The provision of education and training for healthcare professionals through the medium of the internet

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The Provision of Education & Training for Health Care Professionals through the Medium of the Internet

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ABSTRACT

This paper describes a new initiative to provide Internet based courses to student and professional occupational therapists in four centres in the UK, Belgium the Netherlands and Sweden. The basis of this collaborative Occupational Therapy Internet School (OTIS) is the concept of the "Virtual College". This comprises the design and implementation of a sophisticated Internet-based system through which courses can be managed, prepared and delivered online in an effective fashion, and where students can communicate both with the staff and their peers. The aim is to support and facilitate the whole range of educational activities within a remote electronic environment. A major feature of the course organisation is the adoption of a problem-based approach in which students will collaborate internationally to propose effective intervention in given case study scenarios.

The paper outlines the rationale for OTIS, the content and structure of the courseware, the technical specification of the system and evaluation criteria. In addition to the more conventional web-based learning facilities generally offered, a number of agent-based approaches are being adopted to assist in the management of the course by ensuring the proper delivery of course materials and to assist the functioning of project groups.

Keywords

Problem Based Learning, Distance Education, Continuous Professional Development, Occupational Therapy

1 Introduction

Evidence of ongoing competence to practise is now in increasingly high demand

across a broad range of professional service providers. General practitioners and health and social care professionals understandably figure prominently in this category and we have recent well- publicized examples of disastrous blunders that have occurred when competence is not upheld. Most health care professionals are bound by statutory and renewable licensing schemes and there is now a powerful drive to link license renewal to evidence of ongoing study that brings practice up to date. Thus lifelong learning has moved into the general arena as an essential element of proof of competence to practise.

One group of health care professionals, who anticipate that statutory learning will figure in their annual license renewal requirements from 2001 onwards, comprises all members of the British State Registered Occupational Therapists. Like all professional groups of the twenty first century this group is diverse in character and age range. A common factor however is the realization that most group members will have busy professional and personal lives: for them day release courses or ten week programmes of evening classes are no longer a viable option. Flexibility of learning delivery and acquisition is now a key attraction. The course topics that each therapist will wish to study will clearly depend upon individual career pathways and sites of employment. There are however core topics that apply to many practice settings and assistive technology is one such core topic.

1.1 The Occupational Therapist and Assistive Technology

Occupational Therapists, together with other allied health professionals, are at the forefront of rehabilitation teams in their work of enhancing and facilitating independence for people with wide ranging impairments. Occupational therapy remains a notoriously difficult profession to define, largely because of its wide sphere of practice; from cradle to grave, to meet needs of people with a wide range of both physical and psychological impairments, and always in line with a client's environmental and cultural needs. It is accepted that debate concerning definition continues (1), with many erudite writers joining the forum. There is however universal acceptance of basic values or core beliefs which all occupational therapists share, and that recognizes the central concept that a healthy human being will need to carry out personally meaningful activities. This concept of occupational performance is currently defined:

> *Occupational performance refers to the ability to choose, organize, and satisfactorily perform meaningful occupations that are culturally defined and age appropriate for looking after one's self, enjoying life, and contributing to the social and economic fabric of a community.*
>
> (2) 30.

It is not difficult to envisage the vital role that advanced technology plays today, in the therapist's enabling work, to ensure that all clients are able to achieve their highest level of occupational performance, no matter what their level of impairment. Frequently the severity of a client's impairment plays an important part in the sophistication of the assistive devices that are needed to overcome dysfunction. As the millennium approaches, therapists and clients in developed countries are in an enviable position, because advanced technology can be harnessed in an effort to provide a client with a wide range of choice and maximum independent function even when the initial impairment is severe. We see this in such instances as clients with

quadriplegia who are enabled to be independently mobile, driving a high tech. adapted car on the road and a specially modified power chair indoors.

In order for any client to receive maximum assistance from technology it is essential for the therapy team to be fully informed and up to date concerning the options and range of products available. To date it is widely recognized that there has been a failure to exploit the potential of enabling technologies (3). This is due to a number of factors, not least of these being a shortfall in technological awareness among care professionals dealing with clients (4), although amongst occupational therapists this situation is now improving (5). At the initial level then students must be made aware of technology's potential; its possible applications and contraindications which must be considered. At a postgraduate level, therapists in specialist settings need regular updating, to keep their knowledge current. Occupational therapy educators are aware of the enormity of this task. The HEART Report (6) recognized this, whilst advocating that: *"education and training are probably the most efficient ways of influencing the future in any sector of the society"*. This report goes on to recommend:

> *A European curriculum with similarities between the European countries, is of great importance for the development of assistive technology, for addressing the needs of the elderly and disabled and to form a single market in this field,*
>
> (6) 18.

and suggests a model appropriate for both pre and in-service training, which links the user to the environment via the technical components which address communication, mobility, manipulation and orientation.

Occupational Therapy educational programmes are employing an increasingly wide range of methods and media in order to meet both resource and economic constraints and the diverse needs of a broad range of students. Today's undergraduate students may range in age from 18 years to 48 years, with commensurate personal and family responsibilities. Postgraduate students will display an even wider range. Therefore there is a great need for flexible, alternative course delivery strategies to be explored. OTIS is designed with these aims in mind.

1.2 Problem based learning for medical and health professionals

Problem based learning has now been in use for more than twenty-five years and brings many real benefits to health professions' education" (7). Some of the recognised benefits are:

- a deeper approach to learning is encouraged; not merely the learning of taught facts, memorised in order to pass an examination
- integration of knowledge is encouraged, so that the whole patient in his environment is studied, rather than a list of signs and symptoms
- essential core skills are fostered, such as problem solving, communication and team working

The starting point for learning *"should be a problem, a query or puzzle that the learner wishes to solve"* (8). Medical courses which use a formal problem based learning approach are systematic in the way the cases are presented; study is conducted via small groups, each facilitated by a tutor, and face to face feedback sessions are held regularly. The OTIS course, being Internet based, is not appropriate for the formal structure of problem based learning groups. However the concept of a problem solving approach is pertinent and in their professional capacity occupational therapists do this most of the time. Hagedorn (9) makes some important comments about the problem-solving model, which are relevant to the OTIS cases:

> *The problem solving process is a conscious attempt to avoid the assumptions and blinkered thinking which may be inherent in other models, and to view the patient holistically and objectively before deciding on the nature of the problem and how (or if) to treat it ..... One of the features ….. .is that it may highlight that the 'problem' does not lie with the patient, but with her physical or social environment.*
>
> (9) 50.

2 Rationale for OTIS

Many educational institutions are now recognising the potential of the Internet in the marketing and delivery of education and training (for example (10)). The flexibility and immediacy of the delivery mechanism allows new learning paradigms to be developed that can be radically different from existing arrangements for either local or distance delivery. In the particular model developed for the Internet School, the objective is to develop professional skills through problem solving in groups with members from different countries and backgrounds, enhancing the learning experience for all participants.

Some of the advantages in offering courses through the Internet School are:

- The ability for participating institutions to brand and market an extensive portfolio of attractive courses as their own;
- Liaison among the teaching staff of the networked universities;
- Accreditation of course and individual modules in each of the networked states;
- Offering the course to students outside the normal geographic and subject catchment areas of the networked universities,
- Making courses viable that could not otherwise run;
- Combined promotional activities among the networked universities;
- Sharing expertise of educationalists

It is recognised that different educational consortia may wish to collaborate in different ways and the aim is for OTIS to provide a flexible structure to allow Internet Schools to be constituted according to the requirements of the user institutions. In the present case, the school will be 'directed' by a partner that was recognised as a leader in the particular domain. The other partners within the network enrol students from their own catchment area and provide tutorial support to these students. Within this,

one scenario could see students buying the courses from their 'local' university that in turn purchased the course from the course director. An alternative scenario could see the student purchasing directly from the course director that in turn would pay for 'local' tutoring support. Both scenarios are fully supported in the OTIS environment.

3 The Basic Architecture for an Internet School

The prototype Internet School consists of four universities interconnected via the Internet. The current configuration is shown in Figure 1. Students are able to access the Internet School either from within a university using the normal routes to the Internet or from outside using a dial-up connection to an Internet service provider. This allows students and staff to participate in the same groups, whether they are working locally or from either home or work. All that is required is an Internet connection to the Internet School Server (currently in Liverpool). The four universities currently taking part have comprehensive network infrastructures already installed specifically for teaching purposes and internal students are using these facilities effectively. A major feature of the next stage of the project when students will be using the Internet School to study, as part of their assessment for the award of a degree or other qualification is that a significant number of participants will work independently. This will allow us to further evaluate the requirements for active participation over the Internet.

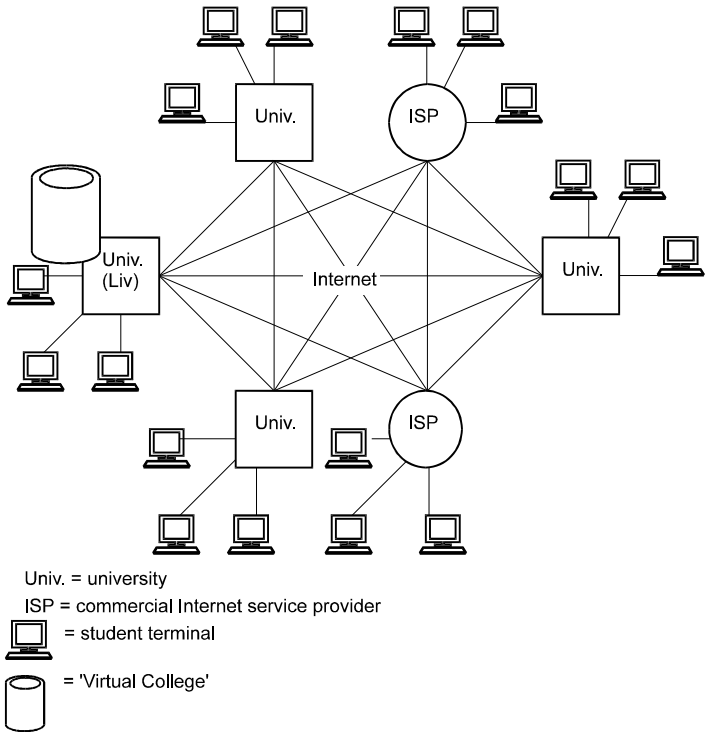

Figure 1: The Internet School Network

The overall structure of the current system is shown in Figure 2. The applications involved fall into two major categories:

- those required to provide the student and tutor interfaces
- those required for the effective management and administration of courses

We are currently concentrating on the first, which is critically important to the acceptance of the OTIS concept. Groups need to communicate if they are to work together effectively.

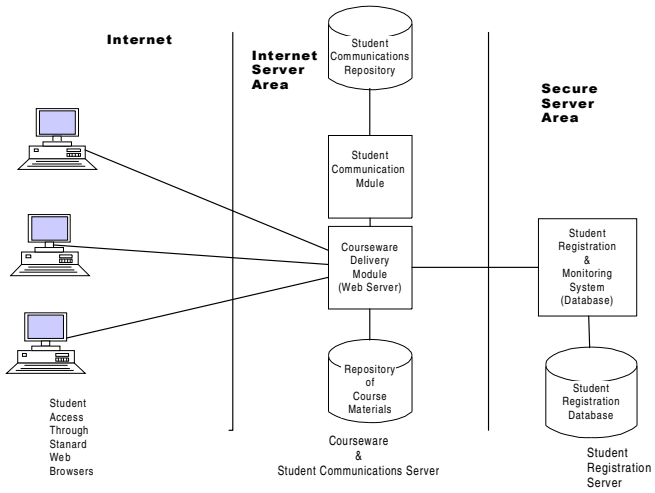

Figure 2. OTIS Software Configuration

3.1 Developing the Interface

There are a number of models for supporting this in the educational context. Two were considered in some detail and simple prototypes were developed so that student reaction could be assessed. These were:

- A set of shared and individual folders that could be accessed through a web interface and participants could participate by calling online meetings, specifying the participants
- A more interactive system, based on the technology used for distributed multi-player adventure game that provided the means for students and teachers to meet both formally and informally by entering the same location or room within the learning environment.

Initial experiments used the shared information spaces model, where students could leave documents; Web links etc., in a hierarchical structure of folders and comment on their own and other students documents by way of annotations. This allowed a fully documented discussion to be built up and tutors could see immediately how the group were developing the project, and whether everyone was contributing fully. Meetings could be arranged through special folders and all the documents associated with them collected in the same place, for use by all the participants. The plan was to arrange tutorial sessions with simulated subjects and to provide the support material in the form of briefing notes in the same place. This proved to be very unpopular with a trial group of students even though the supporting software (BSCW (11)) is widely used to support collaborative working environments. Students were concerned about the lack of information as to who was in close proximity and could see what they were currently doing, without their knowledge. This is often called ‘lurking’ and

could be used as a strategy for other groups to overhear what was happening. A positive sense of who could 'listen' to current conversations was considered essential.

The same group was also presented with another paradigm, that of virtual rooms, with different course activities in each one. Interaction was between individuals within a room, although a paging mechanism was also provided that could be used to call other participants to a particular location, or to conduct one-to-one private conversations. Access controls were visualised as who could enter each room. In these early pilots the only communication available was a 'chat' window as part of the Internet interface and a small typing window through which participants could send their contributions. Feedback as to who could listen was provided by information messages as to who entered or left the room, and pop-up windows giving lists of the occupants of the current room and all currently active members. Conversations could be recorded for personal purposes, so that records could be maintained for future study and analysis. This simple model has proved very effective with occupational therapy students, and was considered very highly in a recent more extended pilot session. The initial trial was based on the CoMentor software package (12) and this has been adopted for further development.

CoMentor was always only intended by its authors to support the communication aspects of the course activities. Its interfaces to static course materials are therefore comparatively weak. Also, all communication is text based, students typing messages to each other in chat boxes. This minimises the network bandwidth required, but may not be sufficient for some of the applications proposed within the OTIS environment. A major requirement for the OTIS system is for students to locate, discuss and evaluate both local course materials and information obtained over the Internet to establish the most appropriate answers to the set case studies. This has led to considerable development effort to ensure that these materials can be collated effectively by each student group so that a coherent answer. The same mechanism is used to allow the incorporation of audio and visual material into the course materials to enhance the presentation of the course materials. This has further been enhanced by providing facilities for both tutors and students to role-play the subjects (and other significant parties) in each of the case studies.

Opportunities also exist to exploit the full functionality of current, commercially available Internet applications. These additional services can be provided through standard helpers, such as Microsoft NetMeeting for inter-group communication. Various ways of incorporating this are currently being investigated, including the provision of special meeting rooms, but this has been found too restrictive. A mechanism is currently being developed that will allow video meetings to roam through the OTIS virtual course, allowing participants to view the associated materials as they discuss them online. Associated with this facility will be individual virtual diaries so that both students and tutors will have ready access to their online commitments.

4 Developing the System

The pilots that have already taken place indicate that the geographic metaphor of the learning space is highly effective, but that considerable care is required in its design

and presentation, if the students are to use it to its full extent. The base system, built over CoMentor (12) had only a limited number of locations, some with confusing functionality within the context of the OTIS pilot course. This has been considerably enhanced to provide a much greater variety of working areas, as shown in the map in Figure 3. These have intentionally been defined to be generic, so that the same map can be used as a basis for further courses. Another development has been the development of a standard set of 'furniture' that can readily be used to add functionality to different rooms, rather than have to build it into the room infrastructure itself. An example is the provision of notice boards etc. This is now a standard component that can be used anywhere that it is considered necessary for students and/or tutors to leave messages. Not only does this make it much easier to provide the required functionality wherever it is needed, but the human interface is very much improved as it behaves in a standard way. Areas can also be modified very rapidly if necessary, in response to feedback from both staff and students.

Figure 3: The Map of the OTIS Virtual World

Table 1 gives the set of rooms as currently defined. The principal rooms are shown on the Map around the main entrance area. Supplementary rooms such as consultation rooms and the exhibition area are reached through corridors off the main area. This allows the maps of these corridors to be generated dynamically, so that only those rooms currently active are displayed to the student. An example this is a virtual exhibition area where suppliers of occupational therapy equipment can display their products and services. Both staff and students can enter these virtual booths and discuss the display, either openly with the company, or simply between themselves and leave messages. A company representative may be available at certain times for online discussion, or appointments can be arranged for virtual consultations. Since the contents of the booth are specified in HTML and Web Links Companies are able to present a wealth of multimedia material, and provide links to other online resources to demonstrate their wares.

A similar model is used for online consultations, where students can enter a consultation room, and review the collected material, which includes written case notes, recordings of interviews etc. They can then conduct an online consultation

with a ‘virtual patient’ in the form of a tutor (or possibly a student) role-playing that character.

Figure 4 shows a typical student interface to the OTIS environment. On the left are a number of areas giving information and course materials, and the right hand areas deal with communication with other students and tutors. The picture on the top left changes to show the current location, and acts as an active map in most areas. In the entrance hall this is simply the map of the OTIS world, and allows access to all the requisite rooms. Each room is ‘furnished’ with the appropriate facilities for the work to be undertaken in it. To the right of this is a menu, giving access to the materials in the current room. This allows students to select material, as they require it simply, and effectively. Once it has been selected, it is displayed in the lower window. Navigation out of the room is by means of the picture. Clicking on the various doors takes you back either to the main circulating area or to various ‘corridors’ that give access to more specific areas.

Students prepare their work in their own study areas and can ‘open’ the doors for review by both tutors and other students of particular pieces of work when they are ready. This gives the opportunity for peer review, allowing other members of the group or specified reviewers to comment on it before it is forwarded for formal assessment. Once the work is ready for submission, it is transferred to the tutor’s work area ready for marking. The tutor can discuss the work online, or through electronic mail, and will eventually return the marked work to the student. Assessments have to be submitted within a specified window, and are acknowledged automatically.

Room	Functionality
Entrance Hall	The first room encountered on logging in. This room will contain the Notice Board and 'blackboard' for important messages of the day
Library	Room containing the tutors' resource materials
Resources	Materials discovered/deposited by students. This is built up during a particular course, and cleared at the end.
Meeting rooms	Meeting rooms for students, tutors and others. These rooms are created dynamically when meetings are arranged, and disappear shortly after that meeting has finished. This allows any necessary documents to be collected in the room to be discussed during the meeting, and for them to be collected and stored permanently after it has been completed.
Patient Consultation Room	A room where virtual consultations are held with patients. These rooms contain various types of information about the subjects of the case studies, and other relevant people, such as relatives, carers etc. Once this material has been reviewed, students can conduct online 'virtual consultations' with tutors (or students) role-playing the major characters.
Exhibition area	An area where company representatives (and others) can display posters and other material either for the duration of the course or for a more limited period. The representatives can define times when they will 'man' their area, and can meet students and tutors here, so that they can discuss their posters and provide additional information.
Computer Help Desk	An area allowing students to access technical documents and on-line technical tutorials. This is also where problems are reported, and a general queries and answers list is built up over the course of the course. The area may be manned by technical staff from time to time
Student Café	A students-only area permitting informal discussions between different groupings of people, who are online at the same time, and wish to join in, by entering the room.
Staff common room	A tutors-only area permitting online discussions that can not be overheard by students
Personal Workspace	The student's desk, giving individual access to email, portfolio etc.

Table 1: The Current Set of Rooms in the OTIS Virtual World

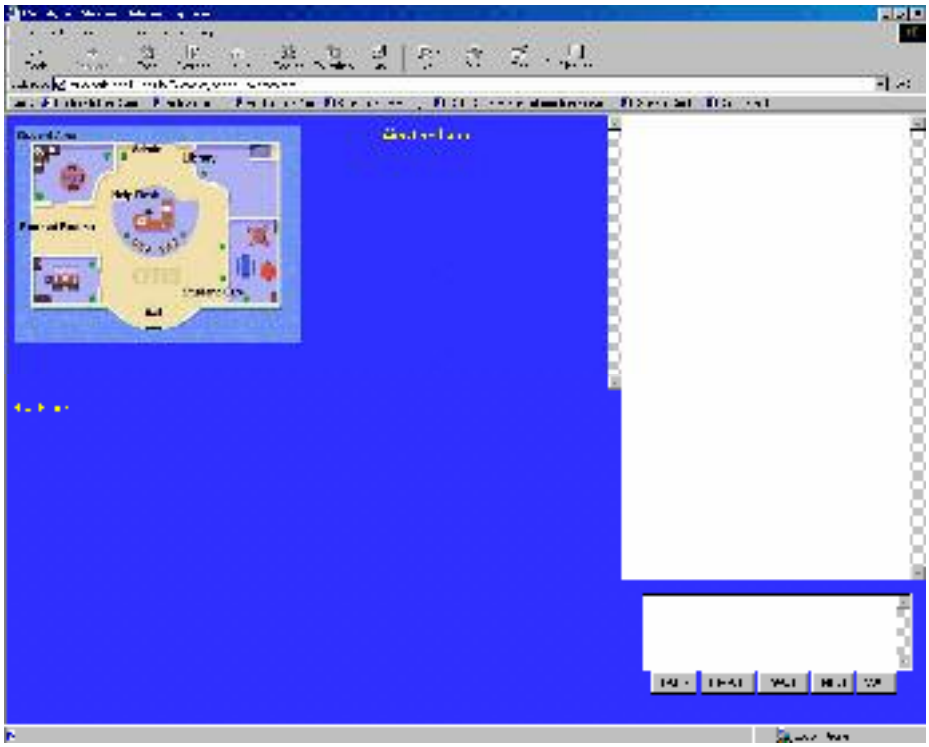

Figure 4: The Student Interface to the OTIS environment

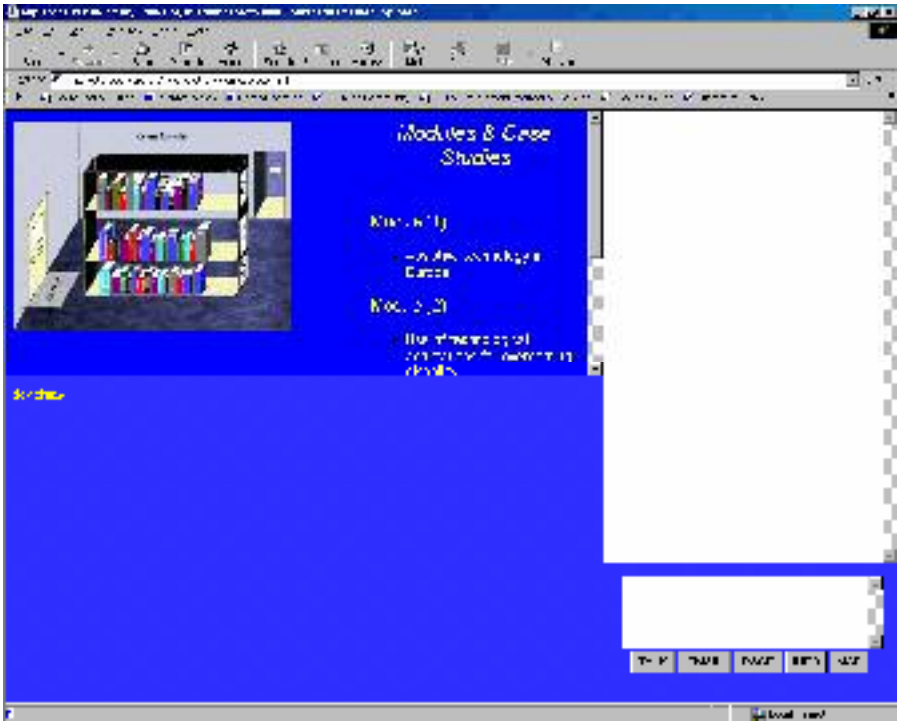

Figure 5: The Library Interface

An example of the more specific interface is the Library, where student can study a range of learning resources specific to the course. This interface is shown in Figure 5. The map has changed to a picture of a library and students can select subject areas to study by clicking on the appropriate shelf. A list of the materials available is then displayed in the menu window. These can be selected and displayed in the lower left-hand area of the window.

All the communications facilities are concentrated on the right of the screen. The large area at the top right is the display area where messages are viewed during conversations. These can be scrolled forward and backward so that the whole conversation can be readily viewed. Below is an area into which one's own messages can be typed. The buttons allow you to choose the recipients of the message, as shown in Table 2.

Button	Action
Talk	Send the typed messages to all participants in the same room. A popup window shows you who is in the same room and will therefore receive the message. This is the normal means of communicating between groups of participants with similar interests.
Page	Send the message to one or more recipients who are currently active within the course world. They can be anywhere, not just within the same room. A popup window allows you to select whom to page from those participants that are currently online. This is the usual way to call members of the group together so that they can take part in a group discussion.
Mail	The message is sent to the selected users' mail area. It may be read by the recipient in their private study area, or they can select to have it forwarded to an external electronic mail account, in which case they can read it in the normal way from that account. Again, a popup menu allows the selection of the recipients from all those participants who have current mail access.
Info	A popup window gives some basic hypertext help on using the system.
Map	Causes the map to be displayed immediately, allowing rapid traversal to a desired location, for example in response to a page request to join a meeting.

Table 2: The OTIS Control Buttons

5 Further Work

Designing and implementing the virtual course world is currently a complex task, involving both computing specialists and occupational therapists. Much handcrafting is currently required to build the environment. This is because there are no clear divisions between the core system, the overall geography of the OTIS world and the course materials. If students are to navigate this world effectively, one would expect that the geography should be closely related to the course structure, and so should be readily configurable by the subject specialists. Some progress has been made, but considerable further work is required before this could possibly be achieved.

Students can find an online learning environment highly intimidating, and there is a major role for 'helpers' of various forms to assist when needed. These can be tutors, but it is often very difficult for a student to find a tutor when they need one. Tutors are only available online at certain times, and these may not suit the other

commitments of a particular student group. This is a particular problem when specific expertise is required and deadlines loom. The virtual environment is no different in that respect than the traditional academic department. Tutors also need to spend significant time monitoring groups and counseling those that are not functioning in various ways. Much of this can be done using agent technology, interacting with both the student and the learning environment (13).

There is also a role for more mobile agents that can explore the world, reporting back on changes and useful material \that would otherwise been overlooked. This gives many opportunities to develop complex relationships between students, tutors and the mobile agents that all populate the OTIS world. We then come to the issues of crowd control. Even within quite limited trials, students have reported being distracted by unintended interactions with other participants in some of the more central areas. This can be alleviated to a certain extent by dividing these areas more effectively, but as the number of OTIS students increase, will inevitably arise again. Social protocols are again needed to ensure appropriate behavior in all areas.

6 Conclusions

Construction of the OTIS environment has entailed a considerable effort in many different areas. This has allowed us to develop a rich distance-learning environment that can support the learning requirements of a highly practical and widely dispersed group of students. The technical solutions have been developed, initially to meet the business requirements of the Internet School model, and more recently in response to the more specific requirements of the Occupational therapy course as they have emerged through course development. The rapid lowering of cost of relatively high-speed internet access to homes throughout Europe will provide many more opportunities to deliver courses such as this more effectively using a richer mix of multimedia materials. In the meantime, the more network intensive materials can be distributed separately on CD-ROMs, so that there are not unnecessary delays in delivery that would make collaboration very difficult. This can only be an interim solution as the immediacy of real-time presentation is lost.

The OTIS project shows that it is possible for students to undertake group learning using problem-based learning techniques when spread over different countries. The current OTIS pilot aims to show that this can be done with reasonable sized classes over the extended periods required for award bearing courses. The distributed nature of the student population means that all support has to be online, and if groups are to gain from the differing experiences across Europe, a high level of online interaction is required. These requirements put major

Acknowledgement

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