. Again, saw drawback with wb in that if you draw in accents as you write, pressing return at the end of the line takes you to below where the accent was drawn, rather than to start of next line. Tedious.

05.12.95
Colour selection done only by students to decorate the whiteboard during the break. Selection of blank page by teacher only done in response to reminder. Most of the time each item is erased to clear the whiteboard. Selects eraser
rather than R. mouse button. Wb used by TUT1 to make notes during a student's presentation, so the points can be taken up later. Also to draw large exclamation mark, question mark and full stop to illustrate possible outcomes of French strikes. TUT1 much more confident than in earlier sessions eg annotated text and changed pages more freely. Times of phantom click plus 5 9 26 28 43 44 69 75 99 mins from start.

14.12.95
Stu3 changed the thickness of her accent line spontaneously. Ch also still rubs the mouse over the part of text she wishes to erase, rather than clicking the RH button.

15.11.95
Tut uses mouseclick instead of return to move to a new line. A few problems with over-running right hand edge of page and followed by erasing more than necessary. Blank page not chosen%3B instead tut types all round imported text. Wb used throughout role play to type words and mark Significant things on cartoon. Over-running problem later dealt with by circling part of text and retyping only what was invisible%3B no erasing. Students decorate wb during break. Plus 83 mins Tut moving back and forth through pages.

24.11.95
Could really do with a format for a table Student taking notes of everything on wb

25.10.95
Lots of drawing today. After 2 phantom clicks. Tut tends to give up and 'draw-write', using mouse as pen. Tut never draws in accent, just says "avec un accente"

26.10.95
Tut2's space management is improving. Takes new pages regularly. Example of picture mnemonic by Tut2. Verb to see with two 'e's, drawn with two eyeballs. Stu3 kept reclicking to go to new line instead of pressing return. Lots of common reference by underlining. Stu3 had some difficulty finding the correct page. Very few phantom clicks.

17.10.95
Start plus 14 minutes TUT1 cannot get whiteboard to respond. OBS2 also tried. Worked after quit and restart. In the meantime students wrote the words which TUT1 said and appeared to enjoy doing it. Problem when TUT1 wanted to erase one the the student-typed words. TUT1 also appeared frustrated by inability to write. Some problems navigating between pages especially remembering which way to scroll. Page numbers not noticed so all found it hard to reference them. Stu1 continued to use wb after problem was fixed. Scanned text in small font. Stu2 leans forward to read it and is therefore only visible in the bottom of the window. Scrolls too fast and skips pages 3 times.

07.11.95
Of 9 failures to write 5 draw clicks. Tutl chooses to erase whiteboard rather than begin new page.

27.10.95
Erase was by back-spacing only until he deleted something by mistake

17.11.95
Uses backspace to erase. Needs reminder about how to select new page or change page. Does not realise difference between scrolling and getting new page. Difficulty arose three times. TUT4 confused when he created blank page and student moved back to previous page. Accidental erasing by pressing right mouse button twice during the lesson. TUT4 wanted to underline and did so with difficulty freehand, rather than choosing the line tool. Student proposed use of a different colour, rather than teacher. Tended to tick (freehand) to give feedback.

08.11.95
Moving forward to next page still very difficult for Tut3. Tut3 listens to students reading out their homework (a fairy-tale), and notes down new/useful
phrases on the whiteboard as they read. She has no phantom clicks, but keeps clicking on a new line instead of pressing return to go to the next line.

07.12.95
There seems to be a distinction between draw clicks and phantom clicks?

19.10.95
Blank pages were created by erasing present page rather than selecting new one. Stu3 erased by accident not realising the last in last out sequence. Tut2 draws accents in above Stu3's text. Accents never ignored, always drawn in.

09.11.95
Still tendency to create a new page by erasing what's on the old one, rather than pressing Blank Page button. Stu5 didn't press return at end of line - sometimes being experienced with computers is a problem - bring cognitive stereotypes to new system. Ch tells her FTP, not through system. Stu3 kept drawing in accents while she was writing - meaning that she kept having to click again to start writing - and difficult to ensure that you keep writing on the same line. Would be better to enter all accents after having typed in text. Plus 45 - whiteboard letters arriving out of order, but despite video loss of 20-25% A reports audio %22ok%22 Different concepts of erasing are interesting - CH employs action with mouse like on a normal whiteboard, A just clicks with RH mouse button.

08.12.95
S slipped quite badly with the mouse when drawing things - finds it quite difficult to control the mouse. They were working in parallel at one point - both using wb Quite playful - S drawing a house over the conjugation tables etc.

28.11.95
TUT1 appears to plan ahead when he needs to write, selecting typing tool and moving to the right place on the whiteboard. Although only 3 phantom clicks there was not a great deal of writing during this lesson and it did pose a problem; plus 11 mins TUT1 succeeded in typing only after 7 attempts. Later he gave up after 4 attempts. Problem with erasing - TUT1 never uses right mouse button but always selects eraser, even for Using letters. Apparent crash of wb on Eliza plus 42 mins may have been result of TUT1 hitting Quit button by mistake; he was moving the cursor around the screen at the time. TUT1 needs reminder of button to press for blank page. Use of wb to clarify words not heard clearly.

ADDITIONAL COMMENTS ON TEACHING SESSIONS:

10.10.95
Comment from TUT1 that the system is efficient because students concentrate hard.

20.10.95
Teacher set homework at end of session as usual.

01.11.95
This was Stu's last session.

11.10.95
Tut3 used a notepad balanced on her knee for taking notes during the lesson - she commented after the lesson that she needed the students to talk more amongst themselves so that she had time to make more detailed notes. She thought that the students were more "intimate" about themselves than they would be in a face-to-face class. She reported feeling very tired after 45 minutes. Would help if material that was scanned in, once returned to the teacher, had indicated on it where the page divisions as they will appear on the screen are.

01.12.95
Lesson started late and ran longer than the recording timer, set for an hour. TUT4 used a textbook and had space-management problems

02.11.95
Both Stu3 and Stu5 made copious notes again - not ideal.

31.10.95
UCL student Stu participating as receiver only on Eliza.

30.11.95
Ch said she doesn't notice phantom click because she doesn't look at screen, but at keyboard Discussed whether to have a break and decided not to - Stu3 said "you learn a lot in 5 minutes!" Used a total of 11 pages on the whiteboard - this would be a good measure to keep in the future.

21.11.95
Working area: TUT1 had a table next to the workstation but it is still not ideal.

13.10.95
Tut4 points on screen to say 'here'.... Whiteboard was messy when finished - using too small a font & trying to cram too much onto a page Stu4 had problems manoeuvring mouse.

12.12.95
Stu1 participating for this session in London and sitting at a workstation next to TUT1. TUT1 had almost lost his voice hence more reading exercises for students and less general discussion. Unable to record this session because of problems connecting to boom. Light bulb went at start of session so no extra lighting provided.

14.11.95
none

23.11.95
Despite the really poor audio, Tut2 and Stu3 did not want to cancel or shorted the lesson.
APPENDIX 6.2 - Student interview/questionnaires

This was a structured interview, during which a questionnaire was completed. Three students were interviewed. Included as an example of enquiries covering the whole conferencing system.

1. Summary results

Questionaire given to students in ReLaTe2 trials, half way through the course - ie at the end of the autumn term. Three students only. The fourth was unable to attend the session.

Actual questionaires are in -ucacjxh/relate/

Main points:

Headsets: 2 X no problem. 1 said headphones were "tight" and "a little uncomfortable after an hour."

Audio tool

One said adjusted incoming and outgoing volume once at the start of each lesson. The others said:
Incoming audio adjusted once per lesson
Outgoing - never adjusted

No problems adjusting the slider controls.

Audio quality

Descriptions of the audio:

"Crackley on occasions and sometimes broken but generally fine - sometimes did not sound like a real voice"

"The tutor always spoke clearly and comprehensively(ibly) yet the sound was often broken up and did not arrive all at once."

"Broken up, especially when two people interrupt each other. Fuzzy, background noise"

Did the audio vary a lot during a lesson: yes, no, quite a lot.
But one also said "If it started off well it continued well". They all also said there was variation between lessons. One said "Some lessons slightly better than others."

Descriptions of the variation:

"The continuity varied and sometimes the volume varied of it's own accord."
"Clear mostly other times not clear".
The background noise was the same throughout but sometimes speech was less broken up.

All said that the 5-point scale was sufficiently fine-grained and 2 rated the audio overall as "fair". One seems not to have given a rating.

Two agreed that more effort was needed to understand the tutor than in a face-to-face class and that this was because of the system, not being unfamiliar with the tutor's voice.
The other said it depended on audio quality. "When the speech was broken it was hard but in general its easy to understand the tutor."

One felt that it would have been easier to understand if the lips had been synchronised.

Compared with speaking and understanding a foreign language over the
telephone:

"Easier on the computer if you can see the person's reactions."
"Easier on the telephone because sound is clearer and lack of image doesn't hinder that much."
"I felt slightly more connected when using this system than on the telephone, on which I found it very hard to convey messages."

Ratings given (when using the foreign language):

At best: attention necessary no appreciable effort required (1); moderate effort required (1); considerable effort required (1).

At worst: considerable effort required (2). One says this is "most of the time". "Somewhere between considerable and no meaning". (1)

See also the first set of comments on video and its contribution to audibility.

Video

Did video contribute to audio audibility?

"Doesn't help that much but sometimes useful for looking at facial expressions"
"It wasn't as useful as being face to face with someone but it was preferable to no eye contact whatsoever. You feel slightly more in touch."
"It was helpful to see a picture of the tutor as it made it more realistic and less artificial."

Were video pictures an aid to communication?

"A little, for facial expressions"
"Yes - realistic"
Yes. "It allowed for better interaction between tutor and students."

How often did you look at the video images?

Nearly all the time (2)
Quite often (1)

Did the video help you understand the tutor?

"Not speech, but facial expressions"
"Not really - not essential"
"occasionally in the way the gesticulations are valuable"

Main benefit of having tutor's image?

"Just to know they're there"
"Realistic - more like being in a class than at a computer"
"The greater feeling of his/her presence"

Usefulness of other students' images?

"Seeing when people are about to speak is good"
".. to see if they are going to speak and if they are interested. More like a class."
"Yes but not vital"

Display of own video image?

"A bit disconcerting, not very useful but need to know how others see you"
When you turn to see the tutor you can't help seeing yourself as well (spoken comment noted by interviewer)
"Not essential to be seen - rather not look at it."
"If anything it was a distraction".
How often did you monitor your own image?

Occasionally (5-10 times per lesson) (1)
Rarely (1-4 times per lesson) (2)

Adjust own camera angle: once per lesson, no, once per term

Ask others to adjust: no, no, no

Picture quality:

Image size: Small image was adequate (3)

Did you choose to enlarge an image? never (1); once per lesson - for the tutor's image (2).

Two felt that the images of themselves and of the other participants were of equal standard. One thought the tutor's image was different from the other student's and described the difference as "disjointed movements". (NOTE: Tutor was in London, both students on the same local network in Exeter.)

Variation in image quality was noticed during the course of a lesson (one says this was only true for the tutor's image; one says it happened "only when the system was about to crash") and described as follows:

"partial images, loss of reception etc"
"occasionally one of the images froze or one would become fragmented"
"partial images" (NOTE: "partial images" is a phrase from the questionnaire)

They did not feel these changes interrupted the flow of the lesson. They were "easy to ignore". But "when the picture images moved very quickly it was distracting as not realistic."

Shared workspace

NOTE: all comments apply to wb, as nte had not been used in any of the sessions at this stage.

Any problems using the mouse?

It was sometimes difficult to be neat when underlining (1).
With experience, this student learned to select the line drawing tool rather than try to draw freehand.

Use of the keyboard was not a problem, except for one student who said: "I was hampered by not being able to type very fast."

Features of the whiteboard that they liked were:

"Different colours" (2); "having facilities other than just typing - eg underlining."

Features that they did not like:

"Can't click on text to edit" (1); "spacing" (1).

Improvements needed?
"click on text to edit" (1)
Make it easier to erase things (2) - "can't change words when pressed return".
"Being able to erase text using the backspace rather than the rubber."

Screen layout - No-one mentioned any problems with this.
Pedagogical issues:

All thought they spoke more of the target language than they would have done in a face-to-face class and all put this down to the small class size. One also mentioned "the lack of inhibition/being able to say what you want." Another commented that "with only two students it required more concentration in lessons to reply to questions."

Suggested improvements to the system from a language learning point of view?

Audio quality "so voice is not broken up" (1)
"Better audio facilities, Easier to use whiteboard, picture with more frames per second" (1)
The other didn't suggest any changes.

Would you consider using a system such as this to learn a language again?

Two stated that they would definitely consider using such a system again, the third said "maybe - better than a correspondence class."

Advice to others?

The advice given by one student was not specific to this system (one assumes); "Pay attention" and "don't go to sleep". But the other two said:

"Look over what you have done in the class afterwards if you have the time as you will not have time to take notes." and "Don't try to write too many things down as the tutor is talking as you may lose concentration on what he is saying, but if you want to jot odd words onto a pad that would be OK".

"Speak clearly" and "Be prepared - because you are asked questions frequently".

Other comments?

"More tiring (having to look at screen and concentrate for a long time). Good because you can go through texts thoroughly and pick out difficult vocab quite easily by underlining."

"It is a system I would recommend second only to individual face to face tuition. It is preferable in conjunction with more interactive classes with larger numbers and where for practical reasons ReLaTe might not be appropriate."
APPENDIX 6.3 - Sample Focus Group Guidelines, Trial 1

Teachers:

(1) Agree on the three best features of the system AND three recommendations for change.

We are asking you to reach agreement in order to provoke discussion. Please report on the points agreed and any major areas of discussion and disagreement.

(2) Pedagogical aspects: What learning activities does the system support best? What is it less good at supporting?

You might find it helpful to consider activities you were forced to modify, or were unable to do at all, as well as those which could be undertaken exactly as in a face-to-face class. Were there any activities which actually worked better with the Relate system?

(3) Anecdotes: describe and be prepared to report on one activity that you think was particularly successful.

Some important general points may emerge from this. Should not try to describe a whole lesson. You might find it easier to get all group members to write a paragraph describing an activity and then to list these. Do they have anything in common?

(4) Write a page of guidelines for new teacher users of the system.

This should be a list of points, rather than an attempt at a user manual. It might be useful to consider: useful previous experience; what to expect; problems to look out for - and how to deal with them; things to try out; other general advice.

(5) If not already covered, comment on the following:

* Teacher-student and student-student relationships; were these any different in the Relate classes from relationships in a face-to-face class?

* Ideal length of teaching session - and whether a mid-session break is advisable;

* Coping strategies employed when not able to hear - for example, were there times when you did not hear something but did not ask the student to repeat it? In what circumstances might this happen?

STUDENTS

You will be asked to give a brief summary of your discussions. It would also be helpful if someone were to take notes and hand these over at the end of the session.

(1) What three things did you most like about the system and which three things would you most like to change? You should try to reach agreement on this. Please report on the points you agreed and any major areas of discussion or disagreement.

(2) Pedagogical aspects: What learning activities does the system support best? What is it less good at supporting?

You might find it helpful to consider activities you were not able to do as well.
as you might have done in a face-to-face lesson and those which could be undertaken exactly as in a face-to-face class. Were there any activities which actually worked better with the Relate system?

(3) Anecdotes: describe and be prepared to report on one activity that you think was particularly successful or that you enjoyed.

Do not try to describe a whole lesson. The easiest thing might be to get everyone to write a short paragraph describing an activity. Then you could talk about these and list them. Did they have anything in common?

(4) Write a page of guidelines for new student users of the system.

This should be a list of points, rather than an attempt at a user manual. It might be useful to consider: useful previous experience; what to expect; problems to look out for - and how to deal with them; things to try out; other general advice.

(5) If not already covered, comment on the following:

Teacher-student and student-student relationships; were these any different in the Relate classes from relationships in a face-to-face class?

Ideal length of teaching session - and whether a mid-session break is advisable.

Coping strategies employed when not able to hear; if you did not hear something properly, did you always ask for a repeat? If not, why? And what did you do instead?
APPENDIX 6.4 – EFL Course: Tutor-student focus group.

Students, seated from nearest to furthest from camera: S1-M, S2-F, S3-M
Tutor leads discussion, based on questions given out on sheet. All have copies of questions. Asked to make notes but didn't.
Answers attributed to individual speakers but paraphrased. See video and audio recordings.

Tutor: What did you hope to gain from the tutorials?
S1: Practise English. Also the technology was interesting. Teaching English in that way was interesting.
S2: Very interesting for young people.
S3: They mention that young people like playing video games.
Tutor: Like Nintendo

Tutor: I would have thought there would be more pressure, it would be more formal, like talking on the telephone but more so - but it wasn't like that.
S1: Less Work
S2: Less pressure
Tutor: (to S2) What did you hope to gain from the tutorials.
S2: I was interested in using computers. And it was interesting with two boys.
S3: My previous experience was nothing to do with computers or computer science so I thought it was a chance to have a very different experience. Interesting to find out how people can work in a different field or with different methods. Useful.
Tutor: Lots of people will use the technology in the future. I felt like that. It's coming so I felt it was a chance to experience it now.

Tutor: Did you get what you'd hoped for? If not why? For example, in terms of the learning, maybe you enjoyed it but did you feel you learned anything from the sessions.
S2: Yes (elaborates a bit).
S1: When you take the course in the classroom you can choose what you want to hear but if you use the headphones you must hear all the time and if you want to keep up [you have to listen].
Tutor: It's quite intensive.
S3: You can't avoid it.
S1: You still can switch off.
Tutor: But you have to make a conscious decision to switch it off. Another thing: learning a language is difficult. Did you find it more tiring because it was more intensive?
S2, S3: No.
S1: One hour is not enough.
They discuss the length of their FTF sessions (over 4 hours).
Tutor: Could you imagine video-conferencing for 4 and a half hours?
S1: With v-conf one person can speak at a time. In class you can talk to each other in groups.
Tutor: That had a big impact on my plans. Usually in lessons I'll ask people to discuss something in groups and then go round the groups. You can't do that because everyone's listening all the time.
Tutor: Explains that he moves people around so they get used to different accents and communicating with different people. Often people sit next to the same person in every class.
S3: One thing that was different from the real situation was the fact that I could see myself on the video.
S2: Yes.
S3: For me it was a problem sometimes because I had feedback on myself ... could see my expression ... sometimes I tried to control it.
It was strange because if you have dealings with people, normally you don't mind - for instance, I'm making these movements [with his hands] - but when you can see, maybe you stop.
Tutor: Yes. It was very disconcerting.
I heard anyone could look in and you wouldn't know they were there so I had a vision of 100s of people looking in and that was quite a strange feeling at first ... that's a new feeling. And also the fact that you can see yourself; I closed my window down for some of the sessions at the beginning because I didn't want to see what I was looking like. Did you have your window up - look at your own picture.
S2: Nods.
S1: No. If you say people can see you, it's a live show, maybe you feel nervous.
S2: Yes
S1: If all the others can see you that's fine [meaning the others in the tutorial?] but if it was a live show I would be very nervous.
Tutor: Remember when the BBC came to watch? Did you feel different on that day.
S2: No.
S3: Yes, Especially for communication [Seems to be saying he felt they should work hard and show they were doing well - difficult to hear.]
Tutor: But did it worry you that people were watching you?
S1 At the beginning I know someone was watching but then I concentrated on the course and I forgot it.
S3 We had a lot of [some kind of exercise?] so we had to think a lot!

Tutor: The next question is about restrictions and new opportunities from this desktop v-conf system. He interprets it as, "What is possible with v-conf?". We've already said it's more intense. Was there anything else it gave you the opportunity to do? Anything that was new?
S2 We use paper in the classroom. With this course we used the screen.
Tutor Did you find it useful using the writing tool - the word-processor tool?
S2 Yes. PlusNods.

Tutor Reminds them they could keep copies of the lesson - it wasn't lost when the lesson ended.
S3 We can move words.
S1 Our traditional learning style was to take notes but with this v-conf teaching we didn't make notes - at least I didn't.
S2 I did make notes.

Tutor: Because you didn't make notes, did you feel you got less out of the lesson? Did you feel you had less to take away?
S2 No.
S1 My memory is not so good.
Tutor: Mine also. For me it's great that I can see everything on the screen, it's all there so I can't forget anything, it's just a matter of scrolling down. [To S3] What about you?
S3 Usually I don't take notes, so it's my nature.
Tutor: You're perfectly happy?
S3 Yes.
S1 The colours were good. Everybody had different colours. So when we moved the words I think you [to tutor] knew who was doing what - and we can know every student's reaction.

Tutor: When you can move things around like that it saves a lot of time. The only rouble is I have to come in early to prepare the lessons - physically type things in but not only that, you know things are separated into blocks ...[yes] ...well, you have to type each block in separately. So all the different sentences I have to type in individually.
Not only that, I'd find myself typing many lessons twice, once at home when I was preparing it, then coming in again and typing in individual words so you could move them around. So that was quite time-consuming but I think that was just a technical thing that they can sort out - if anyone is listening ...
S1 If we are not very familiar with a program ... sometimes ... I always made a mistake and had to change the articles. I think the article itself should be bigger. [I think he's saying that it should be possible to make certain words, or parts of speed stand out from the rest of the text, so you can find them more easily.]
Tutor: What about picture quality?
S2 The video is slow but actually [can't hear] you are watching the faces, that's the important part, not the movement.
S1 I don't think the video is... I always concentrate on the article, not the picture.
Tutor: And on the sound.
S1 Yes, on the sound. I don't look at the picture.
Tutor: Was that the same to you [to S3].

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S3 Yes, it's possible to work without video but if you can't hear …
S1 You need video. The video attracts your, your, the video attracts you but it doesn't matter if it's quick or slow.
[S2: Yes]. You can let the video work slow but you must have very clear audio.
Tutor. I think that's true but I don't think it would be very successful for long without video. If it goes out for 5 or 10 minutes that's OK but if you lose sight contact with people for long it would cause a distance. I was worried at the beginning that there would be a distance, like on the telephone - and there wasn't - but I think that telephone business would be there without the video.

Tutor. Wearing glasses, I found I was leaning forward towards the screen so I noticed that every so often all you could see was this part [points to forehead] of my head. Also, [all join in with this, miming leaning forward and typing, showing just the tops of their heads to the camera]. Is there anything they can do to make that better? Make the letters bigger …
S2 But with very big letters you'd have a very long page to scroll through [mimes]
Someone: A bigger screen?
Yes [general agreement].
S2 Line numbers would be good.
Tutor: The map is very useful but you should be able to click on a bit of the map and go straight there. I sometimes had trouble, scrolling up and down trying to find you.

Tutor: Is it harder or easier to concentrate than in FTF tutorials?
Answer: Easier. No discussion so presumably general agreement?]

Do's and don'ts for future users:
Do read the articles and look up vocabulary before the lesson.
Do Get there 10 minutes before the first session to learn how to use the tools
Don't spend too long chatting or you will run up large bills, as when spending too long browsing on the Internet.
When you are talking to other people you have a different conception of time.

Advice to developers:
Bigger letters in the writing tool.
This is a health issue, because you can damage your eyes being too near the screen.
Need to work on making the connection more reliable and able to support better quality audio and video.
Tutor: having and arrangement of screen and camera which will simulate eye contact.
APPENDIX 6.5 – Evaluation report, Spanish for Lawyers

Extract from the full project evaluation report: results of the student and teacher discussion...

Duration of Course
23/2/98 – 16/3/98, 1 one hour and 1 two hour session per week.

Participants
Two students at Exeter University. One tutor at UCL. A number of observers and technical support staff at both sites.

Technology used
The students were using two SGIs. The tutor was teaching from a Sun workstation. A Sun workstation was used for playing out videotapes used during the tutorials. A VCR was plugged into the Sun workstation and the audio and video were played out through the audio and video tools. The VCR was controlled by one of the technical support staff at UCL, and the tutor had to ask for the videotape to be played, stopped, rewound etc.

The following SHRIMP tools were used: RAT (audio tool), VIC (video tool), NTE and WB (shared workspaces). As it was, both students and tutor used separate tools. [IS THIS TRUE].

Structure of tutorials
The tutorials were very varied. The tutor would give the technical support staff pages of text (questions, newspaper articles etc.) which would be scanned and imported into WB. She would also make use of video clips presenting Spanish law cases.

Every week the tutor would send articles by post to the students which they had to prepare for the tutorials.

Second Evaluation – Results of the meeting with the evaluators to assess the outcome of the tutorial

Discussion with Students
This section lists the main points arising from the students’ workshop. The Workshop was held at UCL on March 28th.

At first the technology can be quite intimidating, both students agreed it would be productive to organise at least one full length training session in advance to help them get accustomed to the tools. By the end of the series the students found they could really relax and concentrate on the discussion instead of dealing with the controls on the desktop at the same time.

It is important for the tutors to be aware of the fact that the students are learning in very unfamiliar surroundings and they must not get frustrated if they take a little longer to do something.

The slow framerate of the tutor’s image during most of the tutorials was quite distracting for the students. They felt that lip synchronisation was quite an important way of reassuring the participants during the tutorial and helping them to feel like they are participating in more of a real discussion.

They found the videotapes, which were played, very difficult to understand for two reasons:
• The level of the Spanish was quite high, there was a lot of legal terminology which they did not understand.
• A combination of the poor sound quality from the tape and the slow framerate made it difficult for them to fully understand what was being said.

One of the students commented that it was often quite distracting not being able to hear your own voice through the headphones, saying it is like talking with earplugs. The students had also noticed that one of the pairs of headsets from Exeter had a faulty connection that caused a low hum in everyone else’s audio.

Another issue which was discussed was that of balance of the volume of the audio between participants. The students were not fully aware that the volume of the individual microphones needs to be adjusted individually which requires a period of testing before the tutorial begins.

It was also agreed that comfortable headphones are essential when participating in a long teaching session, otherwise if the headphones rest heavily on the ears it can cause a great deal of discomfort, which in turn will prevent the participants from concentrating adequately.

People wanting to listen into the sessions from the same room as the participants must be aware that any background noise such as talking can be extremely distracting for the person trying to concentrate on the remote discussion.

The integrated interface at first seemed quite complicated to one of the participants who initially preferred to run the tools individually (this student had taken part in the French for lawyers tutorials and was very familiar with using individual tools). However, as their confidence in the technology grew it became a more practical and preferred method of controlling the tools. Having everything in a confined area was neater and involved far less moving of screens around, although they did feel it was a shame not to be able to see both the shared workspaces at the same time.

For practicality, the NTE was regarded as the much easier method of sharing text, especially when taking notes at the same time as listening to a videotape, WB requires a greater degree of keyboard/mouse co-ordination.

The students asked whether it would be possible to reconfigure the shared workspaces to accept Spanish characters. They considered this to be an important addition to improving the tools for language teaching.
The shared workspace was considered to be a major benefit in making the tutorial more interactive, as it is a function which would not normally be available in a face to face class and allows for more individual attention from the tutor. The students felt that it would have been helpful to have kept a copy of the edited slides on WB after the lesson. This would also have been more conducive in encouraging them to take notes during the session on the shared workspace as opposed to on paper. The legibility of the slides on WB was a key point for the students. It was important for them to be able to read all the text clearly, especially since there were times when they had not been able to read the material in advance of the session and were thus much more dependent on the information on the screen. It would help if fewer people were involved in the smooth running of the session such as the technical support staff for each participant. One of the students suggested trying to teach the tutors how to give technical advice to the students in the event that they are having a problem with the tools. The two weekly sessions were of different lengths. The Monday evening session was two hours and the Thursday evening session was one hour long. The students felt that the two-hour session was too long and the extra hour was really not very productive.

The most effective size for the tutorials was considered to be between two and three students, although three was preferable. The reason for this being that there are still few enough students for the tutor to give them individual attention, but there is not so much demand on the individual students themselves to respond to questions and maintain the general flow of the discussion. With a third person present, there is more opportunity for a student to listen and think about the substance of the discussion and ultimately to contribute their ideas. The three most important things, which according to the students, should be changed:
- The framerate on both the videotape image and the image of the tutor should be higher, although the videotape is more essential.
- Having an area somewhere on the screen for the individual participants to type notes would be very useful, they should only be viewable locally to the machine that they are using.
- Comfortable headphones.

Discussion with Tutor and Observers
The following is a summary of the discussion with the tutor and observers. This workshop was also held at UCL on March 28th.

The course only had two students, again due to the persistent problem with audio cards for PCs. The two students turned out to be very different in their Spanish proficiency. This was one of the main points of concern for the tutor. It was agreed that prior to remote tutorials, the tutor should have a 10-15 minute remote meeting with the students to assess their level and discuss issues like how much homework to give etc.

The fact that the level of the two students was so different, also raised the issue of having individual channels for private conversations between a student and tutor, similar to the tutor sitting down next to a student in class to talk if the students appears to have problems. Initially, until we can make the technology support this, we can schedule one student to arrive 10-15 minutes earlier than the other in turn, in order to have some "private" time with the tutor. Alternatively, the tutor and students could talk to one another on the phone.

The tutor had to make the course easier towards the end as one of the students simply could not keep up with the planned course. The tutor was very unhappy about this and said that compared to a parallel course she was running, the students did not learn nearly as much. She said it was more relaxed, but a waste of time. The students, however, hugely enjoyed the end of the course and felt they had learned a lot. This, to a certain extent, is the same experience as the tutor had in the French for lawyers course.

Issues relating to the physical setup were raised:

Camera position. For people whose experience with video images of "talking heads" are mainly from TV and news programmes, having images of people who are not looking into the camera can be disconcerting. There is no eye contact. Presently, there is not much we can do about that, as we cannot ask people to look into the camera while they are working. The situation can be improved by putting the camera on top of the workstation if possible, so it looks like the person is looking in roughly the right direction.

The field of view on our current cameras is rather restricted. This means that if a students bends down to take notes, he or she disappears from view. We should experiment with more wide angled cameras.

Lighting. This is an issue which keeps coming up. It is important to ensure that the lighting in the room does not make the participant appear too light or too dark.

The size of the video images was deemed to be fine. The tutor would enlarge one or both of the students at different times.

The number of students was briefly discussed. The tutor would have liked to have had more than two students. She said that if there are more students, they can share the load, so the rest do not have to be alert all the time. This is a view reflected by the students.

The tutorials consisted of 1 one-hour session and 1 two-hour sessions a week. The tutor much preferred the one-hour sessions because of the intensity of the tutorials.

The shared workspaces were discussed to some extent. The main problem was that the tutor was not always sure what the students were looking at. Initially, she was not aware that if she clicked on a WB page, the students' WB would display that page also. Another time, one of the students decided to use NTE rather than WB, which caused confusion. The tutor was not a very confident computer user and one or two bad experiences with the shared workspaces made her mistrust them completely.
One of the problems the tutor experienced was when she wanted the students to work individually. Neither of the shared workspaces supports this very well. One solution might be to have a console with shared workspaces, parallel to the video tool, and the tutor being able to enlarge each of them in turn.

Neither of the shared workspaces could produce Spanish letters, which were a minor irritation. NTE can probably be modified to allow this, whereas this is not possible with WB. The observer suggested using a graphics pen and simply (hand)-writing on WB. In the long run, a shared workspace must be found which can support a variety of alphabets.

In general it was felt that the tutors must have more thorough training in the use of the tools before use, in order to make them aware of the possibilities and restraints that they impose.

Finally, the possibility of building up repositories of language teaching material which would be available for the tutors was discussed, including the possibility of access to online dictionaries.
APPENDIX 6.6 - Interview with student on PIPVIC Russian course,

Notes (subject preferred not to have the interview audio-recorded).

Previous experience:
Learning languages - reasonably experienced
Russian - near beginner. A very small amount of previous knowledge. Some did come back.
Computer use - experienced
Multimedia conferencing - no experience

Audio-related
Also rented tapes form lib to help with pronunciation
could hear well enough to reproduce sounds

Video-related
Tried to look at lips
Main advantage of the video - could tell if someone was there
Didn't enlarge images. If had done so for anyone, it would have been the teacher.
Couldn't see objects (referring to a lesson when these were held up in front of the camera and students had to distinguish between, for example, an apple and an orange)

Workspace (text editor)-related
Drawing - lack of this facility was a handicap
Pointer was useful
Keyboard - problems arose because of the delay between keystroke and reaction of the text editor, and also because the cyrillic keyboard was not provided through an overlay but by referring to a keymap on the screen

Took a lot of notes - at the side, on paper.
Providing a note-taking feature in the system would not be very useful because it was so slow to type the cyrillic characters, it would result in screen clutter.
There were problems organising a print-out of NTE contents at the end of the lesson. This needs to be more straightforward.

When all three students were typing simultaneously the whiteboard (ie nte) came into its own. There were problems with managing the space and blocks sometimes overlapped. When this happened you could easily delete someone else's block of text.
Training would have helped with this.

The training in use of the system was minimal and inadequate. It seemed that it was not a priority to the people who were running the sessions. Written instructions, even a Post-it with the keystrokes on would have helped.

The interface of nte was inconsistent from week to week, probably because new versions were brought out during the course.
It was also inconsistent in terms of user expectations, having to some extent the look and feel of Windows applications, but also having a number of features which did not fit this model. Needs to be consistent in functionality and consistent with other Windows applications. Useful and familiar actions like highlighting text were absent. Did not like the concept of blocks - not fine-grained enough and not well-enough defined. Operations that could be performed on a block changed from one version to the next (eg could move blocks at first thten could not). Backspace and Delete did different things in different versions too.
Teacher can lock her text - that's a useful feature.
Need to add freehand writing and drawing.
Overall, it is not worth persevering unless the audio quality is improved. It was not very broken up but it was sometimes indistinct and sounded unpleasant.
The so-called Cyrillic keyboard is not more than a keymap.

"I came away from it at the end feeling that I hadn't spoken much". Did a lot of listening and reading but less speaking. The image size options in Vic were meaningless ( . . . "which means naff all"). The options should be expressed as "bigger" or "smaller". The NTE Edit menu gives Ctrl_X for both cut and copy!

It was useful to be able to see what everyone was writing. The fact that everyone can always see everything did mean that some activities did not work. An example was when students had to type numbers after hearing them. Once the first person had done it the others simply had to copy.

Editing and textual manipulation were clumsy and inconsistent. Training before the session and hands on demonstration of how to do things would, again, have helped.

The teacher could have done with some instructions.

Identifying contributors. Colours worked. The pen icon doesn't always identify the person by name. It is also too big and gets in the way, obscures text you are trying to read. It might float.

Getting to know other students. Video helped - though a still photo would have been equally good. If it had been of higher quality and without such a delay it might have been more useful.

Did get to know others a little. You lose out on the bantering around the lesson activities. Couldn't make asides because it would cut through what she (the teacher?) was saying.

Absence of visual signals
APPENDIX 7.1 – Sample saved text file

October 9th 2001 Group 4

Привет всем!
Как жизнь?

мне кажется
очень хорошо спасибо!
путешествуют
по-моему

я думаю
на мой взгляд

на западных курортах
богатые
проживают жизнь
тратят/живут с размахом
останавливаются
вы живете
остановились

им приходится оставаться
сидеть

удовольствия
выращивает
собирают
сылают
варят вкусное варенье
dелают джем

рыбалку
рыбную ловлю

ловить ловля
поймать

развлечение им
увление им

обратно/назад в воду
продать

люди простые

скромные

монотонно
за рубеж
получают
у них маленькая зарплата
дают
недостаточно
попутешествовать
стараются
накопившиеся накопиться
копить/накопить
копаться/возиться
не делают ничего особенного
занимаются чем-то
ловит рыбу
удит рыбу
рыбачит
на рыбную ловлю
рыбки
есть возможность
вы можете
они могут
позагорать покупаться
замечательный
отличный
красивый
изумительный
удивительный
великолепный
dивный
едут
получают удовольствие от ...природы
партном
тяжело/нелегко/сложно

надо
в долгах у друзей
отдых

Многие россияне сейчас ездят за границу.
Я не согласна потому, что у них не достаточных денег.
Я не убеждена потому, что в России есть много людей, и в Лондоне я часто

ОГЛА СЕН ПОТОМУ

по-моему это не правда, потому что только... Я NE СОГЛАСЕН ПОТОМУ ЧТО
У БОЛШЕСТВА МАЛО ДЕ

богатых русских могут позволить ездить за... НЕГ
граница мой взгляд это не пращо, они не могут себе позволить ездить за

граничу часто

По-моему, это не правда, потому что денег у многих русских не хватает,
чтобы ездить

зая не уверена потому что в России есть много людей, и в Лондоне я часто

ки я

мне кажется, что это не совсем так потому, что вообще они не могут себе

позволить ездить за границу.
Многие русские неприхотливые поэтому они предпочитают отдыхать в России.
частично
С моей точки зрения, это частично правда. Многие русские любят отдыхать с земляками.
По-моему, они отдыхают в России потому, что не могут делать по-другому.
ЭТО НЕ СОВСЕМ ТАК. МНОГИЕ ПРОСТО НЕ МОГУТ ЕХАТЬ ЗА РУБЕЖ А ТЕМ НЕ МЕНЕЕ ОНИ КОНЕЧНО ЛЮБ
ЛЯТ РУССКУЮ ПРИРОДУ.
это не точно правда, кто знает что если у них будет выбор они не хотят ездят часто за
границю.
Наверно это правда, но может быть они только предпочитают отдыхать в России потому, что у них ал...
это не правда все время. Многие русские предпочитают сидеть в России.
POURQUOI, EN RÈGLE GÉNÉRALE, AIMONS-NOUS FAIRE DU SPORT ET AVONS-NOUS ENVIE D'EN REFaire ?

C'EST...  

POUR S'AMUSER  
POUR GAGNER  
POUR S'AMÉLIORER  
POUR OUBLIER LA VIE QUOTIDIENNE

CORPS SAIN, ESPRIT SAIN  
EMULATION  
SE DÉTENDRE

POUR AVOIR UNE BONNE OPINION DE SOI  
AVOIR BONNE MINE : AVOIR L'AIR BIEN PORTANT  
DE L'ÉNERGIE  
DE L'ÉLAN  
avoir une bonne silhouette

ghettos et la détestation d'une société riche et permissive, tout cela justifie en effet que nous fixions des limites claires à notre tolérance.

Entre nous, je fais plutôt confiance au Président tunisien qu'à M. Jospin ou à Mme. Mitterrand pour apprécier la symbolique du voile que les musulmans modernistes interdisent dans leurs classes : ils y voient, mieux que nos jobards, l'ostentation d'une règle coranique qui maintient les femmes, au-delà d'une pudeur imposée, dans un asservissement répugnant pour des peuples libres. naif/ simplistic/ niais

pudique
Des salons aux états-majors d’entreprise, les femmes françaises ont toujours su se faire entendre des hommes. « Au XVIIe siècle, la préciosité fut l’expression même des valeurs féminines, remarque Elisabeth Badinter. Molière s’est moqué des précieuses, mais il n’empêche que les hommes se sont alignés. Ils ont cessé de se moucher dans leurs doigts et de roter en public. »

Aujourd’hui qu’elles ont investi les bureaux directoriaux, les femmes propagent des valeurs différentes dans le management. « On critiquait hier le côté changeant et affectif des femmes, explique Pascale Veil. Désormais, il faut avoir de multiples facettes pour savoir gérer la complexité. »

La flexibilité féminine est une valeur en hausse. Reste, pour les PDG, à le découvrir...

Même au XIXe siècle, période en clair-obscur, le droit à la parole n’a jamais été dénié au « beau sexe ». « J’ai retrouvé des manuels de savoir-vivre à l’usage des jeunes filles datant de cette époque,
<table>
<thead>
<tr>
<th>Municipalités</th>
<th>TGV</th>
<th>Usagers</th>
<th>Passagers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Avantages</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On peut aller n'importe où en France en demi-tarif. Il lie les grandes villes en France et les raccorde à d'autres réseaux européens.</td>
<td>Il peut déranger des habitants qui habitent pas loin des lignes.</td>
<td>Très rapide mais moins cher que l'avion mais presque aussi rapide.</td>
<td>On n'arrive pas à sa destination c'est pour ça qu'on pourrait préférer utiliser la voiture.</td>
</tr>
<tr>
<td><strong>Inconvénients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 7.3 – SAMPLE SCREEN SHOTS, TRIAL 3

[Images of two different screen shots from a text editor program showing Russian text.]

223
Наряду с другими вопросами, один из участников спрашивает:

- Как дела?

Принято следующее ответы:

- Великолепно!
- Отлично, спасибо.
- Хорошо, спасибо.

В конце разговора участники обмениваются информацией о своих днях.

---

**Домашнее задание**

1. Напишите о том, что вы делаете каждый день на работе.
2. Расскажите о том, что вы делаете каждый день на досуге.
3. Напишите о своих планах на ближайшие выходные.

---

**Задание для группы**

Составьте список задач, которые должна выполнить каждая группа на следующей неделе.

---

**Упражнение**

1. Напишите о том, как вы думаете о том, что вы делаете каждый день.
2. Расскажите о том, что вы думаете о том, что вы делаете каждый день на досуге.
3. Напишите о своих планах на ближайшие выходные.

---

**Задание для индивидуальной работы**

Составьте список задач, которые вы должны выполнить в этом месяце.

---

**Задание для командной работы**

Составьте список задач, которые должна выполнить каждая команда на следующей неделе.
3. Я думаю, что многие русские студенты любят заводить знакомства. Культура и общество им интересны и им важно найти информацию об этом.

Почему?
Я думаю, что для русских студентов, жизнь в западе является очень разной.

4. На мой взгляд, почему они интересуются западом, но им также нравится русская культура - особенно русская культура (или побег музыка, интересующий их страны).

Многие из русских и бывших советских людей, которые живут в западе, не знают, насколько они важны и как они могут быть использованы.

Почему у них больше возможностей чем на Западе?
нет - их места в России есть переходы, но запад лучше для жизни.

5. Я не хочу, чтобы некоторые обсуждали все западное, но мне кажется, что большинство хочет ситуацию в России будет лучше чем на Западе.

Я не хочу, чтобы больше чем на Западе?
не - в России будет лучше будущее чем на Западе.

6. Я не совсем согласен. Большинство русских студентов хранят, что Россия должна держать свои собственные культуру. Однако русские студенты интересуют западные языки и отношения, и, кажется, они более...
Очень романтично, но конечно!!! Интернет очень романтично!!!

ну ты прав. Жизнь у меня совсем нет - я только работаю. У меня есть крохот
ну ты прав. Жизнь у меня совсем нет - я только работаю. У меня есть крохот
Это не письмо, потому что студентам нужно заниматься.
неужели?! Но что ты думаете о Рождество - едим, дождь - на улице.
тебя еще во Франции Кришна? Я буду ждать на Рождество в Баку.
У тебя есть кот?

1. Хотя немного ужас в средний класс в России сегодня, и считаю что эти люди не как средний класс в Баку. В России средний класс очень замкнутый, когда на заладе средний класс больше. Значит они не такие и вместе не вместе в Баку. Даже сегодня есть <<еписк усик>> они совсем не средний класс потому что они русские очень богатые. Наверно, средний класс не очень богатый, но они не бедный так).

спасибо многое
Спасибо, Вам!

2. По поводу, люди в России которые называют себя 'средний класс', получает достаточно задач пати, чтобы назвать хорошо. Я считаю, что «новый русский» которые могут путешествовать за границу целым - на этот языке в Баку.

я согласен! Хорошо, Ителка. Спасибо!
APPENDIX 7.4 – OBSERVATION, TRIAL 3

Sample Observation Sheet, Private Dialogues, Activity Descriptions.
Typed for the sake of legibility. Notes were actually hand written.

Date Nov 20 2001
Group 2
Start time 12.06

NOTE – order same as for ?s (numbered slots). No. 4 occurs twice. Yellow 4 should be 5.

File saved start + mins Activity
1 = + 5.00 (Homework?). Stu. refer to paper. T writes and students give oral response.
2 = + 10.00
3 = + 15.00
4 = + 20.00 Paper distributed. Work refers to this (gap filling). As T writes, students in turn give oral responses (suggest words & phrases).
5 = + 25.04
6 = + 30.01 T. writes starter?/statement and provides numbered spaces for the students to type responses in. Stu. all type [Leaves much bigger space this time.]
7 = + 35.00
8 = + 40.00
9 = + 45.00
10 = + 50.00
11 = + 55.00 End lesson
12
Private teacher-student dialogues

Totals
Total 34 instances in 24 sessions. Minutes 15-25 in each session
17 instances took place in just 2 sessions. These were mainly monitoring and management/orienting of students, checking where they were and that they were referring to the correct place/page. Teacher usually walked rapidly round room, pointing at individual student page or screen, continuing to talk to the whole group.

Reasons for individual contact between students and teacher:

| Teacher gives help with functioning of computer or text editor | 13 |
| Teacher manages students; included giving out papers, pointing out correct place or page | 12 |
| Teacher monitors student work | 3 |
| Student asks question, teacher responds | 3 |
| Teacher gives supplementary explanation | 1 |
| Reason not identified | 2 |
| TOTAL | 34 |

Instances logged

<table>
<thead>
<tr>
<th>Session</th>
<th>Instances</th>
<th>Purpose/nature, if identifiable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 03 Group 1</td>
<td>5 + 6 for obs</td>
<td>All problems with nte: how to move text; how to avoid being in someone else's space</td>
</tr>
<tr>
<td>Oct 03 Group 2</td>
<td>(1)</td>
<td>T distributes papers (homework). Talked briefly to individuals about it when giving them theirs.</td>
</tr>
<tr>
<td>Oct 10 Group 1</td>
<td>0</td>
<td>Obs. helps one student (S6)</td>
</tr>
<tr>
<td>Oct 10 Group 2</td>
<td>1</td>
<td>T touches student's keyboard momentarily.</td>
</tr>
<tr>
<td>Oct 10 Group 3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Oct 17 Group 1</td>
<td>3</td>
<td>1 - Initiated by student: question and explanation with gestures and laughter. T leans over computer. 2 - Initiated by student. question and answer/explanation 3 - Brief &quot;aside&quot; explanation</td>
</tr>
<tr>
<td>Oct 17 Group 2</td>
<td>0</td>
<td>Obs. helps student who hasn't used a computer before – 3 times</td>
</tr>
<tr>
<td>Oct 17 Group 3</td>
<td>0</td>
<td>But it's interesting that, when replying to question from T, one student always swings round in the chair to face her. The rest mostly face their computer screens.</td>
</tr>
<tr>
<td>October 24 Group 2</td>
<td>0</td>
<td>Just beyond the 10 minutes a couple need help starting up nte fonts, etc.)</td>
</tr>
<tr>
<td>October 24 Group 3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>October 24 Group 4</td>
<td>9</td>
<td>1 - T points at stu. screen. 2 - T looks over stu shoulder. 3, 4, 5 – points at screen. 6 - T uses stu. keyboard. 7 - T uses stu. mouse and keyboard. 8 - points at screen and speaks to stu. 9 - Stu gets up to look for something by T's computer: brief exchange.</td>
</tr>
<tr>
<td>Nov 14 Group 1 Computers not working</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Group</td>
<td>Action</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Nov 14   | 2      | 8 - T. explaining; gets up and points to page of one student's notes. Talk seems aimed at group, however, and others paying attention.  
|          |        | 2, 3 - T points to page of student notes (identifying what she's talking about?).  
|          |        | 4 - Stu. asks question. Short answer (vocab. or word usage?)  
|          |        | 5 - T walks behind 2 stu. and looks over their shoulders at their work.  
|          |        | 6 - Short aside, and pointing at page, to stu. nearest to her on right (S7)  
|          |        | 7 - Walks round looking over shoulders  
|          |        | 8 - As 6. Short dialogue with stu.                                           |
| Nov 21   | 1      | 0                                                                 |
| Nov 21   | 2      | 0                                                                 |
| Nov 21   | 3      | 2 - 1, 2 - Computer assistance for stu. who has never used computer.     |
| Nov 21   | 4      | 0                                                                 |
| Nov 28   | 1      | 0                                                                 |
| Nov 28   | 2      | 0                                                                 |
| Nov 28   | 3      | 0                                                                 |
| Nov 28   | 4      | 0                                                                 |
| Dec 05   | 1      | (2) - 1 - T. gives out paper to some students (not all), with brief exchanges. But conversation is public.  
|          |        | 2 - T touches stu. keyboard                                               |
| Dec 05   | 2      | 1 - 1 - Gives papers to a few (as prev. group). Seems to be a sheet that not all students have brought to the lesson.  
|          |        | 2 - 1,2 - T. helps stu. who has never used computer by touching keyboard. |
| Dec 05   | 3      | 2                                                                 |
Sample activity descriptions

These are descriptions from observation notes, typed for the sake of legibility.

- S refer to paper (homework?) and give oral responses to T questions. 15 mins
- Paper distributed (gap-filling). As T writes in nte, S in turn give responses (suggest words and phrases) 18 mins
- T writes question/statement and provides numbered spaces for the students to type responses in. T talks and S type. (NOTES: S in No 3 slot has trouble getting Cyrillic keyboard. T gives reminder. Slots need to be modifiable in size. No. 2 runs out of space but can’t make more.) 9 mins (T gives out papers for students to look at while she types in the starter and numbers.)
  1. Tasks for individual response. T types. 2 min 50 sec
  2. S write in numbered slots - examples of use of words discussed in activity 1 - 13 mins
  T + S discuss what S wrote in prev. activity and T writes in nte, S on paper. Turn-taking - each S’s written bit is discussed. 6 mins 30 sec
  As activity 2: S writing in numbered spaces. Some S having dialogue, eg No1 and No 4
  T leads discussion of 4 - 2 mins - leading to
  T giving examples + typing when S give responses.
  1 - As GR2: T initial explanation and then asks S for individual responses which T types. 11 mins.
  2 - AS GR2: S type examples of usage in numbered slots. T talks to individuals and points out general things every so often. Scrolls up and down to monitor student writing.
  Does this activity twice in succession, hence lasts longer than for previous group. 22 mins.
  3 - S. writing but not in allocated spaces. S told to "have a chat, communicate, with each other". Lots of laughing. 12 mins.
  1 - Straight into individual writing. Lots of verbal interaction between students. NOTE: T seems to have typed prompts, ratehr than numbers. S interacting with one another and text. Pairings 138 and 136. 25 mins
  2 - Refer to paper exercise. Not using NTE for this part. Translation/paraphrasing tasks with T. writing possible alternative in NTE. S refer to screen and paper. 12 mins
  1 - Chat as activity 1, previous group (4). Gives rise to more oral comments than other kinds of task. 23 mins.
  2 - Paper reference, (as previous group - 4). T. begins and S respond to questions. Some explanation. 4 Mins.
  3 - S type in numbered slots - give examples of point just explained. Stops to discuss and review at +32.15. T. goes through each person’s and then asks supplementary question and highlights language points. - 9 mins
  Students write in separate areas. Change: Student names used to label each person's working area. (T. explains it’s a new approach to correcting their errors. Each given their own essays, with errors circled and asked to re-write correctly and asked to write examples of correct usage.) T. scrolls up and down, commenting on/discussing with individuals. Uses pointer, voice and occasionally types in a correction. 19 mins.
  Discuss the individual corrected pieces of writing as a whole class. T. types corrections in during this time and also deletes things. See screenshots. 13 mins.
  S get paper-based exercise out. T leads discussion of what part of speech to use (participle). T. writes single words and phrases as suggested by students - ie recording the answers.
  All writing. All interacting. Dialogues? T. adds short questions. S ask questions to get more info. (Games? Ridles? Describe someone famous and others try to guess who it is.) . Some oral "DA" and "No" responses to guesses. Laughter during this activity. 2 S using dictionary. S6 pooint at screen and talks to S7 (laugh). T. someoral comments with S1, then with other individuals.24 mins.
  S refer to preparation (on paper). A blank-filling exercise. S take turns responding to T. questiions - giving their answers. T types. 15 mins
  Follow-up. S read preparation work. T. types key points/words. 5 mins.
  Oral explanation. This is going over work done for homework. ?also revision?? T moves away from computers.. Then back. 3 minutes
  T. to computer. Explains/types and S give responses and S write on paper. 14 mins.
  Handouts (paper) distributed. Tables - prefixes. No change. 8 mins.
  S typing individually - usually single sentences. 16 mins.
  Change to typing in allocated spaces. Describe what you did yesterday, using as many verbs of motion as possible
APPENDIX 7.5 – Student focus groups, Trial 3, Summary

Group discussions - Year 1, Term 2. Students paid £5.00 for taking part. This was used as an acknowledgement that they had given up their time, rather than an inducement to participate.
Tapes: 2 recorders used. Tapes labeled.

Questions discussed
1. The differences between this and classes without a computer
2. What kind of thing the shared text editor is and how it can help language learning - things that work well and don’t work so well
3. Suggestions for the future
4. Any other comments students wanted to make

Responses (including some quotations) are collected under these headings. There is a bit of repetition of points, since some fit under more than one heading. All the points the students make about the shared workspace use in their classes are included.

The differences between this and classes without a computer
"It’s different because everyone has their individual blackboard so there’s less general contact."
But there is:
"More individual contact, with the computers, when we have to write stuff, because then we’ve all got our own colour and she points to it."
"It’s kind of refreshing, it’s not the traditional classroom setting, where you’re all staring at the teacher."

It is difficult to generalize about the interactions with the teacher because the computer class is smaller than it is in lessons without the computer.

They did not agree about talk between students, either the amount that went on or the value of such talk in learning.
"I talk more in a computer class than in an ordinary class."
"I’m the opposite."

When are you most likely to talk to another student?
"When I’m bored."
"When you don’t understand something." This would be either to check with another person, "or to complain."

Most (but not all) thought there was slightly less talk between students in these classes than when they did not have computers.

"There’s much less of us talking between each other. It’s not like a (can’t hear) class." Reason suggested: "You’re more focusing on what you’re doing, really, what’s being written."

Interviewer describes an observation from the lesson – that on occasion they are asked to do something on the computer. Those who are sharing talk to each other. Those who are not sit there but seem to be finding it difficult. Student response: “Yes, it’s true.”

Some thought this reduction in the amount of student-student talk was a good thing:

"Either there’s a good atmosphere or you learn a lot." / "Not both?" / "No."
"When we giggle, we’re not learning."

Another: "I find, the same as in a class, you’re not really supposed to communicate with [one another]."
Interviewer asks for clarification: "So you feel it’s not a proper part of the class?" "It depends which class it is – like a Russian grammar class, no, there’s no communication – when we discuss literature, yes. part of the class."

However, several people agreed that talk between students could be helpful, for example to check with another student when you were not sure of something:

"Listening to other people’s answers sometimes helps because students think differently from teachers and sometimes you can learn from a student’s answer more easily than you can from a teacher’s answer,"
if you can't understand the teacher — not so much in language but in Economics, for instance, that often happens.

"For me, it's [talk is] not important but then I think it's different for older people."

S1: "You build on each other's ideas."

S2: "And you also get confidence from other people."

S1: "And you get reassurance, you feel not the only one that doesn't know the answer."

"We don't agree with each other but we help each other. It's good."

"Everyone gets it wrong, then you feel a bit better about that."

"We sort of shout out everything before we write them down."

The students were asked about non-verbal interactions between students. On the whole, there was not a strong response, but:

"I think we often glance at one another and kind of share some sort of joke, trying to be quiet but not really succeeding. I remember in the last grammar lesson, we had, someone said a very loud answer that was completely wrong."

Reasons suggested to explain this difference were: they were focused on their individual computers; the computers were physically quite distant from one another; the class was smaller.

Less talk:

"We are spaced out. When you're in a class with a lot of people and you're sitting right next to someone, there tends to be more competition(?), even when it's supposed to be studying."

"Less distraction."

"When you [can't hear] the teacher and go on doing your own stuff, there's a bit less of that."

"I agree — with the computers [it's] more concentrated."

"It does concentrate me more, as you're trying to work out ..."

"I think you focus on the teacher in class and when you get distracted, you like to focus somewhere else. So when you've got the computer, you've got two things to focus on already and maybe that's why we're quieter in the computer class."

"This is the smallest class I'm in. Some classes have a disgusting amount of people."

You are "more focused on the computer."

S1: "More focussed, in a way."

S2: "We're more subdued in that class."

S1: "A bit limiting."

But also, two students acknowledge that this might change over time:

S2: "Because it's a novel thing. If we got used to it, maybe it would change."

More talk:

"We talk about what we're doing, while we're doing it, when we're on the computer and when we're in a class and the teacher's asking us to do something, one person's doing it and the others are sitting and listening — OK they talk to each other."

A specific question about the impact of room layout and having their backs to the teacher: it's not a big problem. "You can turn round."

What the shared text editor is and how it helps language learning — things that work well and don't work so well

It is "a multi-user typewriter and you can all see what you're all doing at the same time. That's the key thing."

"Her immediate pointing out and correcting it."

"Immediately, without any movement, being able to [sit down?] and see what all your classmates had written — that was great."

Endings. If you just have to say a word, you can just muffle the endings when you're not sure; but because you have to write it and the teacher can see, you can't do that, you have to spell them out. "Endings are important."

1 "ignore"?
"It's useful for spellings. "Sometimes the teacher says something and I write it down and I'm never sure if I'm right."

They found certain types of activity better than others. There was general agreement that it works best when there is a set of different things to type and you are all allocated one, but write simultaneously. That is better than all doing the same thing simultaneously – which can be "messy". It's also better than taking it in turns to do one thing each (which is slow).

"and more recently, she's had these ready-prepared templates, so we can just plug in the answers, instead of just writing on a blank screen."

"Having a lot of sentences, a lot of things to do and then you do that and you do the next one and then you all look at them, and then we go on to the next one – that's quite useful." Expressing agreement with this: "The last two weeks it's got more useful." They said this was not just getting used to the shared editor but it was a different kind of exercise.

Some suggestion that activities need to be designed for the computer. "Maybe if the exercises we were doing were different on the computer, then there would have been a [can't hear]."

Aware that they are doing exercises which are similar to those done in previous year's without the text editor.

"Maybe it wasn't the actual computer's fault – it could have been what we were doing."

"I didn't think we needed to do it on the computer."

Getting a print out of the work of the whole lesson was useful². "It's definitely necessary to give people a handout or sheet. If you write them down as you go along, that's fine, but you need something to take out, otherwise you're not going to get much from this class". S1 "That is useful." S2 "Yes, we get all concentrated, writing." S1. "You know it's there and you can refer back to it."

But one student also said that you do get handouts in any class. Maybe the difference with the shared editor (potentially) is that students would have control over what is printed and could save it themselves at the end of each lesson. But see note about disc drive on these computers.

"We will get a typed version of some good alternative – whereas if we'd been in a lesson we'd have had to write them down. " "It's definitely that we all get the same." BUT the process can take a long time. Example given was an exercise where (a) the sentences to type had been longer and (b) the exercise itself was more difficult than usual. "It would have been better to do it orally and [the teacher] type the answers into the computer. She can type faster than we can. Then we would have a printout – but we would have had the oral interaction." In agreement with this, another student: "Again, it's about feeding off each other's ideas and getting more confident [instead of] sitting on your own in front of the computer and going, 'I don't know how to do this.'" Asked if this would have been more passive, the answer was that they would be participating actively but orally, not by typing.

Another similar comment was that the difficulty of typing meant that students typed very little in lessons – and less than they would have written in a class without the text editor.

"We don't get to write enough." Interviewer: "Would you have liked to be more active?" "I think so, but [the typing is hard]."

The computers on which students worked had their disk drives disabled. Two questions related to this, about the value of being able to save the work from the lesson and about whether it would have been desirable to input homework text from a disc, were therefore hypothetical. The response was not strong.

Immediate feedback ("her immediate pointing out and correcting") is very useful.

"To have a class and for the teacher to monitor everyone, it's unrealistic to do it without computers. to come round and check everyone, to see whether they've made a mistake."

[One good point is] "the fact that the teacher can check what you're doing, as you're doing it, rather than having to come round and check" but "I think it's got a flip side.

² But because the students' disc drives were disabled, the printout had to be done later, by the teacher. It didn't come directly at the end of a lesson, so didn't seem to be associated very strongly in students' minds with the use of the shared editor.
"When we just use the computer as a superior whiteboard, I've got no problem with it." Speaker compares this with exercises in which students take turns to write single words, which he finds less successful/useful.

When using a conventional classroom whiteboard, the students never write on it, and "in that sense the computers are excellent – Last year we just wrote."

Do they look at what other people have written? When finished – "otherwise I concentrate on what I'm doing".

One student thought the potential of the text editor was to enable the teacher to teach large numbers of people, at a distance.

"She could teach people that aren't in front of her."

**Other points made**

Sharing a computer is not so enjoyable or so good for learning.

"Since we went to a computer each, it's better."

When you have a computer to yourself, "It's way better. Today I was by myself and I feel I learned more. [It's], "having your own space – like, mental space – you're in control. You know you can control it, you can scroll up."

"Today was the first day I've been on my own and it was really great [being able to] choose where you go."

"I hate it [sharing]. Usually the person I share with hogs it." And if you try to share out the typing, to alternate, you waste a lot of time in negotiating and changing over.

Opinions changed over the course of a term. Several people had changed their minds. Having been very doubtful at the start of term, they now enjoyed this class:

"I quite like this class now. I didn't at first."

"When we first started this class, I thought it was a bit of a joke, actually. Because I thought people just came to the computers and started writing ... and I thought this is going to turn into a bit of a circus ... but it's ended up being [can't hear] quite a nice class.

Student who dislikes computers moved from initial horror, thinking it was "ridiculous" to accepting it, although "I don't think the computer is indispensable to what we're doing."

"It's a more interesting class. It can be entertaining. It can be funny."

Time passes quickly (especially when you are not sharing a computer).

"Time goes very quickly in those classes." (Joke that it was because they started late .. laughter). This might be because they are being active: "When you type things and you actually understand more what you're doing – like with the participles, the list of participles we had today – you do feel more involved."

They felt their first reactions had been influenced by their expectations of what a class called Written Russian would be about.

Reactions, likes, dislikes can't be attributed just to the presence or absence of computers. Class size, teaching style (eg degree of formality) or the format of the lessons might be more influential. The fact that this class is quite informal was a factor in students' enjoyment of it. If you don't like a particular type of exercise or lesson, the computer doesn't make that much difference, although "it's a bit better." There was a suggestion that watching Russian Soap Operas, or using a Russian language programme called Masha, might be more useful for learning Russian – then it was acknowledged that this was supposed to be a course in Written Russian.

Although they haven't done a great deal of typing, that isn't the point of the class and they get practice elsewhere, eg. Writing essays.

They were aware that everything they wrote was seen by everyone, but said they were not bothered by it. "Of course I knew but I didn't care."

"Sometimes you're aware of it, but then [door slams] I forgot."

"I wasn't that much [aware]."

"Just slightly. I didn't have this, like, anxiety about it." "Neither did I."

---

3 When asked, all the students said they had had the experience both of sharing a computer and of having one to themselves.
But it could influence the work. You could “wait until one person had done it right and then copy”. The lack of stickers on the keyboards made typing very difficult. Several people also said they would prefer another Russian keyboard layout to the one they were using, which was not the most common/standard layout.

“In the long run, we’re going to have to write essays in Russian.”

Did seeing other students work have advantages? It could do.

“Personally, not, but I can see that other people … to see the mistakes other people make can be interesting.”

They had expectations of what a Russian Writing class was about and they did not expect computers to be involved. “At the beginning we didn’t know what was going to happen”

They and the teacher have got more used to

The class is less formal than some.

They rarely use the “arrow” – the pointer. [disappointing?]

“I like it because you can spin around on the chairs.”

Students’ previous experience and attitudes to computers may influence their response:

“Maybe it’s because I’m terrible at computers and I never use them” and “I’m just really bad with computers. I don’t relate to them at all.” (explaining why didn’t see any particular advantage or strength of the shared editor). This student used the words, “Fiddling around with a computer.”

Suggestions for the future

1. More induction and training would improve things:

This should cover how to use the software - “I still don’t know how to erase stuff.” “The editor is different from any other editor.” (eg. It deletes to the right of the cursor).

It should also cover typing. The Russian keyboard is unfamiliar. Students need to learn to type outside/before the class, maybe the previous year, as typing short extracts and single words during the lessons isn’t enough to teach you this skill. “Once a week isn’t enough.” “It should not be assumed that you can do it”. In the end, the time taken to learn to type in Russian would save time in the lessons and reduce frustration.

“They’ve got two things to learn.” (Typing and the Russian language).

They did not all agree about when the training should be done. Some felt that the first two sessions should have been given over to training but it was also acknowledged that they might have reacted negatively, since this was supposed to be a language class. One suggestion was that the first week of term, “before lessons start properly” would be a good time and everybody should have an hour’s session then.

“Proper” Russian keyboards could be provided. Stickers to go over the keyboard, at the very least, are needed

2. A graphics tablet and pen

This would be good because then you could write words, instead of typing. (Strongly suggested).

3. Better ways to distinguish different participants.

When the group was big, they ran out of colours.

4. A nicer font.

The font is not good enough – it doesn’t look right. Courier isn’t right. Some of the characters are too cramped because it’s not proportional.

The default font size was too small:

“Did you know you could make it bigger?” “But no-body does.”

5. Make it easier to use.

It’s not particularly easy to use. “It feels frustrating to use”. “It’s not the most user-friendly”. An example given was that you could not use the cursor keys to scroll down. If you are used to MS Word, for instance, it’s frustrating and feels old-fashioned (backward). “like the 1940s.”

6. Different ways to distinguish participants.

When the group was large “we ran out of colours”.

In response to a question (Would you like to be able to underline things?) from interviewer – “I think that would be brilliant.”
7. Text communication

S1. "I think it would be good to have some kind of chat between us."
S2. "Hey, yes, a chat room."
APPENDIX 7.6 – Student Questionnaire, Trial 3, Year 2

Aggregation of responses. Comments copied verbatim from student questionnaires (spelling of “grammar” corrected several times). For Section B and Section C, groups are not identified on this response sheet but see also response sheets for each group, with questionnaires.

Section A

1. This question is about your expectations of the Written Russian class. Please list below, in note form, up to three things that are similar to what you expected and up to three things that are different from what you expected.

<table>
<thead>
<tr>
<th>Similar to Expectations</th>
<th>Different from Expectations</th>
<th>No Expectations/didn’t know what to expect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr.1</td>
<td>Gr.1 I thought we would be supposed to write more</td>
<td>Gr.1 I had no definite preconceptions and was unfamiliar with this sort of computer aided learning.</td>
</tr>
<tr>
<td>Write by computer</td>
<td>I thought students would have more input and more work to do.</td>
<td>Gr.2 I didn’t know what to expect.</td>
</tr>
<tr>
<td>Use Russian keyboard</td>
<td>Handouts.</td>
<td>I don’t expect anything (crossed out)</td>
</tr>
<tr>
<td>Interactive (teacher can check while we write)</td>
<td>Had thought there may have been a little more time for actual writing. I assumed written Russian meant creative writing.</td>
<td>I did not know what to expect.</td>
</tr>
<tr>
<td>Most things.</td>
<td>Should be more pupils typing on computers.</td>
<td>We don’t do a great deal of independent typing.</td>
</tr>
<tr>
<td>Gr.2</td>
<td>Gr.2 It’s helped my spelling.</td>
<td>I had no idea what to expect.</td>
</tr>
<tr>
<td>I’ve broadened my vocabulary</td>
<td>It helps me improve my grammar.</td>
<td>Gr.5 I did not have any expectations as this is new to me.</td>
</tr>
<tr>
<td>Writing in Russian</td>
<td>Use of computers</td>
<td>Had no expectations.</td>
</tr>
<tr>
<td>Use of grammar (learning)</td>
<td>Nearly no student communication</td>
<td>Didn’t really have any expectations, since this kind of course was a new thing to me.</td>
</tr>
<tr>
<td>That we had an introduction class to the use of the computers.</td>
<td>Smaller group than expected</td>
<td></td>
</tr>
<tr>
<td>That we are given the chance to compose sentences/paragraphs in Cyrillic on the computers.</td>
<td>Use of Russian texts (ie. books, magazines)</td>
<td></td>
</tr>
<tr>
<td>That there is always someone present to help out with the computers.</td>
<td>Typing has become easier.</td>
<td></td>
</tr>
<tr>
<td>Gr.3</td>
<td>Gr.3 I wish there had been more written work handed in and corrected. Because I am quite a bad typist, the exercises we did towards the end of class were not quite sufficient, I think.</td>
<td>Has actually been useful for grammar.</td>
</tr>
<tr>
<td>Develop my active vocabulary</td>
<td>There are computers.</td>
<td></td>
</tr>
<tr>
<td>Develop my typing skills – Cyrillic alphabet</td>
<td>Smaller class.</td>
<td></td>
</tr>
<tr>
<td>Develop my understanding of various points of Russian grammar.</td>
<td>I thought it would be more practical exercises done directly in a class.</td>
<td></td>
</tr>
<tr>
<td>Programme is much simpler from what I thought, however it’s still difficult to find letters on a keyboard when you need them.</td>
<td>Especially grammar.</td>
<td></td>
</tr>
<tr>
<td>Gr.4</td>
<td>Gr.4 The fact that it’s all on the computer.</td>
<td>Gr.4 The fact that it’s all on the computer.</td>
</tr>
<tr>
<td>The fact that we’re going back on what we’ve been doing in other lessons.</td>
<td>The homework! But this is a good thing.</td>
<td>The homework! But this is a good thing.</td>
</tr>
<tr>
<td>Correction of our work, tight focus on grammar – very good for making us more precise!</td>
<td>However some of the grammar was hard – we have covered all participles now in Russian but the ‘harder’ participles (present active) were only just covered last week in Russian grammar so I did struggle a bit when we did these a month ago in this class. It was good practice though.</td>
<td>However some of the grammar was hard – we have covered all participles now in Russian but the ‘harder’ participles (present active) were only just covered last week in Russian grammar so I did struggle a bit when we did these a month ago in this class. It was good practice though.</td>
</tr>
<tr>
<td>We are learning a big deal of new Russian words.</td>
<td>Working with computers (interesting).</td>
<td></td>
</tr>
<tr>
<td>Gr.5</td>
<td>Less essays than I thought.</td>
<td>Less essays than I thought.</td>
</tr>
<tr>
<td>User friendly programme</td>
<td>Gr.5 Less writing</td>
<td></td>
</tr>
<tr>
<td>Use of computers</td>
<td>Doing it on the computer</td>
<td></td>
</tr>
<tr>
<td>Actually I thought it would be boring (as experienced in high school before), but it is brilliant and so much fun!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asked to paraphrase and vie synonyms and widen vocabulary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HOW THE WRITTEN RUSSIAN LESSONS FIT INTO THE WHOLE LANGUAGE COURSE

Gr.1

It gives us the chance to revise lots of the grammar subjects and vocabulary we are learning.

Helps you to learn synonyms and some grammar items.
Writing is one of the main skills in language learning. The lessons give you practice and the teacher is able to correct spelling and syntax. Classes are interactive, which is unusual if you're writing on your own piece of paper.

It seems to be designed to enable the teacher to correct grammar errors as they are made.

Very helpful, especially the printed handouts we get after classes, what we did in class.

Shows how you to speak Russian and write Russian correctly, with out going to deep into grammar terms.

Gr.2

It helps me to broaden my vocabulary and use the new vocabulary I have learnt.

It helps put into practice the grammar that has been learnt, while also increasing ones skills in their ability to write in Russian.

It fits like a sow’s ear into a silk purse – that is to say ‘snugly’. I would say that it is a nice bit of variety to the other classes – a change of scenario and scenery and therefore most pleasant.

It is the only class where you actively write in Russian, so it is very useful. In addition it overlaps with the grammar class, as there is obviously grammar involved when you write Russian.

In Written Russian you get to use new vocab and grammar you learned (in Aural, Grammar).

Helps all students work on writing skills – especially when asked to answer questions and write quite a long answer. Useful because the teacher can immediately correct mistakes in front of the pupil while he/she is writing. Teacher has more control over students’ written work.

It helps in learning how to type Russian on the computer, and it is also useful when the teacher corrects the mistakes made on the computer.

The Written Russian course is important in developing your typing skills in Cyrillic (especially for future essays). The course also allows you to share your ideas and answers with other class members – and to have them corrected immediately in your presence.

Very useful for use of language.

Helps with grammar, vocabulary, Cyrillic typing.

Not that much writing is going on in the written Russian class. And sometimes it is hard to follow what’s going on.

It consolidates and allows you to practise things you’ve done in other classes.

You learn how to right I (write?) more correctly and precisely, especially making use of new vocabulary. It is excellent for expanding active vocabulary.

You work simultaneously with other students and learn many words covering different subjects.

It is a useful class to practice the writing and realise how well you can express yourself in Russian. And to learn new expressions and the proper spelling of works.

We develop our knowledge of Russian by preparing answers to questions set by the teacher, and then go through these answers in the lesson. The computer helps this by showing spellings. We also write on the computer and are shown our mistakes.

Helps to improve grammar problems.

It deconstructs the texts that we have been looking at in Aural and Written Russian concentrating more on forming the sentences, the syntax and grammar rather than comprehension and vocabulary.

It prepares students for the production of Russian exam.

Reinforce the knowledge I’ve just acquired. Help me correct the mistakes I still produce. Good improver and continuity of what has been done during the previous week and provides variety, allow me to say and write things I couldn’t during a normal class.

Reinforces vocabulary learnt in the other classes and puts into practice grammar learnt with Nick Brown.

3. Compared with other aspects of the Russian language programme, do you find the Written Russian course:

   Tick the most appropriate box.

<table>
<thead>
<tr>
<th>Much easier</th>
<th>A bit easier</th>
<th>About the same</th>
<th>A bit more difficult</th>
<th>Much more difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>x</td>
<td>x x x x x</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Added note (gr3 student, recorded A bit easier): I liked that we were given handouts to prepare at home.
USE MADE OF HANDOUTS
I repeat the new words and learn the examples of the grammar explanation
Exercises are good. Simple and comprehensive reference.
Translate and learn the words
Give you an outline of what we did. Easy to refer to.
I use some of the handouts to help me write my essays.
I haven’t used them yet.
They are useful for reference, especially when writing essays because they contain specific details or examples in sentence structure and grammar.
Revise and get new vocab out of them.
To check corrections grammar wise.
For future reference – useful phrasing/phrases for written work, orals and essays.
Revision/grammar examples.
I always review my notes and put important points into a notebook.
Learn any vocab I don’t know, look at and revise new grammatical forms.
Go through them from time to time to refresh the vocab and grammatical structures.
Test my knowledge of vocabulary
Learn how to spell works; read, write down and try to memorise new expressions.
They come in very useful for the essays and oral presentations – for there are grammatically correct sentences and words we can use.
Re-read them. Check if notes taken during the class were correct and allow me to see and compare each student’s creativeness (without knowing who they actually are, which is probably good).
Good for revising synonyms and vocabulary and picking up useful phrases other students use rather than reinforcing grammar.

GAINS AND LOSSES IF THE SHARED EDITOR WAS NOT USED

<table>
<thead>
<tr>
<th>Gains (things that would be better without the computers)</th>
<th>Losses (things that would be less good or impossible without the computers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typing on this (non-standard) Russian keyboard is too slow and I cannot get enough done. Average about 10 mins per week is not enough to gain necessary skills. Typing errors are confused with grammar errors.</td>
<td>We wouldn’t be able to write as we (should?) do it on a keyboard.</td>
</tr>
<tr>
<td>More class communication.</td>
<td>Would be more difficult to go to sleep</td>
</tr>
<tr>
<td>More written Russian (own effort).</td>
<td>Not as quick. Have to hand in work.</td>
</tr>
<tr>
<td>No comp. (= computer?) skills are needed (typing, knowing how to solve problems).</td>
<td>Time. If the teacher wants every student to write on board, it would take a lot of time for everybody to come up.</td>
</tr>
<tr>
<td>More talking/practising oral and aural skills.</td>
<td>I wouldn’t learn new vocabulary if I didn’t have a computer.</td>
</tr>
<tr>
<td>More time to write because the writing in the computer is slow.</td>
<td>It wouldn’t help my spelling.</td>
</tr>
<tr>
<td>More interaction between students</td>
<td>Able to have a greater opportunity to write</td>
</tr>
<tr>
<td>Faster, as typing in Russian is more difficult and takes longer.</td>
<td>Able to compare with others</td>
</tr>
<tr>
<td>Maybe more work would be done (but then it would probably be less comprehensible too).</td>
<td>Inability to use a Russian keyboard.</td>
</tr>
<tr>
<td>Personally, act of writing out words helps me learn them better. Copying or noting down what teacher says makes me think more rather than teacher typing it and then later receiving the print out.</td>
<td>The (positive) interaction between an individual and teacher would be much slower.</td>
</tr>
</tbody>
</table>

| Everyone writing simultaneously | Being able to see mistakes of individual students and have them corrected. |
| The teacher checking everyone’s work | Everyone writing simultaneously |
| Getting handouts | The teacher checking everyone’s work |
| It would be more difficult for the teacher to correct everything maybe. | Getting handouts |
| Not able to see what everyone else is writing – other ways of phrasing etc. | It would be more difficult for the teacher to correct everything maybe. |
| You can’t share your work with others. | Not able to see what everyone else is writing – other ways of phrasing etc. |
| The teacher wouldn’t be able to make immediate corrections to your work, or while you are present. | You can’t share your work with others. |
| High level of teacher influence. | The teacher wouldn’t be able to make immediate corrections to your work, or while you are present. |
FURTHER COMMENTS

The class is quite fun

| Instant response from professor (except when done orally). |
| Everyone participating |
| Learning to type Cyrillic. |
| Having mistakes easily corrected. |
| I wouldn't have enough time to copy everything from the blackboard, I think. |
| Seeing what other people are writing. |
| I think somehow we pay more attention to the works on the screen than on the blackboard. |
| Learn to type in Russian. |
| To write to each other which is good fun. |
| Would be slower to write all answers on board for each exercise. |
| Interactivity class/teacher |
| Creativeness that does not actually stay personal – class and teacher can read it, correct it, advise me – I can progress! |
| Loss of time – work would have to be handed in and marked individually whereas on computers teacher can check it as you write. |
APPENDIX 7.7 – Teacher Interviews and Written Comments

1. SSEES Written Russian – Notes on pre-course teacher interview

This was not a structured interview. The main purpose was to enable the teacher to explain to the interviewer why she wanted to use the shared text editor, nte.

NOTES:

2nd year ab initio, 1st year post A level.
Written Russian. Text construction, level of word, sentence then paragraph, whole text.
"Shared board" used in PIPVIC trials, distance learning.
Problems with whiteboard in classroom:
  • Constructing texts – not enough space. Have to erase.
  • Messy, especially as students can't write well on board, especially not in Russian script.
  • Students should learn to type. But that's a problem because they still have to hand write in exams, so they still need practice handwriting too.
  • Revision – never know what they are taking away from the lesson. Can't monitor individual writing. Very time-consuming to go through every person's work on board.

Room in library for teaching. With computers.
[we visited the room, so that she could show me]

Room layout isn't quite right.
Not sure how it should be. Will have back to students when talking to them. They will have to face the computer not the teacher.


Tuesday, 2.00. Three groups.
2. Interview with Teacher, Written Russian, mid-point, Year 1

Original tape retained. There is some paraphrasing and repetitions of words have been cut. All points made by the teacher are included - there is no selection.
If the transcriber was in any doubt about the meaning or the point the teacher wanted to make, the exact words are always given. This is indicated by quotation marks. Words inside square brackets - [ ] - have been inserted by the transcriber.

Context: having been introduced to a shared text editor (nte) in distance education trials, the teacher believed it would be useful in her regular teaching. This interview took place at the half-way point in the first term of trying it out. The course was called, Written Russian. Students were second year undergraduates. The lessons were videotaped. Text editor contents were saved and sample screen shots were collected.

T = Teacher. INT = Interviewer

INT - I wanted to chat about how its going [the course], expectations, how it's turned out. Maybe you could start by saying what you hoped for, your motivations?

T - Some time ago I did this distance learning programme and I did find that concept of shared board very effective when I was using it - although when we were doing the course, I don't think we had enough time to explore a lot, so I don't think the other side of the distance learning programme was v. happy, because they had technical problems, they were complaining about the PCs. [Not sure whether she refers to the students or those responsible for the technical side of the trial.] Me as a teacher still had some outcome of it because I thought it a splendid idea to use the computer as a board because as a teacher I find using a proper whiteboard or blackboard ineffective in so many ways. For example, if you do want students to contribute, to classroom work, it's technically difficult to call them up to the board to write things on it and everybody's got different handwriting, especially with Cyrillic and especially with me being not very happy with the board because they do look messy and you have to wipe them off, and it doesn't work and you don't use the right pens and mess it up completely, the whole thing. So I thought it's a great idea.
So I thought my classes in writing, the second year Language Course, I could use the shared board. The thing is, what I've discovered, is "If you do use it as a shared board and don't expect anything else, it does work. If you wanted to use it as a teaching programme, it's a different issue, so you have then to use some other programme(s?), rather than this one we're using, nte".
But so far, "with the things I'm doing, which is v. boring, very rudimental and very probably prehistoric" it still does work, "as I can view as a teacher."

We are doing a couple of exercises we're supposed to do to get ready for their exam - in Written Russian, producing something in Russian. The exercises is the paraphrasing, you have to find synonyms for the words and also, subsequently you have to change the structure of the sentence. That means you work on the level of a word and the level of a sentence, not on the level of a text, which is then probably... would imply using some other computer programme because I wouldn't think it would be that useful.
So, basically, if you do treat it as a shared board, and introduce certain small rules at the beginning, as I've discovered, for example, there's a difference. When you write on a proper board, you use quite big letters and everybody can see it. It took me half a term to realise that it does work more efficiently if they do enlarge the letters. INT - So it wasn't clear that you could enlarge the letters?
T - It was clear, it was just that I was so worried about something else that "I forgot to see what they could see". It means probably more preparation, more working on the problem beforehand.
So if you do use it as a board, as any board, whiteboard or blackboard, it does require some organising, such as agreeing where people write ...if you do agree that everybody's got their own space it then will be more effective.

As a shared board it does work. As a computer teaching programme, it doesn't.

INT - Can I ask you what you mean? If it was a teaching programme, what kinds of things would the students be able to do that they can't on this?

T - I have a desire to move them to the next stage. They are working on the level of the word and the sentence and it does work, we don't mess up the whole screen. But if you want to work on the level of a paragraph, on the level of making a text, I don't think it will work because everybody should see bits of the text and play with bits and construct a paragraph or a text and this sort of programme doesn't give you the potential to do that. So I'm not sure whether I could now move on, to the next stage.

INT - So you're thinking maybe of all the students constructing part of this paragraph and then putting it all together?
T - Yes. Or paragraphs, and then putting them together. Or I would like to give them paragraphs and they put them together or like [can't hear] sentences and they put them together or play with the conjunctions or prepositions, again putting them in the right place.

INT - So that's a limitation of this particular board, this particular programme, that it doesn't let you do that. Any other things that you've found frustrating, that you thought you'd be able to do?

T - Oh yes. It's that the room is not ready for such things. Because we don't have a printer, for example, I can't print out things straight away and distribute them to the students. They still don't have the stickers, of the Cyrillic alphabet,
to stick over the keyboard, and there's something for me, that I'm still not sure about: if you do work with the computer, I don't think then you should give them things on paper. It means, like, double. For instance, I normally give them an exercise. They try to sort it out and come to the class and you discuss everybody's contribution, and then put it on the computer, so ideally, it's got to be on the computer, and they have to study it on the computer. So it does put it on the computer, so ideally, it's got to be on the computer, and they have to study it on the computer. If you're in the middle, they're sitting all round, talking to each other, interacting to you. You start walking teaching programme. We went to your session you did4 and that sounded very nice, that programme, but the only thing is I'm not sure it could deal with Cyrillic, Jim [a colleague at SSEES] was trying to do things with Cyrillic.

INT - So is that another thing? Teaching a language like Russian, which uses a different script, alphabet, is that another thing to sort out? [can't hear]

INT Can I just ask you another couple more questions. [repeats same idea] When you are in the class, does it feel different, teaching when you are using this? What differences are there, do you think?

T - The atmosphere, I don't think the atmosphere differs a lot, though as you probably remember when we started, it was very funny, how people are prejudiced against, even if we didn't use a computer but the computer was in the room, it was something annoying, like something new introduced, why should I do it, when, traditionally I wasn't doing this? You have to know how to introduce this thing to them. Like very gently. Now I've more or less sorted it out for myself, what to say: "if we do need it, we use it, if we don't, we don't". Don't get obliged, or pressurised, to use it. So you have to go from the material, from the tasks you set as a teacher, to the techniques you use, rather than from the techniques, or skills, the potential that the programme offers to your class. Something like additional.

I would think that when you watched the class, you would think that the student - she had no experience at all [of computers] - she's lost. You might think it's because of the computers but she is lost with any class, with any other aspect, she can never find things, a person, the type of student who thinks that everything, that the material is against her. The reaction of students is in no way different. Those who have difficulty with the computer also have difficulty in a traditional setting. Those who want to learn, use it [the computer] in the most effective way and they learn and the people who are normally, you know, a bit confused … so I don't think it adds additional...

The only thing I think is about the paper. They must have either paper or computer.

Using a board, I am at the front of the class. Originally I asked for my computer in the centre of the room. If I want to do something on my computer I turn back to it

At the same time I would be turning back to my board, it's a device and you turn to it. I don't think it's that much different. So there are some things that imply change, it changed the layout, changed the atmosphere [?]. So it took us a few classes but now they seem more comfortable. It's more relaxed.

INT - I'm referring to the lesson where it was half on the computer, half not. Your natural style seems to be to walk towards the students. Sitting at a computer you can't do that. Did you find it a problem, or not?

T - Actually I don't think it is my natural style.

For language teaching, the ideal layout is for the tables in the classroom to be in a circle. The teacher should be in the middle. This room has the potential for that. I would have liked it to be set up like that. I could see them. They could see me. They can see the screen. Then there's no problem. So it would never have been my natural style if it were an ideal world. Unfortunately in our building, that's never the case. Normally you start walking because you can't reach them. If you're in the middle, they're sitting all round, talking to each other, interacting to you. You start walking because they're hiding or they're chatting and you just want to get to them.

INT - Would that sort of layout (I'm drawing a circle) work? [drawing a circle with hands and putting teacher on its circumference]

T - Yes. One of them. A sort of semicircle.

INT - Two things following up points. You were saying, when they are all writing at the same time, you have to draw up some rules about where people should write. Do you think you can just work it out with the class or do you think the programme itself should give everybody a little area?

T - Both. Because you adjust. I'm trying to adjust to the programme. Then you specify, ask the students to use the next line, rather than the line where their cursor stopped ages ago so it's at the top of the page and nobody can see it.

4 Refers to a workshop INT had helped to run, on learning environment tools.
So basically, at the beginning, introduce those rules. But if there is some programme that has a better option … it would be great.

INT - About your students. The impression I get is that no-one is really expert with computers, but some people are quite confident, and there are a few people who rarely use computers.

T - Yes, it's interesting, though. Previously, before I started this, I thought it was the age that mattered. So if you were a mature student you would be less likely to use computers. But this is not the case. We have a few mature students and some used to be business women and they are very familiar with computers. And one of my young students, who I would have thought would be fascinated, is actually quite prejudiced against computers. It's not a question of age, it's a question of personality. Some people like them and some people hate them. That is why you have to be gentle, not insisting on it. That is why all the time I feel, if you do have it as an essential, obligatory, or like a chain of a language course, whether it's fair or not on the students. Because they don't have an option and if they hate it, what would you do? So that is why it has to be combined, or give them an option, or being very gentle with them - I don't know the solution.

INT - Final question. Has it been more work for you, in terms of preparation?
T - It should be. I mean, now, because I'm more relaxed. I'm using the same exercises. Because my class is quite strict and rigorous. "I'm trying to get them to brush up the skills they need for their, aspects of, their so-called production and also comprehension of Russian, exam in written Russian." Because the task is quite small, as such, and not so many skills involved. Basically, I didn't change the exercises from the previous year. That's why they're on the paper.

There is a lot [of work] because, what I do after the class, I edit the thing that they did and put it on a floppy. Yes, it is actually a lot of work. Although, when you've done it once, then it's easier and easier. When you start a new course, on anything, whether it's on the computer or whatever, or a new aspect, there is some work involved. And if it is on the computer, it is probably easier "to operate it", to change things. So probably to start with you've got more work but then in the long run, no.

INT - That covers the things I wanted to ask. Is there anything you think I should have asked you? Anything else that struck you?

T - Wants to know about alternative shared workspace tools. Agree to stop the recording.
3. Written comments from teacher.

This has been processed. No file copy of original, only hard copy. This was originally written in Russian and translated for the teacher. Then it was paraphrased by the researcher for use in a paper. Paraphrased version checked and approved by teacher.

1. May 2001

All parts of the language programme are co-ordinated and share the same text/subject and aim at the same lexical and grammatical task. Thus, the Written Russian course places emphasis on developing skills to create a coherent written text, using the linguistic/background information provided by the rest of the programme. At this stage, students are supposed to be aware of distinctions in certain registers of vocabulary, to a level where they are expected to make the right choice amongst inappropriate words for the type of text they are constructing. From a syntactical point of view a written text is more complex and, at this level, students are meant to learn to form compound and complex sentences (with subordination), to use participle phrases and passive construction, certain grammatical forms characteristic of literary Russian, 'introductory' words (to express attitude) and conjunctions.

It was very important to agree with students on these language learning priorities as, in the case of electronic synchronous discussions, the learners usually demonstrate less syntactic complexity and accuracy, and a more limited lexical range.

First is a paraphrasing task. Students are asked to replace words or phrases in sentences of a paragraph with synonymous Russian construction. They can change the grammar or the vocabulary or both. This type of exercise is included in the Year 1 examination and considered to be useful in preparing the students to acquire summarising skills. These activities aim at enriching vocabulary, teach how to use complex expressions and phrases actively and effectively. Changing a word or phrase almost always leads to changes in the whole structure of the sentence. This type of exercises usually presents a difficulty for students and it is almost impossible to check it in a traditional classroom. In previous years, students were usually asked to do the exercise at home and then the paraphrased sentences were read out or written on the whiteboard and discussed. It was a very time-consuming exercise which participants found boring. In addition, certain points escaped unnoticed and there was never enough time to look through every version of a given sentence. As section 6.1 shows, this activity was felt to be much more successful using the shared editor.

Another important task was very different. A "creative" written task was suggested (to give a description of a typical middle class Russian, for instance). Students worked on this individually. Some students coped with it more quickly than others, in which case they were asked to look through another participant's text. Usually they were asked to concentrate on the linguistic form of the constructed texts and make suggestions about how to improve them. Inevitably, in a classroom, this involves waiting for others to finish, moving and negotiating. It was expected that the shared editor would alleviate these physical problems and enable students to work at their own pace and to see one another's work with less disruption. However, there were some additional, unexpected consequences of using the editor, again described in section 6.1.

2. Additional notes, June 2001

Increase in learners productivity in terms of overall amount of text produced.

The traditional figure of the teacher as authority source and expert is subverted in that the role of the teacher during the electronic discussion is that of a mere participant (Kern, 1995), and Warschauer, 1997). Case of collaborative effort to create texts the situation is similar. In the traditional classroom the teacher is an authority showing the students how to create a text, with shared electronic board the learners are working/creating/collaborating, the teacher is just one of the participants/helpers.

The case of low-motivated unsuccessful I-ge learners am increase in participation in CACD (Ortega). In our case?
APPENDIX 7.1 – Pedagogical Evaluators' Report

This is the report compiled by two of the language teacher expert observers in the ReLaTe project (see Chapter Six, section 6.10.3).

Pedagogical evaluation of the ReLaTe system

Compiled by Marc Georges Nowicki
Edited by Elizabeth Matthews

Contents

I    Introduction
II   Positive features exclusive to ReLaTe
III  ReLaTe's drawbacks
IV   Short term recommendations
V    Relationships between participants
VI   Long term amendments
VII  Conclusions and pedagogical perspectives of ReLaTe

This page condenses the first three pages of the report: title page, contents page and first page of Introduction. The first page of the introduction lists participants by name and has been omitted. This page also gives factual information about the ReLaTe project, which has been given elsewhere in the thesis (Chapter One, section 1.6; Chapter Six, section 6.3.1).

The remainder of the report is the full text, as submitted by the evaluators.
French (advanced, and for business), Latin (beginners) and Portuguese (beginners) were taught as foreign languages at the sites of University College London and Exeter University. Class lengths were 1 hour for Latin and 2 hours for the other languages.

All four skills (speaking; listening; reading; writing) required in language teaching and learning were tested.

The students who participated were all volunteers from a variety of academic disciplines. They were asked to fill in a questionnaire, on the system and its effect on the class, after each session. In addition, classes were observed by assessors, themselves language teachers, who also made brief notes on any technical problems that arose.

The ReLaTe system uses Unix hardware to connect student and teacher via the SuperJANET network. In use it is similar to a conventional PC, but with the addition of a headset and a small, unobtrusive camera. On the screen are:

1. Small frames with live images of the students and the teacher. Headsets allow all participants to be in constant contact with one another. In each frame there is a visual indicator activated by voice, to show who is speaking.
2. The whiteboard (wb) to which all the participants of the class have free access. A series of icons to the right allow choice of colour and font for the writing/drawing tool, to distinguish each participant’s contribution.

The system is easy to use and no previous computer experience is required, though basic familiarity with Windows and mouse operation is helpful.

II. POSITIVE FEATURES EXCLUSIVE TO ReLaTe.

Overcoming distance.
Overcoming distance may not sound striking in a culture of constantly developing computerised networks. However, the ReLaTe system allows live contact between participants in such a way that teaching and learning become highly interactive and intensive. The system is described as remote but, due to the research and development of the audio and video tools, allows all participants to have equal and shared access to all its components.

The whiteboard.
The ReLaTe whiteboard proved to be the most valuable feature of the system: it allows interaction during the class and has potential to one day contain other multimedia elements. So far only the scanner for texts and graphics have been used. The whiteboard is a democratically shared space for expression, learning and research. In contrast to the situation in a classroom, the writing - and explanatory drawings - appearing on the board are not exclusively the domain of the teacher. Indeed, the students were seen to be as active as teachers in this respect.
Interactivity
All participants were able to work together and communicate simultaneously via the headsets and the whiteboard. Oral activity was very high, both for general communication purposes and for specific discussion (in the target language at advanced levels) of the task involved, which could itself be oral or based on written work on the whiteboard. Very high levels of concentration were observed during teaching/learning sessions, with the potential for profound and accurate learning from tasks set during an individual learning session and for development and consolidation of communication skills over an extended period of teaching sessions.

Immediacy
The immediacy of learning and teaching have been identified as great assets specific to ReLaTe. Thanks to the shared whiteboard, the students were very active participants and could receive immediate responses, both orally and in written form, to any queries. The graphic potential of the whiteboard was extremely valuable, allowing the teacher and student to make interventions and amendments as work proceeded. The element of instant and constant feedback was an important aspect of enabling students to make rapid progress and teachers to understand precisely where and why a student had problems of understanding.

Element of play
The element of play and fun seemed inherent in the ReLaTe system, seen by students as a clever device allowing them to be clever. Using it was fun because there were rewarding surprises: the instant spotting of an error, then removing, correcting or replacing it, was encouraging. Drawing was frequently a very valuable additional asset in the teaching/learning process: a simple sketch was often informative and amusing, bringing not only an answer but also a moment of relaxation.

Some examples
Using the ReLaTe system immediately opened up to teachers and students the concentrated interaction and multiple teaching/learning possibilities that it offers. A variety of language tasks was used during the trials, including reading comprehension, explanation and practice of grammar, gap-fill exercises, oral practice and development, vocabulary building, writing and spelling.

1. Gap-fill exercises (French)

The exercises were scanned in or ported to the whiteboard before the class. The student identified the missing word; pronounced it; wrote it in the gap. The resulting word enabled the teacher to test and the student to demonstrate understanding of the grammar of the sentence; understanding of the relationship between how a word sounds and how it is spelled, depending on the grammatical context. Each gap involved the potential for discussion of all points at any stage of the exercises. Discussion involved all participants.
2. Teaching a point of grammar (Portuguese)

Topic: direct and indirect object pronouns. Both the rules and the usage were discussed and practised by means of the whiteboard. The teacher began by converting a sentence with object nouns into its equivalent using the pronoun forms, accompanied by explanations. The class then progressed with the student converting further sentences, with constant discussion of what was involved in terms of gender, number, word order etc. The intensity of practice and comment was such that the grammar point in question was very thoroughly learned.

3. Reading comprehension (French)

A short text was scanned in or ported prior to the class, using one side only of the whiteboard. Discussion was based on both the content and the way access to the content derives from understanding the structures and idioms in the text. The unused side of the whiteboard was used for notes on grammar, synonyms etc, either as previously foreseen by the teacher or as a result of discussion during the teaching session. Contributions could thus be recorded in the form of new vocabulary arising from discussion, brief notes on verb formations, syntax, or points of grammar.

In all cases, the value of the drawing tool to underline linguistic or grammatical relationships, to point to a specific word, enabling others to locate it quickly, to indicate an error prior to removing it, helped give the classes interest, dynamism and a sense of concentrated and efficient learning and teaching. This tool was also used to teach, discuss and practice use of accents and other linguistic signs. At all times in these exercises, graded according to level, all four skills were simultaneously involved, consistent with the level of expertise being developed by the course.

The motivation of students remained high during the trials, even though the high quality audio reported by users as being fundamental to the effectiveness of the classes was not always achieved. The students’ willingness to compensate for this was a very positive element of the trials. However, associated stress and tiredness were also noted, and soon after trials began, a complete break from the workstation, of at least 5 to 10 minutes at the mid-point in the 2 hour session, was implemented.

Overall, teachers and students found the ReLaTe system effective and easy to get used to, making learning and teaching successful and enjoyable.

III. ReLaTe's DRAWBACKS.

These fall in to two distinct categories:

1. Deficiencies of the system at this stage of development.
2. Improvements needed in the environment and not inherent in the system itself.
1. The System.

a. Audio and video quality. Dependence on the network.

The audio quality proved to be the main source of inefficiency of the system and frustration for the participants. Variable quality of sound and the slowing down of the video, at times to the point of complete freezing, were disruptive, tiring and stress generating.

Apart from the quality of headphones and microphones, the two factors responsible for ReLaTe's audio quality:

   a) the audio tool itself
   b) the network

The decision, early in the pre-trials in the summer of 1995, to abandon the "press to talk" mechanism in favour of headsets immediately made communication easier and more effective verbal exchanges were more natural and fluid. Participants quickly progressed from concentrating on whether the communication was actually taking place to concentration on the teaching/learning task, confident in the viability of the system. The audio tool was under constant development during the trials, with excellent levels of audio and video synchronization being achieved by the end of the autumn trials.

However, the bandwidth available on the SuperJANET network cannot be guaranteed, hence the efficacy of the audio and video tools in teaching sessions depended to a large extent on pressure on the network elsewhere. Good quality audio meant that classes were extremely straightforward, with little compensation in listening and speaking needing to be made. Poor quality audio made the difference between a class that was tiring and stressful and a class where work continued via the whiteboard alone. Whatever the reason for poor sound quality, the consequences for the participants were the same: either struggling to carry on with the class, sticking to the original plan of the lesson, or, video allowing, trying to switch to mainly written activities and thus relying less on the sound. Complete breakdown of the link between Exeter and UCL caused two sessions to be abandoned since no communication was possible.

b. The writing tool.

This tool for typing or drawing is triggered by clicking a mouse button. This device was a source of irritating disruptions, with short delays being experienced between clicking for writing and actually seeing typescript on screen. Some of these delays were due to lack of experience. Participants needed to adjust to the fairly sensitive handling required in usage of the mouse. Practice was also needed in dexterity or accuracy when using the drawing tool to insert accents, underline or circle words. It was felt to be awkward and, at times, difficult to activate.
c. Scrolling the pages of the whiteboard.

On several occasions this device, activated by the mouse, proved disruptive. Used to scroll backwards or forwards, at times it was difficult to scroll accurately, sometimes more pages than desired being changed, even when participants were not newcomers to the system.

2. The Environment.

a. The headphones.

The headphones used were too heavy and caused discomfort during sessions that were generally of 2 hours, with a mid-point break. Practical aspects, such as cable lengths between headsets and workstations, at times caused problems, sometimes bringing participants too close to the screen.

b. Telephone link.

In cases of network failure, inability to communicate with the other site can be disconcerting and frustrating. Telephone links are therefore needed in all rooms.

IV. SHORT TERM RECOMMENDATIONS.

1. The System.

a. Further research is needed into the quality of the audio and the frame rate of the video. In a few circumstances the teachers blamed the ReLaTe system when the network was responsible for the poor quality of sound and image. Depending on the development of the infrastructure in the future, it could be interesting to investigate the use of the ReLaTe system with all its present and potential features on a high bandwidth network, which would guarantee a better quality of image and sound.

b. The writing tool. Remove the "phantom click" of the mouse, not only by improving the button/mouse device but also by implementing an electronic pen.

c. Scrolling pages of the whiteboard. Improve the button/mouse device to prevent accidental scrolling of more than one page. Implement key combinations for these operations.

2. The Environment.

a. Replace the present headphones with light, ideally cordless ones.

b. Make sure that there is an easily accessible telephone link between sites and between the actual rooms where the trials are taking place.
V. RELATIONSHIPS BETWEEN PARTICIPANTS

1. Teacher/Students

These were very positive, for the following reasons: the low number of participants during
the trials (4 students maximum, habitually 2 or 3), the interactive nature of teaching/learning
tasks, and the element of play inherent in the system, contributed to the development of close
and effective working relationships between teacher and students.

For the same reasons, teaching and learning were effective and rapid, which strengthened the
relationship. Both teacher and students had equal access to the whiteboard, hence a feeling of
intimacy and shared endeavour developed between teacher and students. This in turn
generated involvement and concentration on both sides.

As far as audio contact is concerned, ReLaTe has the limitations of a telephone conversation.
However, the picture of other participants, whether clear or not, prevents the relationship
from being faceless and psychologically brings it very close to the face-to-face type of
contact.

When using ReLaTe everyone is in visual contact with each other, which is not necessarily
the case in the classroom. This helped establish and maintain contact, concentration and
contributions throughout the sessions. One student's reaction to meeting his "remote" tutor
for the first time at the January discussion meeting was to realise that indeed he already
"knew" his tutor from the remote teaching sessions. This provides anecdotal evidence to
suggest that "remoteness" is merely a description of a physical situation that the technology
overcomes, not of the human context of teaching and learning which it is designed to support.

2. Students/Students

Active participation in a ReLaTe class created similar relationships to those in a classroom in
terms of belonging to a group and participating in the various activities. Obviously, elements
from the classroom, such as physical closeness (which allows eye contact) explanatory
gestures and most of the body language messages, are enhanced by even higher verbal
production and writing/sketching on the whiteboard. Students did this freely during the class,
as well as during breaks when system problems needed attention.

Activities such as role playing and constructing a story in turns brought them closer to one
another. The element of fun, somehow nearly always present, also acted as a good unifying
factor.

There was no feeling of isolation or distance. Each speaker also saw his own face, which
reminded him that he is seen by others. This, after a very short time of adjustment, brought an
awareness of individual responsibility for participation in the class and hence the successful
prosecution of learning and teaching. It was suggested that working alone (ie, participant at
his own workstation) and remotely from other members of the class, gave a sense of not
being scrutinised or overlooked and contributed to lowering the degree of self-consciousness
that can sometimes be a problem in conventional classes.
VI. LONG TERM RECOMMENDATIONS

The experience of the trials has allowed us to realise the potential of the system and thus has helped to identify the areas which would particularly benefit from further developments.

The recommendations refer to two distinct issues:

1. The ReLaTe system.

Using ReLaTe so far, despite a few well-defined technical difficulties, has been pedagogically most encouraging and has created many ideas as to its potential for language teaching. Discussions with users on the future evolution of the system have provided a number of specific ideas:

   Sound and image library.
   Access to audio recordings: pronunciation drills, songs, news, poetry, radio programmes etc. Access to recorded images: video sequences, still images, graphics.

   Files.
   Possibility for students to open their own files for vocabulary, grammar, etc. Also for submitting their homework or retrieving an assignment corrected by the teacher.

   Grammar tables and vocabulary lists.
   To be easily accessible from a drop down menu or an icon.

   Dictionaries.
   Accessible with a click of the mouse or with a key combination, the dictionaries (mono or bilingual, synonyms, etymology, usage etc. - depending on the task) would be most instructive, enlightening and time-saving and could be used not only during the classes but also for preparing homework.

   Timers.
   One device to allow monitoring, either digitally or graphically, of each individual's contributions, including the teacher himself. Another device, along the lines of a stopwatch mechanism, to monitor time allowed for or devoted to different activities.

   Printing out.
   Facility to print out all materials from the whiteboard.

2. The environment, and more specifically the architecture of the ReLaTe workstation.
Accents.
International keyboard, plus key combinations for phonetic symbols and other rarely used linguistic signs.

Recording and playback of the sessions.
To help the absent and latecomers. This would also help teachers to analyse teaching strategies.

Zoom on texts and images.
To help working on texts printed in small characters and analysing graphics.

Writing tool.
Redesign the entire whiteboard interface to make it similar in structure to Microsoft Word for Windows. Main word-processing features such as highlighting would enhance the whole performance. The electronic pen would be also most useful.

Full screen size whiteboard.
For some activities the possibility to enlarge the whiteboard would be helpful, with the option of having the pictures of participants on top or not at all.

Arrow.
Very much the same as the mouse's arrow but with a distinctive colour for each participant.

Enlarged pictures of participants and/or zoom on the lips.
For teaching and correcting pronunciation.

Access to the whiteboard
Allow all participants simultaneous access to the whiteboard at all times.

2. The environment.

Table, shelves, bookstand.
The adaptation of a good computer table to the needs of the users of ReLaTe would relieve some of the problems experienced in managing the space around the workstation. Teachers and students need working space for taking notes, putting down a book or a document. Using materials already scanned in is one of the most powerful features of ReLaTe. However, this does not exclude using, for example, a reference book or a magazine. Ergonomically designed shelves, including, for example, a bookstand on a revolving arm, would be very helpful.

Lighting.
ReLaTe requires specific lighting: the face of the participant has to be well lit, otherwise it will appear dark in the picture on the screens. The space around and behind the user also has to be bright.
VII. CONCLUSIONS AND PEDAGOGICAL PERSPECTIVES OF ReLaTe.

ReLaTe emerges from the recent trials as a valid tool for language teaching. Some of its characteristics are unique and its potential for teaching merits further investigation. It has been interesting to note that the reactions of both teachers and students to the system and the classes taught through it were essentially similar, with the same assets and drawbacks being pointed out.

The ReLaTe system seems ideal for small group tutorials (for languages and for general purposes). It could also be used for lectures with bigger groups where no constant interaction is required or desired, though this would be to lose some of its unique features. Many pedagogical aspects of using ReLaTe, both physical and psychological, have to be studied further. It might be advantageous to arrange separate sessions for teachers to become students, to experience the system from the learner’s point of view, the better to perceive students’ needs. The next series of trials should attempt to define the maximum number of students that it is feasible to teach, at the same time as maintaining the high levels of concentration thus far experienced. In order to measure the effectiveness of the system, further research and evaluation is needed, using closely monitored remote courses and parallel control courses. The levels of motivation, stress and tiredness when using this system would have to be carefully assessed and the length of a class prescribed.

Teaching via ReLaTe is not about improvising. It is necessary to produce an appropriate methodology, taking advantage of all that the system can offer. This will enable ReLaTe to be directed at numerous and different specific needs which the special nature of the whole system’s pace of teaching and learning can most effectively support.

Apart from its purely pedagogical possibilities, ReLaTe can bring to its users flexibility in teaching and learning in both time and place, a factor which should generate further research, not only into developing the system for use on PCs, but also into appropriate teaching methodologies.