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From the editor ..

Welcome to the January 2001 issue of *Learning Technology*. The newsletter is aimed to provide not only the report of various activities which are undertaken by IEEE Learning Technology Task Force (LTTF) but also document the latest happening in the world of advanced learning technologies.

We had a very successful first event of LTTF - the IEEE International Workshop on Advanced Learning Technologies, New Zealand (http://lttf.ieee.org/iwalt2000/). The proceedings can be ordered at the website. Photos and various presentation slides are also available there.

The next event in this series will be held at Madison, USA during August 6-8, 2001. The call for papers is included in this newsletter. The website of the event is http://lttf.ieee.org/icalt2001/.

We have also managed to get FREE MEMBERSHIP FORM for Learning Technology Task Force on LTTF website. Please complete the form at: http://lttf.ieee.org/join.htm.

Besides, I invite you to contribute your own work in progress, project reports, case studies, and events announcements in this newsletter. For more details, please refer author guidelines at http://www.ieeetclt.org/content/authors-guidelines.

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International Conference on Advanced Learning Technologies (ICALT 2001) (Call For Submissions)

6-8 August 2001   Madison, Wisconsin, USA
http://lttf.ieee.org/icalt2001/

Proceedings published by:
IEEE Computer Society

Conference Theme
"Advanced Learning Technologies: Issues, Achievements and Challenges"

The rapidly increasing interest in advanced learning technologies provide many challenges to those engaged in research and development. On the one hand the capabilities of digital technologies in providing and contributing to learning environments are opening up new approaches that utilise, for example, multimedia, virtuality and collaborative methods of knowledge management. On the other hand the changing and increasing demands of education in this technological age require practical techniques and applications that benefit a wider range of abilities, learning styles and organisations.

Where should the computer be placed in these developments and what roles should it undertake in learning environments? What theories and representations should underpin research and what are the fruitful directions to follow and exploit? How should the adaptive intelligences of computing systems and teachers/students interact and collaborate? What pedagogies are appropriate and useful to guide applications and what tools and media are required for developers, teachers and students? Also evaluation is an important but often neglected issue, but what methods are appropriate to provide guidance and empowerment to these advances in learning technologies and their implementations?

ICALT 2001 invites submissions with a good theoretical base or formalism that present new, yet unpublished, solid achievements based on experiments, that come to answer concretely one or more of the questions above or can point to possible answers. Survey papers are also accepted, if they are well documented, make a contribution to the field, and reveal new aspects and perspectives, as well as future directions.

Submission Deadlines:

Friday 9 February 2001:	Workshop proposal submission
Friday 16 February 2001:	Paper submission
Friday 16 February 2001:	Tutorial proposal submission

Submission Information:

Details on submisison procedure are available on the conference website: **http://lttf.ieee.org/icalt2001/**

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The Inquiry Page: A Collaboratory for Curricular Innovation

The Inquiry Page is a web site for collaborative curriculum development. It supports a range of activities in which educators are encouraged to investigate, create, discuss, and reflect. Teachers inquire through their access to resources on teaching and learning, including quotes about inquiry teaching, articles, project links, curriculum units, and content resources. They communicate with other teachers through various online communication media. They construct their own versions of curricula using an online inquiry unit generator. They express themselves through these units and through sharing both literal and textual photos of their classrooms.

Background

All learning begins with the learner. What children know and what they want to learn are not just constraints on what can be taught; they are the very foundation for learning. Dewey's description of the four primary interests of the learner are still appropriate starting points: inquiry, or investigation--the child's natural desire to learn; communication--the propensity to enter into social relationships; construction--the delight in creating things; and expression, or reflection--the desire to extract meaning from experience. Dewey saw these as the natural resources, the uninvested capital, "upon the exercise of which depends the active growth of the child."

But, as Dewey recognized, schooling is not just about the individual. It is the coming together of the child's interests with those of the society. The disciplines we study in school represent centuries of collective thought as well as the interests of the larger community in maintaining itself by communicating its knowledge and values to the next generation. The Inquiry Page < http://inquiry.uiuc.edu/> is about how teachers weave a learner's interests with those of society. It does this by supporting teachers as they share their successes and their collective expertise (Bruce & Davidson, 1996; Bruce & Easley, 2000). The page currently supports teachers and learners of all ages and curricular areas.

Inquiry Units

The Inquiry Page fosters the online creation of Inquiry Units by teachers (or students). Each unit starts with a guiding question and provides a space for activities of Investigation, Creation, Discussion, and Reflection. The user fills out a web-based form that leads to an XML-formatted data structure. When the unit is called up again by the same, or another user, a dynamic HTML file is generated. The latter can be used by students as they conduct their inquiry. In addition, students can edit a copy of the unit, thus using the curriculum Inquiry Unit as a place for their own work.

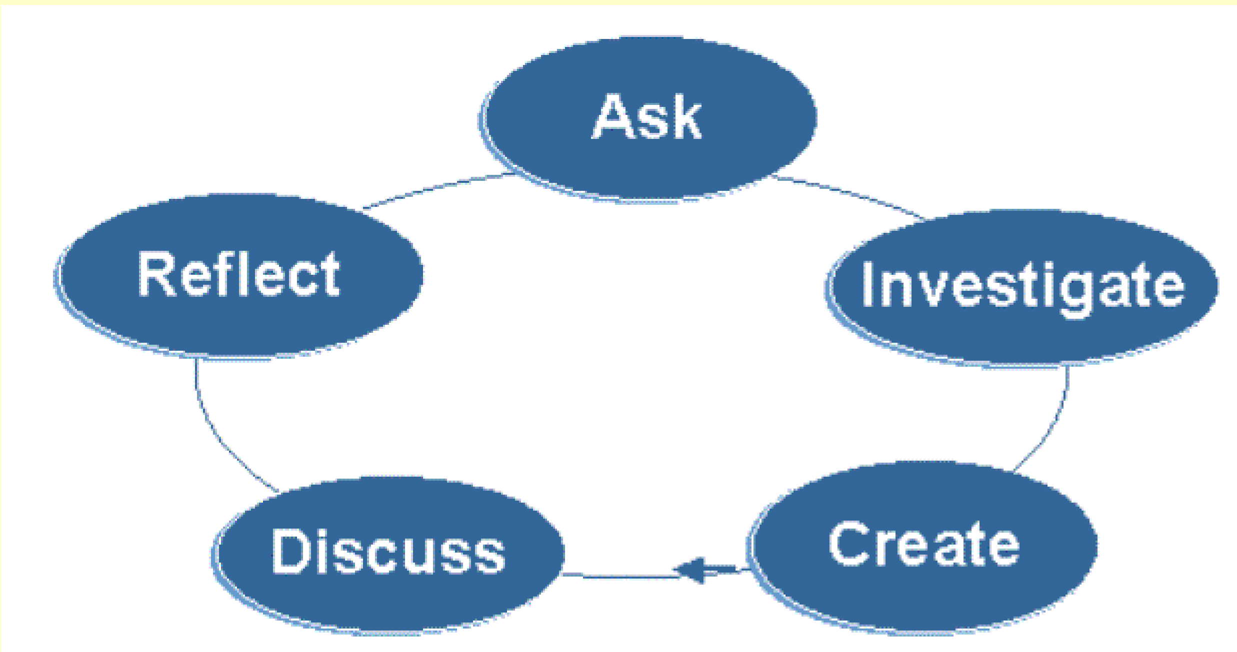

Figure 1. The inquiry cycle used to enter Inquiry Units.

The cycle employed in the Inquiry Page unit generator presents an idealized model for inquiry, not to constrain our account of inquiry, but rather to serve as a reminder of the range of activities that might be involved. The danger in any description of a process is that the reader may infer that that description is the only, or the ideal, form of that process; or, that the aspects of the process are steps to go through in some linear fashion. The intention here is not to specify the only, or the ideal process. Nor is it to identify rigid steps to follow in doing inquiry. Instead, it is to present in an organized way some of the important aspects of inquiry that might be supported in a successful learning environment. Inquiry often leads to new ideas, results, theories, questions, etc. that can be communicated with others. This communication is central to the whole inquiry process and our classroom environments ought to have a place for it.

Some Elements of the Inquiry Page

Quote of the Day: A collection of writings on teaching and learning, with a special emphasis on those that expand our conception of what learning can be.

Links to Resources: A dynamic incorporation (using Digital Windmill) of the Open Directory category: Reference: Education: Learning Theories: Inquiry Based Learning. This category is edited by the Inquiry Page development group.

Evaluating Inquiry Instruction: A web page linking to articles, presentations, and other resources regarding the special issues of evaluating inquiry-based learning.

Inquiry Units: A searchable data base of units for inquiry-based instruction across grade levels and subjects.

Inquiry Partners: A growing collection of partner projects, courses, and schools.

Conclusion

We welcome your feedback, your contributions of Inquiry Units, and your inquiries regarding participation in the Inquiry Page project.

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Using Active Worlds Technology to Build an 'iUniverse' of 3-D Collaborative Learning Environments

Abstract

Today's digital revolution and the rapid development of the Internet affect every major field of human knowledge and ultimately the way we teach and learn. Large amounts of human knowledge are available online – in the form of text and images but also as audio files, 3-D models, video files etc. 2-D Web interfaces are equipped with more and more plugins to access these different data formats. Research and teaching projects become collaborative efforts that bring people with different skills and expertise together. Domain experts are often spread out in space and time zones and consultation and collaboration has to proceed remotely instead of face-to-face. What is needed are learning and teaching environments that allow people to exploit multi-modal data, that are accessible anywhere, any time, and that support student-student and student-instructor collaborations efficiently. Here we report the design of different multi-modal, collaborative 3-D online Learning Environments that are interconnected with standard web pages.

The Learning Environments are part of an evolving collaborative information universe at Indiana University. They are inhabited by avatars (acting as placeholders for human users) and provide means for interacting with objects in the environment, with embedded information sources and services, and with other users and visitors of the environment.

3-D Online Browser

Today, different browser systems can be used to design 3-D Online Learning Environments. To find the best and most versatile to use with students that have no prior programming knowledge we examined The Palace (www.thepalace.com), Blaxxun's online community client-server architecture (www.blaxxun.com/community), Microsoft's Virtual Worlds Platform (http://www.vworlds.org/), and Active Worlds technology (AWT) by Activeworlds.com, Inc. (http://www.activeworlds.com/). Active Worlds technology was superior in that it

- Runs on a PC or MAC (running PC emulation software),
- Provides quick and convenient download and installation,
- Provides 3-D graphics, high quality audio and video grabs,
- Has real-time, object-based construction that requires no programming knowledge,
- Is a multi-user environment in which users are represented by avatars, and
- Is extremely easy to use but can be connected with external programs to satisfy most needs.

AWT is different from most 3-D systems in that its environments are created entirely online. "Bots" can be used to control the building of objects and backup worlds, offer contextual help by recognizing words from chat texts and triggering automatic responses, interface with the internet - download web pages, read relevant information, generate web pages on the fly and submitting them, monitor chat text for appropriate content and eject offenders, and many other purposes.

Last but not least, AWT is a widely used system. The Active Worlds Universe is home to hundreds of thousands of users and millions of kilometers of virtual territory. Active Worlds Educational Universe comprises more than one hundred worlds, each of which is dedicated to the exploration of educational applications of this technology.

Figure 1 shows the Active Worlds Browser interface. It provides a "List of worlds and teleports" for easy navigation on the left hand side, a 3-D virtual reality window and a chat window in the middle, and a Web Browser Window on the right hand side.

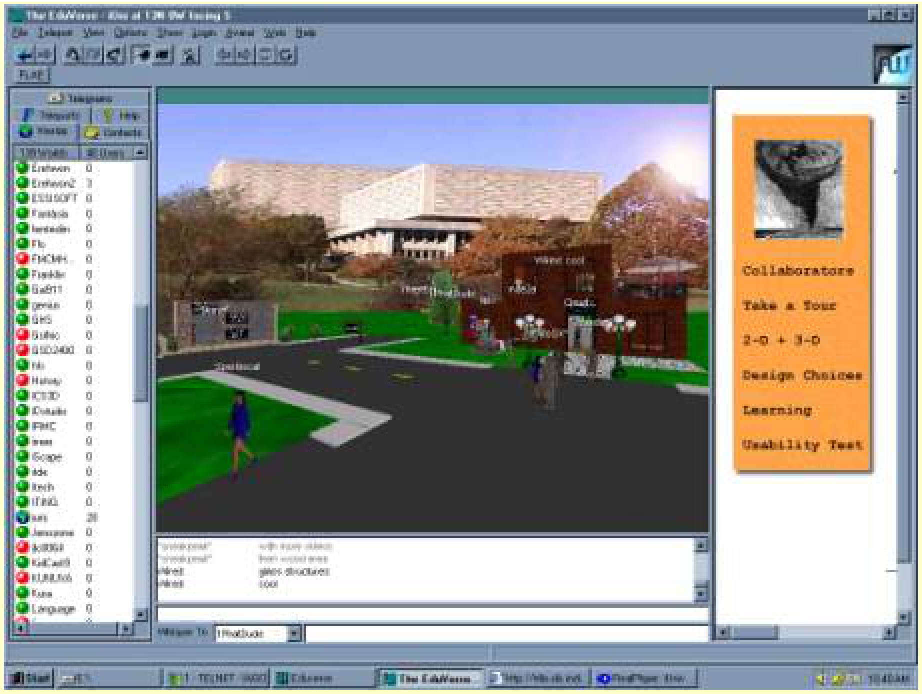

Figure 1. Active Worlds Browser interface showing the 'Disaster Area'

iUniverse: A Collaborative Information Universe at Indiana University

In Fall 2000, the User Interface Design course at the School of Library and Information Science, Indiana University was taught using AWT. Students learned how to design standard web pages and JavaScript first. In the 4th Lab session, students entered the 'iuni' world that was set up especially for this class. They learned to navigate in the 3-D space and to manipulate objects. During Lab they started to design their own virtual homes in cyberspace as well as menu systems for easy access of information (via web links) and places (via teleports). Snapshots can be accessed at http://ella.slis.indiana.edu/~katy/iUni/pics.html.

As part of their project work, they examined and evaluated other worlds in the Eduverse universe.

For their final project, students offered faculty on campus to design customized 'Learning Environments' for different classes. The result is a 'Natural Disaster Area', a 'Science House', a 'Quest Atlantis' portal to different theme parks for kids, an 'Art Café', and a 'Virtual Collaboration Area'.

The 'Natural Disaster Area' was designed by Maggie Swan. It teaches about natural disasters and the different levels of damage they can do to various types of buildings/structures in a realistic setting. The intended user group is youths at the Boys & Girls Club in BL (Coordinated with Quest Atlantis see below). An accompanying website can be found at http://vws3.avl.indiana.edu/team2/home.html.

The Science House was build by Kent Holaday. It resembles a 3D Virtual Science Dictionary. Different objects in this house are linked to web pages describing function and science behind diverse household appliances. Intended user groups are general public, science students, and science educators (http://vws3.avl.indiana.edu/team3/scihouse.html).

The 'Natural Disaster Area' and the Science House have been developed in collaboration with Dr. Bill Harwood at the School of Education, IU.

Quest Atlantis is the name of a portal site to different Educational Theme Parks for Kids

Designers are Hakan Tuzun & Mark Dial in collaboration with Dr. Sasha Barab, School of Education, IU. The intended user group is children, ages 6-14 at the Bloomington Boys & Girls.

Details can be found at http://vws3.avl.indiana.edu/team1/.

Lilly Lu, Gertrud Peters & Sy-Miaw Lin, designed the Art Café. Its goals are to sharpen viewers' sensibility & perception of artwork; build viewers' visual vocabulary & their visual concepts; enhance viewers' understanding & appreciation about art work; and assist viewers in organizing & verbalizing their aesthetic experience (http://vws3.avl.indiana.edu/team5/www/artcafeweb/Homepage.html).

Last but not least there is a 'Virtual Collaboration' area that was designed by Randy Fisher & Tim Bowman in collaboration with Allan Dennis, Kelley School of Business.

It is supposed to provide a 24/7, worldwide accessible meeting space for business professionals (http://vws3.avl.indiana.edu/team4/index.html).

Brian Horvitz, PhD student in Instructional Systems Technology, IU advised the students in the instructional design of their projects.

Taken together, the different Learning Environments present instructional material in a 3-dimensional, multi-modal, and highly interactive space that can be experienced collaboratively. Students can visit environments and interact with events that distance, time, or safety factors normally preclude (e.g., visit a disaster area showing the effect of tornados). They can collaborate online with other students or teachers (e.g., attend artist talks in the Art Cafe, meet with remote collaborators in the Virtual Collaboration Area).

Summary

Students taking the User Interface Design course had hands-on experience in the design of intuitive and effective, multi modal interfaces. They needed to decide which information to present as text, images, sounds, video grabs in 3D or on a web page and how to effectively use web links, warps, teleports, JavaScript, etc. to achieve effective interactivity. The close collaboration with faculty from other departments provided a project management challenge. Initial feedback on the course shows that almost all students found the design of the 3D environment the most interesting and challenging part of the course.

Research on virtual environments for education (Winn & Jackson, 1999; Online Library VLearn 3D) has suggested that VE's have a number of properties that help students understand scientific concepts and principles. First empirical evaluations with visitors of the Learning Environments confirm that the virtual experience is far more engaging than traditional lecture and discussion methods. Detailed evaluations and usability studies are planned.

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Loosely-Integrated Open Virtual Environments as Places

Introduction

What makes popular virtual learning environments that position the learner in control of the environment, instead of just focussing on transferring knowledge to learners, is that they engage learners in continuous building and reshaping of understanding. Commercial heavyweights like WebCT(http://www.webct.com/), TopClass (http://www.wbtsystems.com/), Blackboard (http://www.blackboard.net/) and Lotus Learning Space (http://www.lotus.com/home.nsf/welcome/learnspace) offer powerful tightly integrated courseware environments for content-centred course development. Each environment has some strengths and weaker sides. On the other hand, the shift from one environment to another requires substantial efforts both from the academics and the students, due to the different models and concepts used in each environment.

Addressing these issues we have developed a framework for the design of loosely integrated open virtual learning environments. In this article we present an example of such environment – the Virtual Campus (The Virtual Campus, Faculty of Architecture, University of Sydney - http://www.arch.usyd.edu.au:7778), where the conceptual integration is based on the metaphor of a virtual place, used also in TAPPEDIN (http://www.tappedin.edu), Virtual U (http://www.vu.vlei.com/) and TheU (http://www.ccon.org/theu/).

Organisation of the Virtual Campus

The organisation of the Virtual Campus follows three fundamental paradigms - spatial, functional and semantic (Maher, 1999). The spatial organisation of a virtual place supports our cognitive models and experiences in the physical world. Spatial organisation provides the cues for navigation, behavior and reactions in the environment. The Virtual Campus is organised around the notion of the *room* as a spatial unit and information container. The functional and semantic organisation of a virtual place shapes the grouping of the spatial units. Functional and semantic organisation of the space is derived from the functional requirements and semantic relations in the learning environment. Semantic relations usually reflect underlying course logic. Functionally the Virtual Campus is organised around the presence of various buildings where each building serves a specific function. The buildings provide office space, course subject space, and common library or resource space. The course subject space is organised semantically, according to the specifics of the subjects taught. The staff and student spaces are personalised information spaces provided as modifiable prototypes consistent with the style of the campus. This approach supports flexible learning by providing a place environment with access to online course materials, other students in the course and instructors. The place concept is similar to the physical campus, providing the interaction and knowledge management framework of the learning space. The place concept offers a consistent frame of reference in the information space of an integrated learning environment. The learning environment supports internally both synchronous communication (meetings, seminars and presentations, collaborative development activities) and asynchronous communication (email and telegrams, bulletin and white boards), in addition to access to course materials, quizzes, project data, student monitoring and evaluation facilities.

Loose integration and underlying technology of the Virtual Campus

On the implementation side, this approach to collaborative learning environments follows from the concept of "loose integration" (Maher, Simoff and Cicognani, 2000, Chapter 6), where the environment is composed of different stand alone environments, integrated with bridging data interfaces under a common human-computer interaction metaphor. The current implementation structure of the Virtual Campus is shown in Figure 1. It is based on two separate servers: *place server* and *course server*. The place server is based on a lambdaMOO server with the BioGate interface between the MOO database and the web server. In the MOO server every participant is represented by a character. The course server, where the course materials reside, is based on a WebCT server.

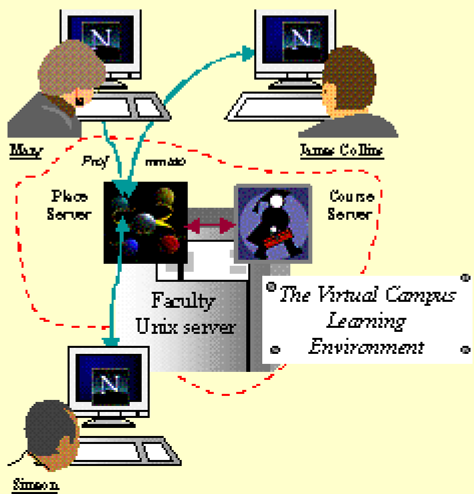

Figure 1. The implementation model of the Virtual Campus

Figure 2 shows the idea of the loose integration. The bridging data interface passes the information about the character and current location in the place to the course server. In the user interface this is reflected as an additional icon on the toolbar. Thus, to access the course materials corresponding to a room in the learning space of the Virtual Campus, a student selects the "book" icon in the toolbar (the idea is illustrated in Figure 2).

Current configuration of the Virtual Campus has been used for seminar style classes and virtual design studios. Figure 3 shows a moment from a lecture in a subject room with the focus is on the slide projection screen. Each of the participants, present in the room, can switch his/her attention between the room view, the slide projector screen, the whiteboard, or the course materials.

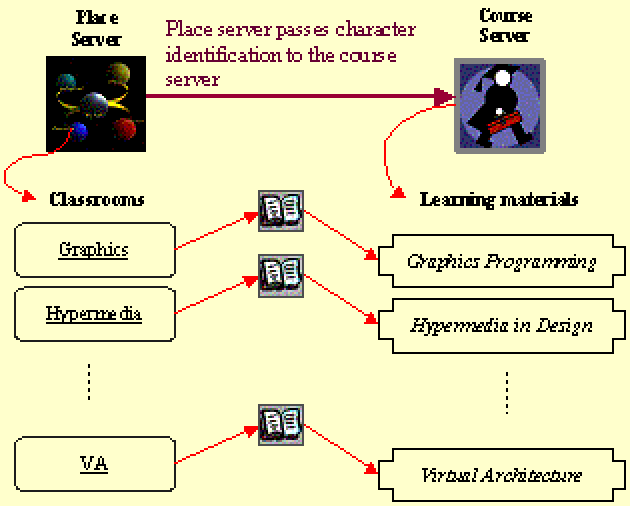

Figure 2. The loose integration implemented in the Virtual Campus

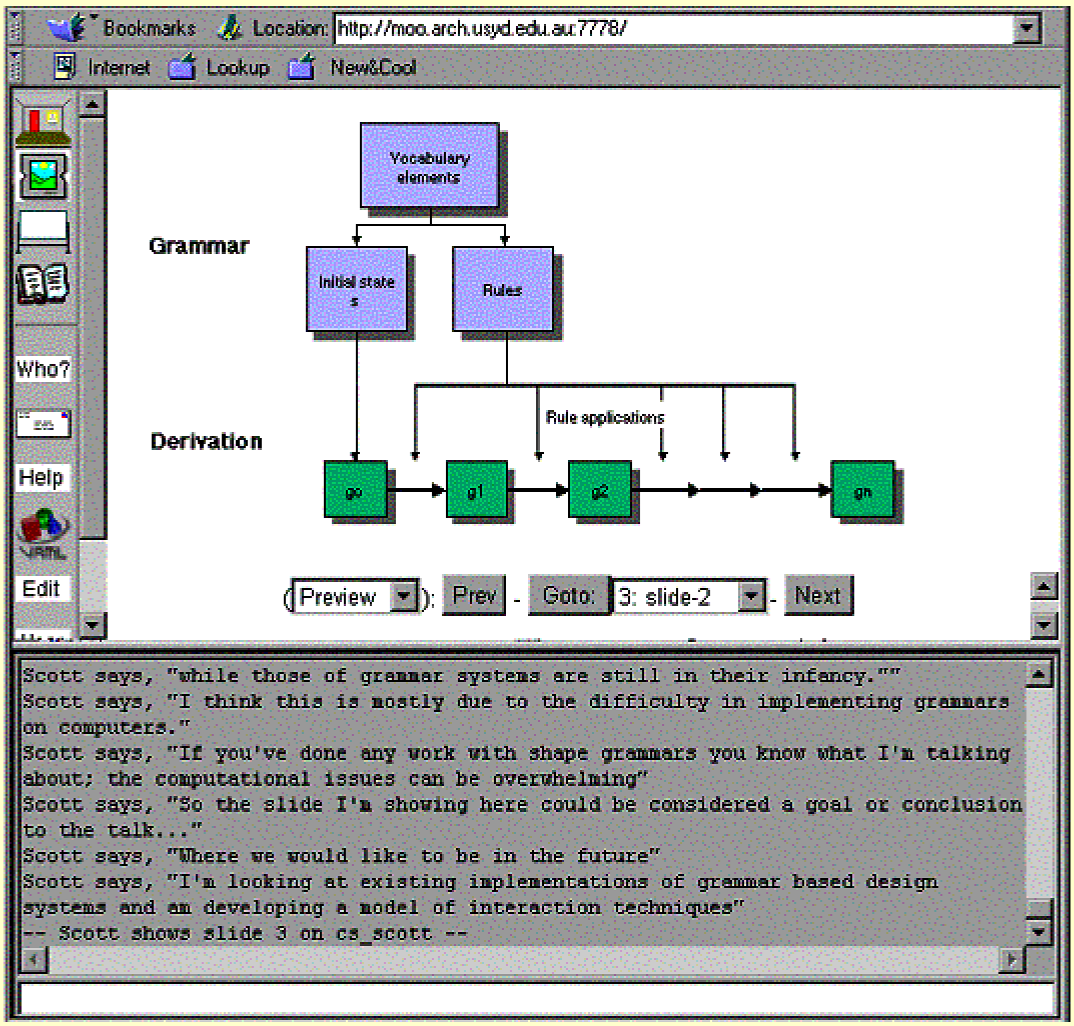

Figure 3. Lecture accompanied by slide presentation in the Virtual Campus

Loose integration and open learning space of the Virtual Campus

The loose integration approach offers an open learning space. The idea of the open learning environment is the incremental addition (and perhaps subtraction) of CAL (Computer-Assisted Learning) technologies to the learning environment in a way that doesn't violate the consistency of existing virtual space organisation and human-computer interaction interface. In terms of our framework, this means the development of a bridging interface and the design of the corresponding icon for the toolbar. For example, ActiveWorlds is another environment that we have used as a virtual place for learning activities. The spatial organisation of the environment corresponds to the geometric model of a real world, where each participant is represented by an avatar. Under the "loose integration" framework, the integration with ActiveWorlds requires a similar bridging data interface which passes the information about the character and current location on the place server to the ActiveWorlds server. In the human-computer interface such addition is reflected as an additional icon on the toolbar. For example, current interface to the place server of the Virtual Campus does not present the characters in a 3D view of the rooms. An Active Worlds Universe server has been loosely integrated as a complementary virtual place server. Figure 4 shows a session in Active Worlds, where the students are represented as avatars.

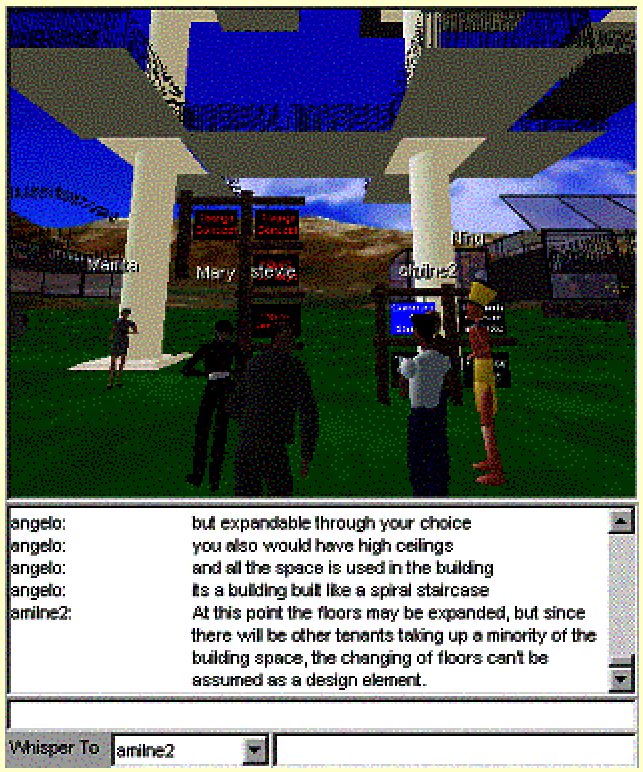

Figure 4. A design session in Active Worlds

Conclusion

The integration of the two complementary models of the place with online learning materials extends the range of supported learning designs, including:

1. Small group learning: seminar style discussion both on-line and face to face, readings, slide presentations.
2. Large group learning: multimedia lecture style presentations available online including slides and corresponding audio and video vignettes, interactive exercises, and quiz assessment.
3. Self-paced constructivist learning: Laboratory style tutorial exercises and project-based assessment, customisable learning materials based on student profile.
4. Collaborative learning groups with access to a range of online materials and specially designed meeting places.

An open learning environment, based on the "loose integration" principle provides a consistent data source for the analysis of the communication that occurs during the educational activities. We have developed a framework for analysing communication in a virtual place learning environment (Simoff, 1999; Simoff and Maher, 2000).

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Flex-eL: - flexing the boundaries of e-Learning

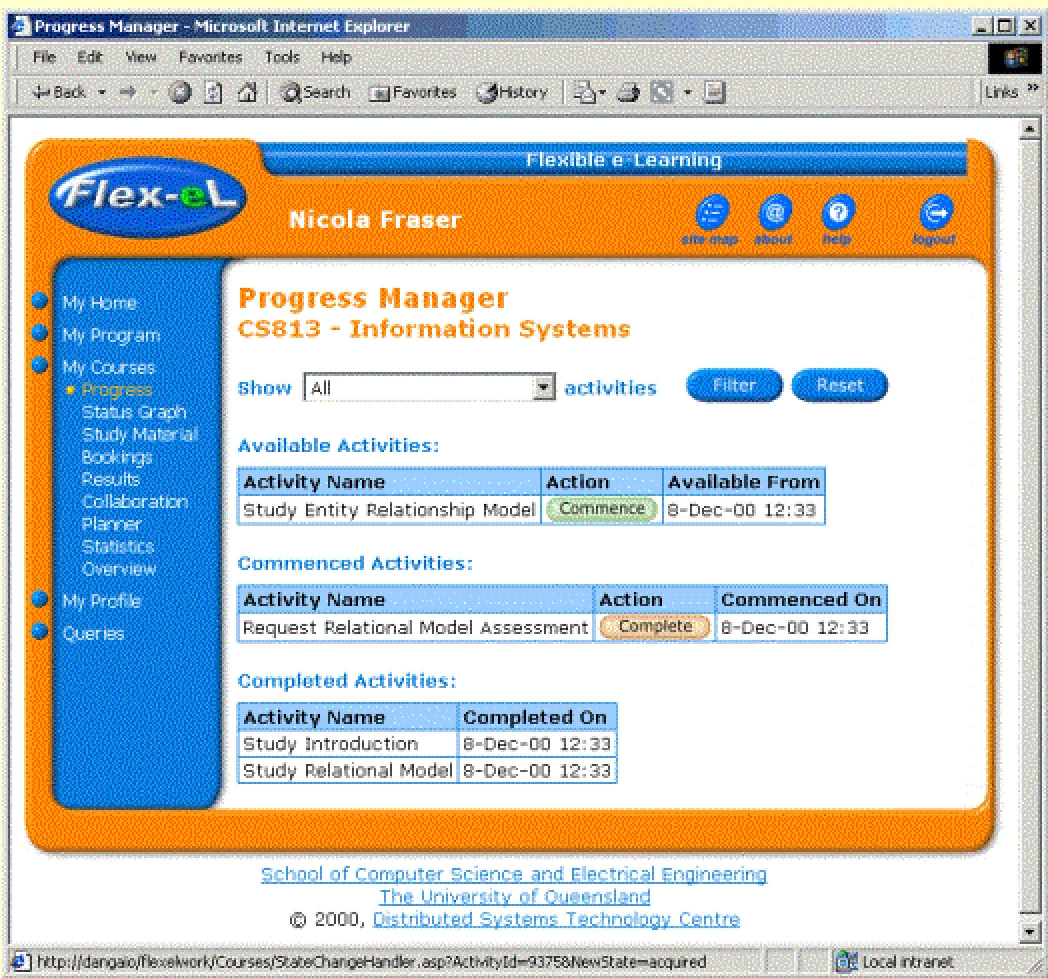
How flexible is ‘flexible’? The new buzz-word of flexible (also mixed-mode, resource-based, ‘open’) education is given greater credence by the development of Flex–eL — a new educational/IT solution for integration and management of learning and teaching activities. It offers unique features allowing complete flexibility of time management, material access and personal consultations for students as well as teaching staff during the defined study period. The technology has been conceived, designed and built by the Distributed Systems Technology Centre (DSTC Pty Ltd) at the University of Queensland.

Flex-eL integrates individual components of study such as enrolment, learning and assessment into one, fully system-supported stream of activities that allows a student to choose a course, module, and specific learning activity from a pre-selected learning path via an easy-to-access navigation structure. In contrast with the traditional mode of teaching focused on direct instructions with strict linear time constraints, Flex-eL provides better access to and more effective interactions with teaching staff by providing system-supported feedback sessions and personal guidance for students as and when they need it. It may be conceptually related to 'just in time' learning, which better suits adult learners. It also substantially changes dimensions of time, quality and nature of interaction between learners and teachers.

To achieve this integration, the system is based on workflow technology, which allows educators to program the best combination of educational process and technology. Currently, educational resources are produced and made available in modular format on CD-Rom or on-line. If students experience difficulty, they can make on-line bookings for consultation with staff. They can also communicate with their peers — for each activity, the email or contact details of other students are available on-line along with chat and bulletin board discussion tools. Staff as well as students can nominate dates and times to consult with each other using these tools, as well as the facility to book face-to-face, individual or group consultations.

In this respect, the environment provided by Flex-eL enables better interactions between students themselves as well as student and teaching staff necessary for effective active learning at the level of individual learning activity, course module, whole course or degree program. This feature prevents student isolation, often associated with on-line modes of study.

Screens (example shown below) are similar currently for all participants in the system, students and teaching staff alike. The contents differ, in that teachers have access to all students' progress, status graphs, results, bookings and so on.



When students have completed a module of study and wish to undertake assessment, they make a booking on-line. This automatically appears on the teaching fellows' screen, and whoever is available may assign a time and place to the student.

The interface is currently being updated after the first pilot implementation of a Master of Information Technology course (Information Systems) run in Semester Two, 2000. The pilot, just completed, was a resounding success with only one dropout from the course, and very favourable end responses from students. This compares with a previous dropout rate close to 50%. Given that current students combined traditional as well as 'flexible' learning, the results are very positive for moving towards full flexibility of the system across a given program. A comprehensive evaluation of the program is planned with continuing students and staff in 2001 and the results may also shed light on patterns of learning that have previously remained invisible within conventional learning environments (recording of where students need assistance at any level or activity in their program).

Flex-eL offers unique features for support of flexible, individually tailored learning pathways and study styles for students. It provides facilities for individual time management by relaxing enrolment time constraints and removing the concept of an academic semester. Students decide about the dates of the assessments prescribed in the course structure for predefined parts of the study material. Students get flexible access to support services, study material and audio presentation facilities that will operate not only during business hours but will be open and closed on demand in response to learner's choice of access.

Flex-eL also improves course administration by enabling detailed monitoring of individual student progress and groups of students, enforcement of academic prerequisites and improved management of both university and learning resources.

Overall, the Flex-eL system supports a dynamic move away from a traditional 'subject' focus to an 'integrated study area' process that marks a potential paradigm shift in higher education and 'flexible learning'.

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Computers and Lifelong Learning: From Graduand to Employee

Recognition that we live in a rapidly changing knowledge economy has led to increased interest in lifelong learning. Employees can no longer learn one set of skills that will apply for the rest of their lives because jobs or job qualifications change (Knapper & Cropley, 2000). Educational institutions are currently faced with the challenge of developing lifelong learners who will adapt to the everchanging workplace. Employers and postsecondary institutions offering professional programs are paying increasing attention to the effective use of computers, and the lifelong learning strategies required to maintain literacy in the networked world (Oblinger & Vervilla, 1998; Katz & Associates, 1999). Educators responsible for post-secondary programs that are designed to prepare students for particular occupations acknowledge that they must work closely with employers, professional bodies, and in some cases, governments, to ensure that their programs reflect the changing demands of the workplace (Oblinger & Rush, 1997).

Given the increasing measures of accountability imposed on post-secondary institutions by governments and accreditation bodies, as well as the rapidly rising tuition costs students must bear, evaluation of technology as a learning tool and other computer use related programs needs to be thorough and timely. Within the body of work done on the systematic evaluation of the use of computers to support effective processes of learning, little work has been done that compares learning with computers in post-secondary programs with learning with computers in the workplace. In response to the need for such comparative work, Queen's University, in partnership with St. Lawrence College, is currently engaged in a two year research project, *Computers and Lifelong Learning: From Graduand to Employee*(CLL Project), funded by the Office of Learning Technologies, Human Resources Development Canada. The focus of the project is on those processes of learning that are effective in a wide range of circumstances, in keeping with public concern with the development of learning organizations and lifelong learners.

The project will be carried out in two phases. During the first phase (which is approaching completion), information is being gathered from graduands in their final post-secondary year. During the second phase, some of these students will be followed into their workplace settings. Near the end of their first year of employment, we will ask the graduates about the role computers have played in all that they have had to learn as new employees. We will also ask them about how well they feel their previous program prepared them for that learning. This sample of new employees will be supplemented by groups of alumni of the two partner institutions and by a cross-section of new employees of cooperating employers.

Initial Findings

In the first step of the project, 143 college and university graduands were surveyed to assess their computer experience, their conceptions of learning, and their orientation to work. This sample will be supplemented by further data collection in 2001. Most of those sampled were in a professional program that included practical workplace experience: nursing, education, office administration, and computer engineering technology (software design). Those sampled had ready access to computers and made extensive use of the Internet for gathering information and communication. Over 80% used the Internet in seeking employment. Most rated their computer skills at an intermediate level or higher, preferred to use a variety of strategies in learning about computers, and felt well prepared for their chosen work. They expect to make extensive use of computers in the workplace.

In comparing our findings across the four professional programs that we sampled, we found interesting differences in conceptions of learning, in computing expertise, in the people to whom students turn to learn about computers, and in the ways in which graduands expected to use computers in the workplace. These differences suggest to us that we need to pay careful attention to the particular structure of each professional program and to the particular demands of each profession in examining the role of computers in learning.

Next Steps

As the project unfolds, we will be working closely with groups of post-secondary institutions, graduands, employers, and employees to develop effective instruments to assess the ways in which computers support graduands and new employees adapt to an ever changing workplace. We are hoping that some of the measures we develop may help employers and employees improve the match between work requirements and employees' conceptions of learning and orientation to work. We are also hoping that post-secondary institutions may benefit from the research as they adapt their programs and employ information technology in new ways to accommodate changes in societal expectations and student needs. We are focusing on the role of computers in learning because of their pervasiveness and because their use is closely connected with rapid change and the accompanying heavy demands for lifelong learning.

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Designing and Building an European Occupational Therapy Internet School

Abstract

This paper describes the development of the learning environment for the Occupational Therapy Internet School (OTIS). The OTIS project is a feasibility study for providing Internet based courses in health care disciplines. It uses a

problem based learning approach to promote collaboration between students based in several different European countries, who study and evaluate the different strategies for assessment and treatment of patients across Europe. The partner institutions develop courses collaboratively. OTIS is now delivering a pilot programme to occupational therapy students in four colleges in Belgium, the Netherlands, Sweden and the UK.

The OTIS system comprises a Virtual Campus based on MOO technology. It has been specifically developed to promote a problem solving approach and collaboration between students. The intention is to use the core OTIS system to develop courses in other health care disciplines, so the system architecture comprises a generic core common to all courses, and a course-specific element capable of rapid development in response to on-going evaluation and as partner institutions exploit new opportunities offered by Internet technologies. A number of practical issues that are generally applicable to developing future courses are discussed.

1 Introduction

The Occupational Therapy Internet School (OTIS) project is funded via the European Commission's TEN-Telecom programme, and aims to promote collaboration and effective communication between students from different countries, enabling them to explore similarities and differences of approach to health care in their countries. An OTIS pilot course entitled "High Level Assistive Technology in European Occupational Therapy" is being undertaken by occupational therapy students and postgraduates in the University of Liverpool (UK), the Hogeschool van Amsterdam (Netherlands), the Hogeschool West-Vlaanderen (Belgium) and Linköpings Universitet (Sweden). The pilot course was developed collaboratively by occupational therapists in the partner institutions and the Department of Computer Science, University of Liverpool.

The intention is to set up further OTIS courses within the domain of problem solving courses for health care students and professionals in continuing education, and involving collaborating partners in different countries. Accordingly, the OTIS system has been designed to be as generic as possible, in order to minimise the costs of developing further courses.

2 Educational Requirements

The first educational decision was the agreement that the course philosophy would encompass a problem solving approach. This is widely used in college-based health care courses. "Problem based learning has now been in use for more than 25 years and brings many real benefits to health professions' education" (1).

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, query or puzzle that the learner wishes to solve" (2). Medical courses using a formal problem based learning (PBL) approach present cases to the students for study in small groups, each facilitated by a tutor, and face to face feedback sessions are held regularly. It was recognised that while OTIS students would benefit from the use of a PBL approach, an Internet based course cannot meet the formal structure of problem based learning groups. Instead, the course design team aimed to develop essential professional skills by designing materials that should be addressed via the use of a problem-solving model (3).

3 Analysis of Technical Requirements

The technical design arose directly from the educational requirements, with the additional requirement that the system should be developed to support rapid development of future problem solving courses in other disciplines. The technical solution had to be as generic as possible, with reusable components, and comprise a common core system for all courses. It was also important that the technical environment should provide a rapid development medium for the courseware, as this would be developed in very close conjunction with the staff running the courses. An iterative approach to the development of courseware was anticipated, in the initial development as staff from different countries learn to collaborate together, and later as staff respond to student feedback and evaluations, and learn to exploit new opportunities offered by the Internet.

The key requirement for the core system in a problem based learning course is the need to support synchronous (real time) communication. Students would be interacting not only with each other and their tutors, but also experts such as representatives of companies, and the patients themselves. The communication facilities had to permit small groups of people within the virtual college to meet either formally or in an ad hoc manner, to discuss matters separately from other groups who might be meeting at the same time. It was essential that the screen design allowed space on screen for the case studies and other documents being considered, as well as the communication session.

It was important for site navigation to be as intuitive as possible, to reduce the learning curve for new students and to encourage them to feel comfortable with the system. Students need to be able to find the case studies, library materials and course details easily, as well as locating other members of their communication group.

The organisation of the library materials was developed to support the problem solving approach, and finally, the system had to be attractively presented and rich in multimedia.

4 Technical Solution

4.1 Overview

The OTIS system design arising from the requirements analysis identified the need for a core system which would be common to all future courses, and a course-specific element comprising the course materials. The core comprises the user and document management facilities and communications. The course materials are developed in HTML using standard Internet tools.

While the specifics of the course materials will be different for each new course, each course would be expected to comprise of the same general areas, such as case studies, reading materials and course guide documents. A generic skeleton structure within the HTML was therefore envisaged, which would be common to all courses and would also provide the integration with the underlying core system.

4.2 Architecture

The basic architecture of the OTIS system is shown in figure 1.

OTIS Course Documents and Multimedia (course-specific)	))
Virtual Rooms Environment (same for every course)	) User

Interface between Core and User Interface (same for each course)	) Interface))
Central Core, collaborative working environment (same for each course)	)) Core) Software)
Web server software	) Web
Systems and backup software	) Server
Hardware	) (basic system) required for each) course)

Figure 1

Both the core software and the user interface are based on a Virtual Campus metaphor (4) that comprises a number of virtual rooms such as the library, student work area, help desk etc. (5)

This provides three advantages:

- more intuitive navigation around the system
- each virtual room engages the users currently in the room in a communications group
- the Virtual Campus provides a generic layer in the user interface which will be common to all courses

4.3 Core Software

The core software provides communication and document management facilities, as well as handling user accounts and providing secure logins to the website. Because of the importance of communication within the OTIS pedagogic model, the core software had to be able to handle real time communication of organised and ad hoc groups, as well as email.

The CoMentor software package, developed by the University of Huddersfield (6), forms the basis for the core. CoMentor is based on a multi-user object oriented database, and uses the LambdaMOO (7,8) technology used for distributed multi-player adventure games.

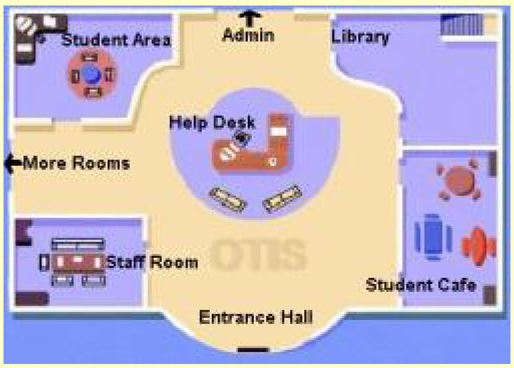
Within CoMentor, 'player' (student) objects have a property 'location' (virtual room) describing their current position in the virtual world. Players can 'Talk' to other players at the same 'location'. This allows students and teachers to meet both formally and informally by entering the same location or virtual room within the learning environment. Users can 'Page' other users located anywhere throughout the system, as well as using CoMentor to email other users, such as people not currently logged on.

CoMentor provides user validation at login, ensuring that only registered students and staff are able to access the OTIS system. The user management facilities permit the creation of pseudo-users, whose identity users can assume, such as for example a patient. During communication sessions, it appears that a real patient is communicating, rather than a role player. CoMentor also provides a personal area for each user, displaying the user's photograph and any personal details that the user wishes to provide. All users can view the personal area, which help to build bridges between people who may never meet each other face to face.

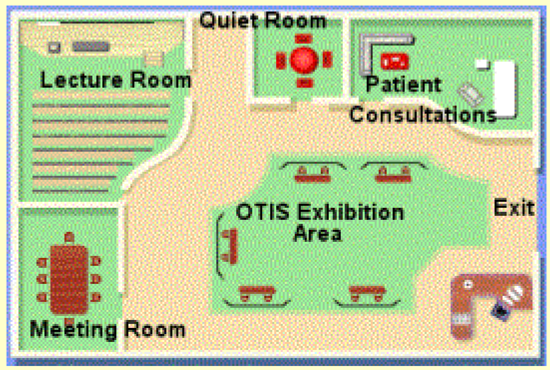
The CoMentor core has been enhanced to provide reusable modules, which can be plugged into the user interface as required. A meeting room booking system has been developed, which auto-generates meeting rooms when the booking is made. This module is used in the OTIS Meeting Rooms, Exhibition Area and Patient Consultation Area. A notice board module provides notice boards for all to see, but staff, or students, as appropriate, may only post notices.

4.4 Virtual Rooms Environment

The virtual rooms metaphor in the core has been carried through to the course materials. The HTML documents comprising the course materials are laid out as a series of rooms in a virtual college. All rooms are accessed from one of two main maps (figure 2), and the relationship between the rooms is shown in figure 3.



The OTIS Main Map



The OTIS Courtyard

Figure 2

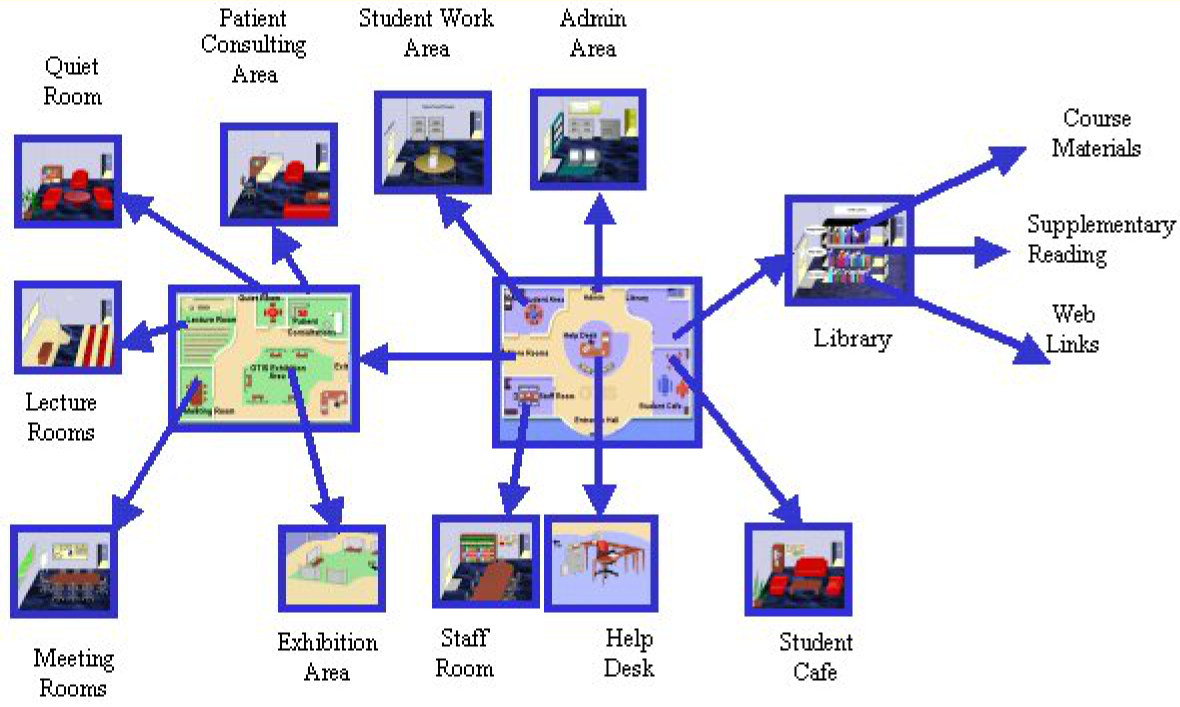


Figure 3

Within each room, the left hand side of the screen displaying the Internet course materials is based on a series of generic three part frames, comprising a room map, a menu and a display area. The first frameset for each room and its associated map, menu and display areas will be generic between courses, and the map is reused at each sub-level of HTML framesets within the room.

A common feature of the room maps is the door on the right hand side of each map, which brings the user back to the OTIS Entrance Hall or Courtyard. This makes the OTIS system very easy to navigate, as the user is always one mouse click away from the central point.

5 Evaluation and Future Work

Evaluations during the first pilot course have shown that technically, the system is working well, with remarkably few problems. However, a significant improvement in the quality of communications can be achieved by introducing video- or audio-conferencing. Sending text messages as at present is slow and tedious, and seriously limits the interchange possible in a one-hour conferencing session. Work is currently underway to provide basic conferencing facilities within specially booked meeting rooms.

Agent technology, interacting with the student and the learning environment (9) can be used to assist tutors, who may not be available always, when required. 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 counselling those that are not functioning in various ways. An agent helper can assist the student by providing basic advice and assistance at any time, and by interacting with the agents associated with other group members, can provide the feedback necessary to attain goals and meet deadlines.

The system has been designed to provide a core system that will be the same for every future course, allowing the course-specific HTML and multimedia to be easily plugged into the core system. OTIS now has a core system comprising the communications, user and document management, and virtual rooms environment, and a simple hyperlink interface between the HTML and central core. While course-specific HTML can be developed rapidly, much of the courseware costs is associated with obtaining and using multimedia, and there is a significant cost with developing courses of this nature in complying with IPR and Data Protection issues.

This project shows how problem-based learning techniques can be used effectively in a distance-learning environment to bring members of highly practical professions together across many different countries. This allows experiences to be shared and best practices to be disseminated rapidly across national boundaries.

Acknowledgements

The OTIS project is funded by the European Union through the TEN-Telecom programme. The system is based on CoMentor, developed by the University of Huddersfield, whose help in setting up the system is gratefully acknowledged. Certain of the software described in this paper was developed by the following MSc students at the University of Liverpool under the direction of two of the authors: Theo Hagos, Lee Kempson, Simon McCormack, Neil Mitchell and Alan Tierney.

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The Need for information Literacy in Online Learning

Promoting information literacy in online learning is a critical component for student success. Information literacy "enables learners to master content, and extend their investigations, become more self-directed, and assure greater control in their learning." [1] However, finding ways to develop information literacy competencies in online learning can be a challenge. All too often, emphasis in instruction is focused on mastery of information technology rather than the development of information literacy. In response, the Association of College Research Libraries (ACRL) published a guide entitled *Information Literacy Competency Standards for Higher Education*. These standards offer a "framework for assessing the information literate individual" and identify the range of competencies students should master to meet the objectives of each standard [2].

Standard One:

The information literate student determines the nature and extent of the information needed.

Students who have mastered this skill are able to define the need for information, identify a variety of information sources, determine the costs associated with obtaining information, and reevaluate the extent of the information need. Online instructors can evaluate the way in which students have mastered this skill by creating assignments that involve comprehensive library research. Assignments should engage students in the process of acquiring materials through interlibrary loan and research through automated library catalogs. Many libraries also have subject specific web pages designed to assist students with research. Some of these sites include access to online databases that provide citations to retrieve full-text articles from scholarly journals. The goal is to demonstrate to students that there are varying levels of locating information through the use of the Internet. Students should come to understand that research involves much more than using simple search engines.

Standard Two:

The information literate student accesses needed information effectively and efficiently.

All too often students have difficulty locating material for their assignments because they do not know how to form search strategies. It is important for instructors to realize that some students may not know the subject vocabulary that will generate the best retrieval for information. For novice researchers, concepts such as truncation, Boolean operators, and other search strategy protocols are not easily understood. Since online students may not have access to bibliographic instruction, it is the responsibility of the instructors to provide students with the general background information that will assist them with beginning a search. Furthermore, unless the library staff has access to the web assignment, providing reference assistance to students' online queries may be difficult if the student fails to provide all the details if the assignment to the librarian. As a result, it is crucial that online instructors teach students how to develop and refine their search strategies. If the instructors are unable to provide this assistance, then they must find a way to include an element of web-based bibliographic instruction into their course.

In addition to finding ways to include library instruction in their courses, online instructors also need to be aware of the web-based research services available in their institution's library. In a survey study I did evaluating the role of the library in distance education at Kent State University, I found that less than 3% of the faculty involved in teaching web-based courses were aware of the web-based library services that students could use for assignments. [3] If the instructors are not aware of the library online resources available, then how can they expect their students to know? Since students enrolled in online course depend on the assistance of their instructors, this lack of knowledge poses a serious problem.

The library staff at the University of Minnesota conducted a similar study and found that in addition to a lack of awareness, many instructors purposefully designed their web-based assignments to avoid the need for the library. [4] This response is not an appropriate method of resolving the issue. If online courses are to be designed such that they parallel their traditional counterparts, then it is important students be provided with the same level of library access as their peers on campus.

Standard Three:

The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

Students who master this standard are able to cite information and restate it in such a way that it supports their arguments. Students must be taught how to cite electronic information and instructors should not accept email attachments of papers or other written projects if there is question regarding citation. Some instructors may not choose to impose standards for materials submitted in electronic format, but they need to be aware and proactive about identifying Internet plagiarism. Instructors who do not check their students' assignments for plagiarism are only perpetuating further academic misconduct.

Students who master this standard should also be able to evaluate the information they locate to determine its validity. There are numerous web sites that provide discussion and sample forms for web evaluation. Students are taught how to compare information, identify cultural biases, and recognize the strengths and weaknesses of given information within its context. All too often, students equate technology with accuracy; some students believe that visually appealing web sites are more accurate than ones just listing text. Instructors need to remind students that accuracy, authority, point of view, and the site's timeliness are all key factors in differentiating the reliability of information retrieved from the site.

Standard Four:

The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.

Information retrieved for an assignment may mean little to other students or the instructor of the course if it is not communicated effectively. The fourth standard suggests that students need to know how to prepare the information they retrieve so that it communicates clearly to its intended audience what it is supposed to communicate. This skill is crucial in an online setting where students do not have the face-to-face opportunities to clarify what was written. Hence, in chat room type situations or listserv groups, students need to be taught how organize the information such that readers from the remote site will be able to understand the meaning.

Standard Five:

The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

This standard involves an understanding of copyright, privacy, and security in both the traditional and electronic environments. As students share resources over the Internet, issues of intellectual property need to be discussed. Students need to be made aware of the institution's policies regarding the use and access of materials. Net-etiquette, campus acceptable use policies, and academic misconduct must be discussed in all classrooms. All too often, online instructors do not make mention of any of these concepts, yet they are even more important in the online environment.

One reason it has been difficult to promote information literacy in online learning is that emphasis in instruction is focused on the mastery of information technology rather than the development of information literacy. Although mastery of the technology is important in developing academic goals, fluency in this area is limited to the technology itself. Orientations for distance education students focus on how to use the equipment, software, and the type of technical support available to them to handle the functions of accessing their course. Very seldom is there discussion of information literacy.

Another reason why information literacy is not included in online instruction deals with the fact that many instructors seldom involve the library staff in the development of their distributed learning courses. Yet, the library staff can identify potential problems in accessing material from the web site and assist in making the site more user-friendly. One of the chief complaints of students enrolled in online courses relates to the poor construction of the web site. Students have difficulty deciphering the page due to a lack of information or poorly constructed directions. It is here, the library staff can assist the faculty member in creating a more informative site.

Finally, the third reason why online instructors fail to address the importance of information literacy is that they consider it not relevant to their course. Yet, the contrary is true for "information literacy is an intellectual framework for understanding, finding, evaluating, and using information . . . [it] initiates, sustains, and extends lifelong learning through abilities which may use technologies, but are ultimately independent of them" [5].

All instructors should obtain a copy of the standards from ACRL at http://www.ala.org/acrl.html to have for use in creating course assignments. Assignments should be modified to address the objectives and competencies of the guidelines. Students should be given library research assignments in an online setting. If online instructors would simply place a link to the library home page on their web site (a very simple task), it would at the very least suggest to the students that the instructor hold some value for the library. Instructors who fail to provide their students with opportunities to develop their "information literacy" skills are only creating courses below the standards comparable to traditional courses. Hence, instructors involved in online course development have a responsibility to review the resources available to their students in the online environment. If student success in is an objective for online instruction, then it is crucial to create an environment that provides the same level of academic support. "Courses structured in such a way create student centered learning environments where inquiry is the norm, problem solving becomes the focus, and thinking critically is part of the process." [6].

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Interactive CD-ROM to Help Childhood Cancer Patients

State University of New York at Buffalo students are working in conjunction with the Psychology staff at Roswell Park Cancer Institute developing an interactive multimedia project. The main objective of this work-in-progress is to provide information and support for childhood cancer patients, their families and friends. Having a positive state of mind is important when coping with the difficulties of treatments and emotional turmoil of cancer. Interactive media allows a personally customized environment so individuals can learn at their own pace and seek out the information pertinent to their needs. This method of learning is especially useful at a time when an abundance of information has to be absorbed and important decisions have to be made in an extremely short amount of time.

The initial student design team struggled through the beginning stages, proposing and rejecting overall structures until they adopted the current theme: Roswell Park is a caring place where real individuals: doctors, nurses, patients and patient's families share what they know and help as much as they can. Today there have been more than fifty graduate and undergraduate students working very closely with the children, their families and the professional staff of Roswell Park Cancer Institute. The project has grown tremendously from its initial stages and still continues to grow well beyond the expectations of the staff at Roswell.

The implementation of this project is an ideal opportunity for students to work together from many disciplines gaining real world experience. Students successfully work within team atmospheres combining the skills and talents of content experts, interactive programmers and creative individuals. At the same time students participate in a very rewarding project while learning to produce a full fledged publication utilizing new media. Above all, this project offers an opportunity to apply this new media to an unquestionably worthwhile cause.

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Parlez-vous Internet Detective

This month **Internet Detective**, a free Web tutorial on Internet skills, registered its ***one-millionth*** user and launched new versions in French and Dutch.

Internet Detective has proven enormously popular with Web users worldwide, probably because it tackles a universal problem: how to quickly detect the best information on the Web, among the millions of sites available.

Be wary of the Web

The tutorial encourages you to question the quality of information you find on the Internet. It gives you the valuable skills needed to arm yourself against hoax sites and irrelevant or false information. These skills can help you to get the most from every site that you visit and save you hours when searching the Web.

Helping students to wise up

Universities, colleges and schools have been using the tutorial to teach students to be wary of using information they find on the Web for their coursework, at least until they have evaluated it carefully. With so much information available, from all manner of sources, students need to be able to critically evaluate information and establish for themselves what is reliable, accurate and from a trusted source.

Internet informants

Internet Detective was produced by staff at The Institute for Learning and Research Technology (ILRT) at the University of Bristol, UK, with software from Netskills at the University of Newcastle. The ILRT is home to a number of high profile Web services for education and research, including SOSIG (The Social Science Information Gateway) - one of the first and most enduring Web services for Web-searchers looking for high quality sites.

Free and easy

This is an informal, teach-yourself tutorial with interactive quizzes to lighten the learning experience. It's ***free for everyone***, thanks to funding from the European Union and to translations from The National Library of the Netherlands (Dutch translation) and the University of Lyon (French translation).

The word on the street

There's been lots of very positive feedback on the site from all over the World. Examples include:

"Internet Detective is a very good example of empowering Internet users with critical skills"

"Too often people quote chapter and verse from a Web site and have no idea about the author's credentials, knowledge

or reliability. Thanks so much for this information"

"Internet Detective is a unique reference, teaching the skills that students need in order to surf the net intelligently."

"I found the tutorial extremely helpful, and definitely challenging. (Actually, it helped me develop a lot more caution and a little more humility about evaluating Web sites, since I had much more trouble than I would have expected.)"

"We are a corporation and I feel that any company doing business in the Web space should know as much as possible about how to evaluate the quality and reliability of other organizations' Web presence. Thank you for creating a tool that addresses this need."

Internet Detective is freely available to everyone at:
http://www.sosig.ac.uk/desire/internet-detective.html

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The Virtual Training Suite

http://www.vts.rdn.ac.uk

Ride the e-Train and give up bad searching for good

The Resource Discovery Network (RDN) is pleased to announce the launch of the RDN Virtual Training Suite - a set of free, interactive, web-based tutorials for students, lecturers and researchers who want to discover what the Internet can offer in their subject area.

Although the Internet is becoming an invaluable tool for learning, teaching and research, finding relevant, high quality information is becoming increasingly frustrating and difficult. The RDN Virtual Training Suite offers anyone with Internet access an hour of self taught - any time, any place - training in Internet information skills, suitable for Internet novices or improvers - in fact anyone who wants to find high quality information on the WWW fast and efficiently. Each tutorial has been written by an academic or librarian with specialist knowledge of both their subject area and the Internet.

Key features include the opportunity for users to:

TOUR - key sites in their subject area
DISCOVER - techniques for improving Internet search skills
REVIEW - skills needed to evaluate internet information
REFLECT - on practical ideas for using the Internet to support study, teaching or research

Quizzes and exercises help to lighten the learning load and a virtual "shopping basket" is available in which users can collect links to interesting sites and return to them later.

Who should know about the Virtual Training Suite and why?

Students - who can use the tutorials to familiarise themselves with the key sites in their subject area and gain tips on how to use the Internet to support their study and research.

Lecturers and teachers - who can discover ideas for making effective use of the Internet within their teaching and support their students by encouraging them to work through the tutorials.

Internet trainers, librarians or academic support staff - who can integrate the suite within institutional training programmes to complement local induction/education/refresher activities. Posters and leaflets are available to help you promote the service.

Eleven tutorials are currently available and a further twenty-seven are under development.

Tutorials Available July 2000:

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Computers As a Second Language: For Teachers Too!

Abstract

This study's inquiry was directed at educators that are not regular users of technology in the classroom or at home and why that may be so. Although "technophobia" (fear of using technology) was the initial topic of interest, it was later

apparent that none of the subjects felt an overwhelming anxiety toward computer use and other forms of technology; rather three important themes surfaced as a result of the qualitative analysis. Each of the three themes is listed as 1.) Time to use technology, 2.) Personal interest in computers and other forms of technology, or 3.) Personal knowledge of technology. All forms of technology were discussed, yet computers were the main source by which subjects divulged information. The findings are congruent with second language learning theory in that the individual has to develop technology use in a sequential order starting with a silent period and moving through early production till the goal of an advanced level is reached. Personal communication with the computer is a must to develop any type of mastery and time to use it with colleagues has to occur on a regular basis.

Introduction

In the near future, it will become apparent that computers and other forms of technology are heavily used in classrooms and their objectives and results of those objectives will be heavily monitored and scrutinized (Goals 2000; Texas Education Agency 2000). The problem is that there are those educators in the classroom that either don't use technology or simply refuse to use it to provide instruction (Bergen, 1995; Bollentin, 1995; Buchler & Ballard, 1995; Spresser, 2000; & Weinman & Haag, 1999). The nature of technology divides the majority of users into two main categories, 1.) Eager adult users of technology, which make up only 10-15% of adults and 2.) Children that have the access and support of computers by way of socio-economic status at home (Bollentin, 1995). Because of the relatively short life span of computers on store shelves, new and ever-present learning must take place to keep up with all the bells and whistles that come into play, or as Bergen (1995) puts it, "terra incognita" (unknown territory).

Review of the Literature

Many teachers feel the crunch of time to teach certain skills and don't put a lot of emphasis on learning technology because they don't see the connection of computer skills to classroom learning (Buchler & Ballard, 1995). Some estimate that there are 50-60% of the population that are over-hesitant-prove-its and they must be shown how technology will help them in the classroom before they make the effort to conform to it (Spresser, 2000). Furthermore, 30-40% are resisters to technology use and sadly, 45% of all elementary teachers are labeled "technophobes". Nearly one half of elementary teachers refuse to use technology leaving the other half of the population to be split up into the prove-it category and the eager-users of technology category.

Haag and Weinman (1999) described this phenomenon in their study:

> As a predominantly middle-aged female population, teachers have been charged with a "technophobic resistance" to computers in classrooms. In many cases, however, teachers lack even the most basic training with computer technology and education (p.5).

Many point to outdated computers, lack of computers and software, and lack of training with the proper support as the reason for non-use. There seems to be gender inequities in all of this as well. Courses in graphic arts and computer aided design tend to favor males over females charging the lack of interest on the part of the females as the underlying factor to an unbalanced norm in schools today. Under these conditions, there is a limited amount of research that supports gains in classroom achievement when computers are used (Stellwagen, 1999). This revelation adds fuel to the fire for the prove-it population when they argue their point for technology non-use. For those termed "technophobes" (one who is afraid to use technology), there are other issues that have to be dealt with in order to get them to use technology.

Yildirim (2000) disclosed that:

> Teachers are more hesitant and less likely to embrace computer technology than other professionals. Education majors report that they don't feel adequately prepared to use it (p.2).

Only after a literacy course were teachers indicating that attitudes (anxiety, confidence, and liking) significantly improved. Hence, the language of computers had to first be learned in order to make headway into the acceptance of technology by technophobes. Even after the first literacy course for these technophobes, they felt unanimously that a second literacy course would only help with technology acceptance and use in their personal lives.

In the limelight of the new millennium's day in technology use, there are those states that are providing guidelines for technology in the classroom. One such state is Texas, which has in writing, Chapter 126 of the Texas Essential Knowledge Skills, posted on the web by the Texas Education Agency to guide public school teaching with clear objectives and time frames (TEA, 2000). Chapter 126 of this framework concerns itself with technology objectives from kindergarten to grade twelve. The problem for Texas in technology will be to provide the right support for teachers and useful guidelines for effective teaching strategies. If what has been proposed in previous studies holds weight, and 45% of elementary teachers in the nation are "technophobic", what do we need to successfully implement technology skills in the coming months and years?

When looking to other states and programs where success has been recorded to circumvent the digital divide in teachers, some stand out as worthy of investigating. Hester (2000) found that teacher support is more critical to student use than student support. Also, it is more important to provide a teacher of technology that has more in common with the target teachers than a teacher with no curriculum in common (e.g. a fifth grade teacher that knows and supports the needs of fifth grade teachers that have to hone their technology skills vs. a computer teacher that doesn't know the fifth grade material at all and therefore no real understanding of fifth grade).

Consequently speaking, Dr. Larry Rosen, vice president of Byte Back, an internet magazine, and noted psychologist in the area of "technophobia" said (Bollentin, 1995).,

It is not enough to have a training program. You have to have what we label Exploration and Enhancement (E & E) time that is simply playtime (p.10).

Also conquering with Dr. Rosen is his partner Dr. Michelle Weil, president of Byte Back, and another authority on "technophobia" (Bollentin, 1995). She said:

> It's not exposure alone. It's exposure plus being exposed to the technology by someone who is confident, who is a good teacher, and who values the technology (p.6).

A tactile-kinetic approach with technology learning can be accomplished by simply playing with the computer on a regular basis. Playing lowers the affective filter and allows more learning to take place. The less you are nervous about the computer, the more you will take with you for later use. This follows the very same pattern as second language strategies purported by prominent theorists (Asher, 1999; Chomsky, 1976; Krashen 1983; Terrell, 1983). What has happened is that technology teachers are left with more responsibility and opportunities to see what technology has to offer and pick that which appeals to them for their classrooms. All too often the "status quo" prevails and the real technology education happens at home only for students that can afford it. It is estimated that 16 million kids have Internet access and the email is their biggest use for it (Bergen, 1995).

The problem is, only those teachers with three to five years experience have the ability to apply what they know in their classrooms (Hester, 2000). This is somewhat close to what a second language learner needs in time to proficiently demonstrate native-like command of the new language (Chomsky, 1976). Even though each and every individual has the ability to learn a second language or technology by way of a language acquisition device, not everyone has the necessary motivation to learn something that takes so long to master. Consequently, those teachers that do not learn to use computers in the classroom will be replaced by those who do (Meloni, 1998).

Teachers that do demonstrate mastery of technology and all its jargon have frequent trouble in explaining with any great success the phenomenal abilities of the computer. The abilities of the computer are very difficult to explain to someone who hasn't experienced the visualization of such an event. Wishengrad (2000) reported computers make all subjects easier to learn, surpass textbooks in their size and scope, and get higher paying jobs possible when their potential is harnessed. This phenomenon happens even without a college degree. Something so ubiquitous as the

Internet is useless unless teachers are adequately prepared and continuously supported in integrating the web into their classroom (Yildirim, 2000).

Since computers have evolved into such a multileveled beast, very few teachers use them for presentations like Power Point, electronic mail, searching the web, doing spreadsheets, or multimedia software (Becker, 2000). In fact, it is used primarily for word processing and computer skill development (Mitra, 1998). What was unveiled is the fact that computers and attitude are not one dimensional constructs making the adaptation to computer use that much harder. Changes in time and increased use happen at different rates for different categories.

So where do we begin getting the entire teaching staff to buy into computer use in the modern classroom? How does one use a constructivist theory that claims understanding newly communicated beliefs and melding them into one's own understanding? The purpose of this study is to determine if there is such a concept as "technophobia" and why teachers don't use computers in their classrooms. Thus, in this study I tested theory as well as attempted to discover new theory for non-use of technology. In the former, I depended on grounded theory (Corbin & Strauss, 1990) to derive understandings from concrete observations. I used a qualitative research method to examine teachers who professed they didn't use technology in their classroom to any great extent if at all. A structured interview was used at first and after the first few piloted interviews, one main factor culminated from the literature review, technology is a second language and has to be treated as such. Qualitative analysis of the six interviews involved identifying codes and themes generated by the participants and the comparisons of these with the existing literature.

Methodology

Participants

Participants were six men and women educators who resided in a rural southeastern Texas town and its vicinity. Personal petitions on the part of the researcher were made to the participants in order to have them share their technological use of the past and present. These individuals were comprised of one middle-aged white woman (teacher), one middle-aged white man (teacher), one middle-aged white woman (aide), one first year Hispanic female (teacher, interview done in Spanish and translated), one middle-aged black woman (teacher), and one white middle-aged man (superintendent). These participants ranged in age from early twenties to late fifties. The total concludes as four teachers, one aide, and one superintendent, all of which worked in the same district as the researcher. All conveyed that they did have issues with computer use and that they thought they thought it would be interesting to share their histories for the benefit of the study. Although participants should be few in number, strangers to each other, and represent some contrasts with regard to background and demographic characteristics, all were accomplished except that they weren't strangers to each other. They did remain strangers to the fact of each other till all data was collected, member checks were completed, and results disseminated. Consistent with these suggestions, members of the study came from different backgrounds, had different issues with technology, and had different ability levels of technology use.

Participants ranged from complete non-users of technology to those that used it to perform some kind of accomplishment on the job. All reported rather limited home use of the computer or not at all. All of them reported to own one in the home or soon to, and having someone that they could rely on when the time came to have to use it. All members signed the appropriate waivers and one middle-aged white female teacher refused to participate after discussing the proposed topic with her husband. Admittedly, all members knew the researcher prior to the study for over a year and reportedly felt comfortable with the whole process and its outcome.

Procedure

Data Collection. A sample of self-selected individuals was recruited by word of mouth by myself on an individual basis.

I sought individuals in education that admitted they didn't use computers or other technology for the purpose of instruction in the classroom and would openly share their experiences in this phenomenological study for the purpose of understanding if there were such a thing as "technophobia" as they saw it, what the common reasons were for non-use of technology by educators in the small rural district, and if there were any other underlying reasons for non-use of technology. Volunteers made it known orally that they would indeed participate in the interview process and that the interview would last no longer than one hour. The actual duration of each interview was about 40 minutes on the average with one lasting one hour and the shortest being one half an hour.

The research was conducted according to the ethical principles for research involving human participants at Sam Houston State University, Huntsville, Texas. Each person completed a form indicating his consent to participate in an audiotaped interview that would later be transcribed by the researcher. They were further notified that other professionals would read the transcripts and that excerpts would be taken at random and published. Each was assured of the confidentiality of the material and that all information would be destroyed after the project was completed and published.

Participants were informed the content of their histories in this phenomenological study would not be disclosed in a manner that would breach confidentiality and no reason was present to cause distress or discomfort. Further information included the participants being able to drop from the study at any time they desired. Again this was brought up in the member checks that verified what the true intent was at the time of disclosure. Questions were based on a prior interview of two psychologists explaining their experience with "technophobia" and a few questions put in by the researcher to address teacher usage of technology in each participant's class or home.

The design of the questions was open-ended and non-directive as possible. Overall, the questions provided some consistency of structure in each interview while also allowing the participants to add whatever they felt was worthy data to the study. After the first interview, I made only slight adjustments for the purpose of yielding more informative data. This is consistent with Guba and Lincoln's naturalistic inquiry (1985). As a result of this type of change, I made the questions more probing and open ended to provide a rich, thick description of exactly how the participant felt about the different aspects and constructs of technology use. Examples of the questions are:

Do you or any member of your family use computers, the Internet, faxes, cell phones, etc. and if so please explain each and to what degree?

Are there other issues about the computer and why you don't use it more regularly at home and in the class?

Do you find ways of getting around the use of a computer? Or just simply refuse to use it? Please explain.

Do you feel that most others know about computers and you are one of the few who don't?

Explain what you know about using a computer for personal use, schoolwork.

As noted earlier, follow-up questions were used when applicable to probe the participant for more than a yes or no answer and to elaborate on a particular theme when it arose. For example, if the participant said they had a person at home that helped them with the computer, I would then ask the participant to explain exactly what it was that their helper did for them. If topics arose that revealed bad experiences with technology, or positive ones for that matter, I would asked the individual to explain why the feelings accompanied the circumstance.

In general, participants were asked to describe how their experiences with computers affected what they did with them nowadays and how it made them feel. They were also asked to divulge their knowledge base, their interest, and the time they devote to technology in regards to how they used them in a pedagogical sense. In addition to knowledge base, it was asked of the participants to reveal what part, if any, they knew about the Texas Essential Knowledge Skills and to add anything they deemed appropriate as it concerned itself with the study.

Each interview was audiotaped by the author: a forty-two-year-old doctoral student and bilingual teacher. I have had an elaborate amount of training in computers and plan to incorporate computer technology as a focus of my dissertational study. Prior to this study, I have never had the pleasure of interviewing people for research purposes, yet I have had the distinct pleasure of being guided by my professor, an expert in qualitative studies.

Data analysis. Interviews were audiotaped and transcribed verbatim by the author and checked for accuracy by the professor and each participant in the investigation. After accuracy was confirmed, the author simultaneously read the transcripts as he listened to each of the tapes. Consistent with triangulation of the data according to Yin (1994), the author read and reread the transcripts, highlighted the themes in a word processing software, and color-coded relationships into three different color codes. Through this process, the verbal data were reduced into workable and meaningful patterns. This brought about the parsimonious units into patterns that became explanatory or inferential in that the units came together to identify emergent themes, or patterned codes in the three colors.

For this study, I defined a code as an overall response described by the participant about “technophobia”. These codes fell into these three areas: a.) Personal knowledge of the computer, b.) Personal interest in computers, and c.) Personal time for computers. These areas include all responses, either positive or negative, that have a bearing on why the participants use or don’t use computers for the purpose of educating others, namely students in their classes.

The transcripts were coded by the author and checked by the professor, a principal, and a counselor. Consistent with the principles of grounded theory (Corbin & Strauss, 1990), I found noteworthy codes by answers that emerged from the interview data. A code was noteworthy if it showed up on at least three transcripts or none at all if the question was geared to negative responses, which held relevance in the scope of the interviews as they compared with each other. After I identified the codes and themes in the study, I promptly contacted the participants for their feedback. They were asked to explain how accurate the codes identified their experience with technology. The purpose was to verify the importance of each code.

I instituted a number of safeguards to decrease the bias in the analysis of the data. In order to increase validity and reliability, I observed standards proposed by grounded theory followers such as Guba and Lincoln (1985). The idea of trustworthiness concerns itself with the repeatability of investigation data. To establish this, I cross-referenced the transcripts with current literature within the educational realm. Statements about my theoretical orientation and expectations were employed as another source of reliability. Reliability was also enhanced by member checks. Through triangulation of the data (Yin, 1994), I used multiple sources of evidence. Finally, I sought testimonial validity from each of the participants by conquering that each of the interpretations of their interviews were consistent with their personal experience.

Results

Problems Addressed With Technology

One of the main arguments of the participants in this study was the fact that even though they had a computer in their room, it was down a majority of the time and no immediate recourse could be sought to alleviate the problem. Along with it being down, one member professed still not having a computer, although the Internet lines were in place and an air conditioner was put in to maintain the computer at the correct temperature. And finally, no one received any kind of significant support that allowed teachers to learn how to use the computer in the room. Only a system of reporting problems and then having to wait as long as a few weeks on a list for someone to come by and fix a problem was the norm. Software instruction was non-existent.

Qualitative Results

I identified a total of 58 codes in the transcripts and of those, 40 proved to be noteworthy. Of the 40 codes, 8 proved to be significant even though there were no responses from any of the participants. These areas defined the fact that subjects generally felt no “technophobic” tendencies and that their non-use of technology was justified for them individually. In regards to the other 32 noteworthy codes, they were the remainder of codes whereby the participants answered similarly on the questions with at least two matches to each question, three matches held more significance.

Within the main and sub-areas of categories lied three major themes that became the focus questions of the study: 1.) What is your personal knowledge of technology? 2.) What amount of time do you spend on technology per week or per month? And, 3.) What is your personal interest in technology? Excerpts from the transcripts are listed below by themes and they are listed on table one in the appendices.

Theme #1: Time

Here a few of the responses that the participants made in answer to questions in the interview process. Time is the essence of this theme because it is the main reason why educators reported they didn't use technology more. The excerpt numbers are those numbers that correspond directly to each code found in table one under the theme of time.

#2. Don't use it at home (100%):

No. Really I don't have time to sit down at the computer and use it very much. It is just very time consuming. You can just sit down there and before you know it, four hours have gone by.

#3. If I were younger, I would use it more (50%):

If I were ten years younger and knew that I had to use it on the job, I would learn it then because I know I would have to in order to keep my job.

#4. Use it at school (16%):

Well I am not using it at all. The only thing that I would use it for would be grades if I were forced to. In this school we will be on the grading system and you will have to use it. It is about the only thing I would use it here for. And I guess if someone were doing a special project, it would be good to look up something on the Internet. The Internet is full of information. The thing I don't like about the Internet is, there is so much illegal stuff on there and there is so much pornography on there and that chaps me off, I don't like that.

I am frustrated that there isn't time enough to learn these programs. I thought I would work on that next summer, but summer is a long time between years.

#6. There is no time to use it (100%):

I just don't have time here at work to use it and when I get home it is the same thing. I am a woman and I have other more important things to do like cook and clean.

#7. Prefer to practice with someone (66%):

Yes I would. I have a friend and he is a great computer guy, and I just like for him to tell me certain things about the computer that I don't know. And when I see him operate the computer, I just watch you know, and so I pick up and learn a lot of it.

Theme #2: Interest

Within the theme of interest came twelve codes that hit noteworthiness in my opinion and they had to do with feelings as well as interest. If it came to be that the participant was just not interested in technology, it had a pronounced impact on their usage of any such media. Even when it comes to what a teacher is provided to do the job, I felt had something to do with this theme because an attitude, whether positive or negative, could be sparked from this type of technological interaction. Here are a few responses in the area of interest in relation to their appearance in table one in the appendix.

#1. Didn't have what you needed to work with (84%):

I would like some language arts programs that would allow for some immediate feedback: an interactive type. I feel we don't have access enough to the Internet on my grade level.

#2. Scared to use it (0%).

No. If I need to use it, I can get someone to help me or I will do it myself.

#3. Feel inadequate with technology (84%):

Very! I have no time to sit down and look at the programs that we do have and I am not going to stay up here at night to see what we do have. And there is so much the kids have to know that doesn't have anything to do with the computer. If I am going to spend my time on something, it is going to be on that. And that is an extra because they cannot use that on the test.

#4. Find ways to not use the computer (33%):

Well, I guess I am kind of a rule follower. If I am supposed to do it, I will do it. I make sure my children are getting the number of minutes they are supposed to do, the number of projects.

#7. Willing to learn more about the computer (84%):

I am hoping that it will get so easy that I will work myself into it. Like I say, I don't need it right now in my job and if it became necessary to have it and keep my job, I would make that decision whether I wanted to delve into it and I could do it very easily if I just sat down and played with it.

Theme #3: Knowledge

Within the last theme, knowledge came out with seventeen noteworthy codes, by far the most. It was not only a matter of competency with technology, it was what an educator is aware of. Sometimes the knowledge one has is not in line with the rest of the staff. On the other hand, it may well be advised to listen to known areas of concern. Here are a few glimpses into the area of knowledge directly out of the transcripts. These codes follow the same pattern for matching to table one as the previous two themes.

#1. Kids know more than you about computers (84%)

As I said, we have in this district a few kids that know as much or more than the computer teachers and help us with the district technology. As far as the rest, more than half of the kids know more than me. For instance, if I needed to do a Power Point presentation, I simply couldn't and would have to get someone to help me. On the other hand, many of our students could do that easily.

#3. Someone in your family that you depend on for technology (100%):

Oh Yes! I've got a daughter that is in college and a son who is finance and uses the computer all day long. I need to rely on my daughter and my wife too. My daughter taught my wife how to email this summer when she went off to college so they can email each other and they do it.

#5. Familiar with the Texas Essential Knowledge Skills for technology (0%):

I would have to look at the TEKS since I don't teach it. I am really concerned and I don't have access to it.

No. I remember one principal saying that technology should be incorporated. It must have been at a staff meeting or some place. I don't remember. Or maybe they said it's coming. One or the other, I don't remember.

#6. Know that a fourth grader has to do email (0%):

No, because I haven't tried to use it.

#8. Aware of illegal activities on the Internet (66%):

I have serious questions about the technology and the rate it's developing faster than the rate of what it can be utilized or policed. I don't know if I should say policed. I think as fast as new technologies are developed, people develop ways to misuse it, like hacking, hacking into sensitive areas, the way that they can access children's time and minds. The young people seem to be on it more than the adults.

In table one, the rest of the codes and their frequency responses are listed to give an extended view at the educator's responses. The transcripts of these interviews provided several noteworthy themes, yet, only time, interest, and knowledge culminated to a significant level. All respondents seemed open to the process and very truthful in their answers. Likewise, they provided more than an adequate response for the questions that were presented. Five of the six interviews were directly audiotaped in person and the sixth one was done in an over-the-phone conversation due to lack of time at school. Two of the six were taped in the researcher's room, three in the room of each respondent, and one from the home of the respondent via the phone. A complete list of initial questions can be seen in table two in the appendices.

Discussion

Krashen (1999) stated, "comprehensible input… and access to books" are what most second language learners need, yet usually lack, to acquire a second language (p.ix). Being surrounded by those that speak the language is essential. What this means is that in order to learn a second language, as technology may seem to some, it must follow a sequence. First there is a silent period (listening to those speaking the second language). Next, there is continued listening and living close to the language followed by early production of language. Finally, there comes native-like production of the target language. The process takes anywhere from three to seven years. The same can be said of technology as a second language when it takes almost as long for a teacher to learn how to use it well enough to teach it (Montoya, Sandin, & Wiburg, 1999). It won't be the technology that replaces the teacher that doesn't learn the new technology venacular, it is the teacher who does learn it (Meloni, 1998). Of the codes that emerged from the study, most held consistency with writings of many second language authors (Asher, 1999; Chomsky, 1996; Krashen, 1993 & Terrell, 1983).

Taken together, the results indicate a striking similarity with second language learning. The findings are especially intriguing because if it is a second language, technology that is, then there are ways to address it pedagogically. How many people in college degree plans that have to take a minimum of thirteen hours of foreign language only to end up with little or no working knowledge of the language in future years. Or, how often do you hear someone say, I will take a class and learn how to speak the language this summer. According to the natural approach, if you aren't surrounded by the language on a consistent basis and acquire it through sight, sound, and guidance, you do not stand much of a chance in speaking the desired tongue. Communication can take place without having to speak if you are called upon to act and do so correctly (Asher,1999). This is how a parent teaches their child the word no, through repeated actions and guidance. Computers require much the same kind of strategy, you have to get acquainted with it and then communicate back and forth to really grasp its unique potential.

Just to further illuminate this point, I will compare a kindergarten student who comes to school with a learned language and a technology tech that has no formal training in computers, though, works for a school district making the same salary as a certified teacher. Most educators have seen both scenarios and can relate to the frustration when a nondegreed tech can easily get a job in the outside world making at least double what the certified pedagogue does. Anyway, back to the analogy. The kindergarten student comes to school with the ability to communicate with the teacher orally. The child has not taken a class in the summer to perform this task but can do so because he acquired it through his environment. Looking at the tech, we see that he came to school with the language of computers. He learned it much the same way; with a little direction from his environment, time spent communicating with the computer, and acquiring the necessary skills and the level of proficiency goes up. After such natural advances in the acquisition of technology, the tech can then learn about computers as the kindergartener learns to read and write. This is where technology cognition comes into play on a level well advanced to that of teachers that don't know even the minor basics.

For adults to become effective technology language learners, they must first get the affective filter down to a level they are not embarrassed to use it openly. Compared to a second language learner, if you are always afraid you will say the wrong thing, you won't say anything. Since Hester (2000) found that teacher support is more critical to student use of technology than student support, it must be significant that teachers make students feel comfortable with trying new gadgets, thereby lowering the affective filter. The same comfort about trying something new must be felt by teachers when they are the learners of the new lexicon. When teachers finally do take classes they like, they admit that another class would be beneficial for their advanced training. This may be because a language is always practiced and learned, and the more you know the more stimulating it can be to learn more (Yildirim, 2000).

Plenty of playtime is one thing necessary to acquire that which seems so natural for more advanced technology students (Bollentin, 1995). Those more advanced have put their time in and continue to develop, that which "technophobic" teachers are reluctant to do. Seeing, speaking, working, listening, and playing are all part of the package of technology. Movement is another aspect found in second language theory that must be included (Asher, 1999; Jenson, 1998; Krashen, 1982; Terrell, 1983). Movement is necessary to make the learner think about the ensuing outcome of the event he is participating in. In no uncertain terms, you have to get your hands dirty like the kids on the playground and not worry about getting off it until you have had your turn at the computer. You have to put your time into it like a child, without worries.

What you learn on the playground, you learned with friends in the same boat as you. If you allow others to play the game for you, you would not have the pleasure of experiencing the learning yourself. You will have to depend on the degree of knowledge of whatever other person you happen to depend upon for answers. If that person did not play on the playground often enough and continue to practice, you simply wouldn't know. You would have to accept their word as fact. The Internet is just one type of playground that is useless if you haven't gone there with someone else. It takes seeing, dialogue, moving through it, hearing, and gathering to be truly proficient at it, support is a must (Yildirim, 2000). The more new skills gained, the more valued they become. New learning always happens in language, the same can then be said of technology. Instead of a new word a day in Spanish, it is a new skill on the word processor. It could also be how to scan a document and file it for later use.

Even forced use of the language may lead to positive use of it and more positive attitudes. This can be an unlikely analogy for technology if continued support is not present (Mitra, 1999). Teachers that are forced to use computers long enough will find in the end that they are truly going through all the phases of computer acquisition including: a silent period, early production, advanced mastery, and mastery of technology. Perhaps the only difference between voluntary learners and them is the preliminary begrudging attitude. Later they may find they can do it. They will then get past the word processor, email, and games that they have been limited to in the past and may move on to more advanced software like Power Point, the web, and multimedia productions (Becker, 2000). If it is true that women make up an overwhelming amount of "technophobic" teachers in education, then administrators will have to understand that the language of technology is as compulsory for females as it is for males and take measures to help them reach an equal plane (Haag & Weinman, 1999). Special efforts should be taken to recognize this marginalized group of educators that make up over three quarters of the entire teacher workforce. .

After teachers have acquired more knowledge about technology, they can then get to the task of learning it for the purpose of teaching it. Younger teachers may have the same needs for technology acquisition if they are not in the clique of technophiles due to socioeconomic reasons. Remember, you can be any age to learn a new language, the older you are, the easier it should be because you understand the rules of language. Just get the affective filter down and play on the playground with your peers.

As a second language learner of Spanish myself, and a second language learner of technology, I find a great similarity in technology and a second language. I hear many different people say the same things when it comes to learning either one. They believe children are somehow more gifted to learn so fast when the real reason is that the children put their time in on the playground and they play no matter how good they are at doing the task. It can be said that none of the participants in this study found time to put in on the playground. They had no friends to help make sure they practiced and kept on playing. What we do find in the study, which is somewhat intriguing, is the fact each of the respondents had someone they could depend on for their computer knowledge skills much like people do to me when they need me to translate for them on the spot. Or much the same as an immigrant does when they don't speak the language and they have to depend on their kids to translate when buying a new car or house, even when the child is in elementary school.

What I found encapsulating was that most teachers know the importance of computers and other forms of technology, yet they don't know what is expected of them when it comes to teaching technology in school, much less the skills to do so (table three explains Texas technology essential knowledge skills for students in kindergarten through fifth grade). Those that are reluctant to use technology seem to do the same kind of depending-upon-the-other that is done when a translator is needed. Most people I encounter believe I learned my second language as a child and are usually taken aback to find out that I started a second language when I was in my twenties. I did not acquire technology skills till I was in my thirties and not till recently on an advanced level. It is easy to see how I come by this comparison of technology and language. The commitment it takes to learn a second language is not found in very many adults from the United States. Unless you have an ancestry that promotes it, it just doesn't happen too often. My best advice would be to stay surrounded by it on a daily basis to acquire it; then it can be learned on a cognitive level.

Several limitations associated with sample selection should be noted. First, there was no way to confirm what the participants shared was indeed the truth. Second, all participants were volunteers with only one teacher asked to participate refused. Third, the participants were familiar with the researcher prior to the study and may enhance some to believe that the respondents could have been lead to answer a certain way. To account for this, I did not let anyone know of another person participating till the study was over and all member checks for validity were established. And lastly, the type of qualitative analysis used can be construed as both a strength and limitation. The method used in this study is most consistent with a postpositivistic paradigm and followed the influences of grounded theory (Corbin & Strauss, 1990). Efforts to decrease bias were employed by the use of triangulation of the data (Yin, 1994).

I recommend that future research on this particular topic incorporate alternative qualitative procedures that are consistent with grounded theory, constructivist theory, and second language acquisition. Second, the more inclined studies will be a replication with bigger samples and longer amounts of time in data collection for optimal results. Third, another important aspect for the future lies in defining more precise ways of second language theory strategies that can be applied to technology training, (e.g. dissecting a computer down to all its simplest parts and becoming familiar with each to build a stronger understanding than just abstractly). Fourth, present studies could be tested in a quantitative format to give more life to the findings.

Significance

To understand the immense amount of time and true stick-to-it-ness required for technology to be learned, it would behoove administrators to find the computer playground on their campuses and the regular time necessary to play there. In the near future, Texas will be demanding more compliance with the technology TEKS than ever before and like many other states will seek ways to enforce it. Understanding the time, interest, and knowledge themes presented in this study, an administrator with the proper insight can use these items wisely now for advanced levels of proficiency when the time is critical. Continuous support can be provided with the understanding that if your staff is not speaking the language, one cannot expect them to speak through a few introductory classes that they may forget down the road. In the natural approach to learning, there has to be time for a silent period, daily expectations for compliance with the freedom to choose what is needed. And finally, what is offered needs to be from a colleague who understands what the teachers are going through. It is another waste, this time in money, to bring in someone too advanced with little or nothing in common with the staff.

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Table 1. The Table of Codes From Respondent Data Grouped Into Themes

Themes and Codes Under Each Theme	Number	Percent
A. Time		
1. Look up financials.	2	33%
2. Don't use it at home to any great degree.	6	100%
3. If I were younger, I would use it more.	3	50%
4. Use it at school.	1	16%
5. Speak technology jargon.	4	66%
6. There isn't time to use it.	6	100%
7. Prefer to practice with someone.	4	66%
8. Other more important things to do.	6	100%
9. Only four days a year training or less.	5	84%
10. Time to do email.	3	50%
11. Their students have computer class each week.	6	100%
B. Interest		
1. Didn't have what you needed to work with.	5	84%
2. Scared to use it.	0	0%
3. Do you feel inadequate with the computer?	5	84%
4. Do you find ways to not use the computer? Yes.	2	33%
5. Does it make you angry to use the computer? Yes.	1	16%
6. Do you like to speak the jargon? Yes.	0	0%
7. Are willing to learn more about the computer? Yes.	5	84%
8. Would you rather use it with someone? Yes.	4	66%
9. Are you afraid to push the wrong buttons? Yes.	3	50%
10. Did you buy a computer because you wanted to? Yes.	5	84%
11. Do you program your VCR to tape ahead? Yes.	1	16%
12. Does computer use affect you physically or emotionally?	0	0%
C. Knowledge		
1. Do you feel like the kids know more than you do about the computer?	5	84%
2. Have you received software training? Yes.	0	0%
3. Is there someone in your family that you depend on for computer advice?	6	100%
4. Do you feel like others know more about the computer than you do? Yes.	6	100%
5. Are you familiar with the Texas Essential Knowledge Skills for technology? Yes.	0	0%
6. Did you know that a fourth grader has to do email? Yes.	0	0%
7. Do you use the Accelerated Reader? Yes.	3	50%
8. Are you aware of all the illegal activities on the Internet? Yes	4	66%
9. Have you done any presentations on the computer? Yes.	0	0%

10. Have you bought software for your classroom? Yes.	0	0%
11. Did you take classes for the computer? Yes.	5	84%
12. Do you use the fax? Yes.	5	84%
13. VCR?	6	100%
14. Do you set it ahead? Yes.	0	0%
15. Do you use the cell phone? Yes.	5	84%
16. Program it? Yes.	2	33%
17. Are you familiar with technology jargon? Yes.	4	66%

Note: Data in this chart were taken directly from the participant's responses during the taping of interviews and member check interviews. Later they were coded into these three themes.

Table 2. Survey Questions

1. Could you tell me about yourself and how you use technology (Computers, faxes, phones, cell phones, VCR's, microwave, etc.)?
2. Do you feel most others know about computers and you are one of the few who don't? Explain what you know about using a computer for personal use, schoolwork.
3. Do you or any member of your family use computers, the Internet, faxes, etc. and if so please explain to what degree?
4. Is there someone in your family that knows about technology and does the performance skills on the computer for you, that you depend on to operate it, or who you call for answers when you have a problem with the computer? Do you simply let this person take care of this for you? If yes, please explain.
5. Are there other issues about the computer and why you don't use it more regularly at home and in the class?
6. Are you unfamiliar with technology language and how does it make you feel to talk about bits, bytes, peripherals, hard drives and other technology jargon?
7. When did your school put a computer in your classroom or expect that you use it to teach with and did you receive any training on software or simple use of the computer? If yes, was it adequate training for you?
8. Tell me how does it make you feel to use the computer or have to use the computer? Is it better to be alone or with someone when using a computer?
9. Do you feel like kids know more than you do about computers? Please explain this.
10. Do you feel inadequate with your knowledge about computers?
11. Are you afraid to push the wrong buttons?
12. Does it make you angry or physically uneasy to use the computer?
13. Do you find ways of getting around the use of a computer? Or just simply refuse to use it?
14. Are you willing to learn more about technology or not? Please explain.

Table 3.

Texas Technology Essential Knowledge Skills for Kindergarten through Fifth Grade, "E"

Indicates to Emphasize, and "R" Indicates to ReinforceYear

Technology TEKS K-5	Kinder	First	Second	Third	Fourth	Fifth
A. Introduction	E	R	R	R	R	R

1. Foundation	E	R	R	R	R	R
B. Knowledge	E	R	R	R	R	R
1.Foundations	E	R	R	R	R	R
a. Terminology	E	R	R	R	R	R
b. Save Files	E	R	R	R	R	R
c. Print	E	R	R	R	R	R
d. Adjustments				E	R	R
e. Access Printer				E	R	R
2. Foundations						
a. Keyboarding	E	R	R	R	R	R
b. Touch Keyboarding	E	R	R	R	R	R
c. Punctuation	E	R	R	R	R	R
d. Proofread	E	R	R	R	R	R
e. Language Skills	E	R	R	R	R	R
f. Timed Exercises				E	R	R
3. Foundations						
a. Policies	E	R	R	R	R	R
b. Illegal Software	E	R	R	R	R	R
4. Information Acquisition						
a. Keyboard Search	E	R	R	R	R	R
b. Navigate Search	E	R	R	R	R	R
5. Information Acquisition						
a. Text, Audio, Video, Graphics	E	R	R	R	R	R
b. On-line Help	E	R	R	R	R	R
6. Information Acquisition						
a. Determine Success	E	R	R	R	R	R
b. Usefulness	E	R	R	R	R	R
c. Critical Analysis				E	R	R
7. Solving Problems						
a. With Software	E	R	R	R	R	R
b. Use of Software	E	R	R	R	R	R
c. Use Variety of Data				E	R	R
8. Solving Problems						
a. In Groups	E	R	R	R	R	R
b. Research	E	R	R	R	R	R
c. Communities				E	R	R
9. Solving Problems						
a. On-line Evaluation	E	R	R	R	R	R
b. Software	E	R	R	R	R	R
10. Communication						
a. Define Audience	E	R	R	R	R	R
b. Use Multimedia	E	R	R	R	R	R
c. Spreadsheets				E	R	R

11. Communication						
a. On printer/Monitor	E	R	R	R	R	R
b. Stored Files	E	R	R	R	R	R
12. Communication						
a. Use Stored Files	E	R	R	R	R	R
b. Evaluate Product	E	R	R	R	R	R
c. Create Rubric				E	R	R

Note: Data in this chart were taken from the Texas Education Association, 2000 (TEA, Chapter 126) and condensed in simple terms to understand skills to be mastered by students from kindergarten to fifth grade. Retrieved October 12, 2000 from, The World Wide Web.

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The AURORA Project: Using Mobile Robots in Autism Therapy

Since 1998 the *AURORA* project (*Au*tonomous robotic platform as a remedial tool for children with autism) studies how a mobile robot could be developed into a teaching device to be used in the therapy of children with autism.

According to the National Autistic Society (NAS) autism is characterised by a triad of impairments in social interaction, social communication and imagination. Depending on what is included in ‘autism’, rates of occurrence are given which range between 5-15 in 10000. People with autism (or better: autistic spectrum disorder, ASD) find it difficult to relate to other people and develop social relationships with other people. They often react inappropriately in social interactions and have difficulty in understanding another person's thoughts and feelings. This impairment of social interaction skills can pose serious problems to people with autism, e.g. it prevents them from taking part in everyday social interactions that are necessary in order to learn from others, and to lead an independent life as a member of human societies.

The literature discusses a variety of potential causes of autism. Often autism is combined with other disabilities, in particular learning problems, which make diagnosis and the choice of therapy difficult. A variety of different therapies exist, ranging from music therapy, holding therapy, and ABA (Applied Behaviour Analysis) to TEACCH, a therapy method also used in Radlett Lodge School, a school of the NAS, and a collaborator in the AURORA project. A key part of the TEACCH method is that it encourages *pro-active* communication in the child.

Figure 1. Two children with autism interacting with the mobile robot used in the AURORA project. The project is supported by a grant from the UK Engineering and Physical Sciences Research Council (EPSRC, GR/M62648).

The AURORA project investigates if and how a mobile robot can be used to encourage pro-active communication in a child by studying unconstrained interactions between a child and a mobile robot in a playful context. Here, the child is interacting with the robot in a room, in the presence of a teacher and two project members who videotape the interactions and operate (e.g. start and stop) the robot. The robot runs *autonomously*, i.e. it is not controlled remotely. We believe that since autonomy is an important factor in *human-human* social interaction it is also important for recognising and accepting a *machine* as an interaction partner. The project uses the interactive mobile robot Labo-1, donated by Applied AI Systems Inc. The robot's basic sensor configuration consists of active infrared sensors for obstacle avoidance and pyro-electric sensors which allow detection and following of humans. The robot weighs about 6.5 kgand dueto a 4 wheel differential drive it can turn very smoothly. The robot can produce words and simple phrases in certain situations, using a voice production device.The robot can avoid obstacles and detect and follow humans. Figure 1 shows a child with autism interacting with the robot. The trials involve children between 8-12 years of age. Note, that our primary aim is not to develop a social relationship between the robot and the child. Ultimately, the robot should play the role of a mediator, a device that can help a child to bond with other (autistic or non-autistic) people.

The first phase of the AURORA project established with 5 children that 1) the robot is safe for the children to use, 2) the children are not afraid of the robot, 3) the children are sufficiently motivated to interact with the robot over a period of ten minutes or longer, 4) the children are more interested in the robot in 'reactive' mode in comparison to the robot showing rigid, repetitive, non-interactive behaviour, 5) the children have no problems coping with the robot behaving reactively but not completely predictable. In these trials the robot showed a few basic behaviours of approach and avoidance.

In the second phase with 7 children we investigated whether the children behave differently towards the robot as opposed to a non-interactive toy. For this purpose a quantitative evaluation technique was developed, based on the analysis of micro-behaviours. Results showed that the children showed more interest in the robot (in terms of gaze, touch etc.) and were more engaged in interactions with the robot than with the toy. It was therefore established that the robot can engage the children with autism in interaction dynamics that are important to social interactions in general and that future trials can be based on (e.g. turn-taking games).

In the third phase we investigated 3 pairs of children. We found that the particular kind of social interactions among the children in the presence of and during interactions with the robot reflects their social interaction outside the classroom. This established that interactions with the robot in the pair-trials were not 'artificial', so future trials can build on such 2-children scenarios.

Future work in the AURORA project will 1) compare the results gained so far with results with non-autistic children, 2) increase the behavioural complexity of the robot towards more 'intentional' and less reactive behaviour, 3) modify and improve the quantitative behaviour evaluation technique, 4) investigate new methods for automatic data acquisition of simple interaction patterns.

The AURORA project aims at teaching children with autism social skills. Generally, learning about social skills in the AURORA project should be a positive, 'joyful' experience.

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NAS: http://www.oneworld.org/autism_uk/index.html

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Learning System Design: More than Atomic Science

Summary

Cognitive science has provided some profound insights into how people learn. The design of on-line learning environments should incorporate these to move past the traditional focus on "atomizing" the material to be learned, and begin to treat learning as an active and integrative process.

There are a number of issues that I feel contribute to the failure of educational technology - within a corporate setting - to have a substantial impact on the targeted learner . These include the uncritical adoption of inappropriate technical solutions and the absence of focus on devising effective instructional underpinnings. A key condition of success is ensuring that a strategic plan encompassing the delivery context, the design of the instructional system, and the sustainability of that system is clearly defined and properly implemented. I'll argue in this article that devising that plan in turn requires a broad consideration of a number of systemic issues coupled with an extension of the way in which instructional design is conceived.

Systemic Issues and Challenges

Identifying the list of issues and constraints that will (implicitly or explicitly) have a substantial impact on the success of an instructional system is a critical component of developing a solid strategic plan. There are some issues which, in our experience, are fairly common across corporate environments. These include the following:

1) the time available to individual employees - *for the purpose of learning* - is limited and likely to decrease as they assume - paradoxically - increasingly complex and diverse responsibilities

2) the time available for *active coaching* intervention is limited and likely to decrease (for the reasons cited above)

3) management is unwilling or unable to engage in *meaningful* data accrual regarding training intervention efficacy due to the labour and expense it involves

4) the *creation, maintenance and distribution* of content is costly

These issues in turn have the following impact:

1) learner motivation to *actively engage* with the instructional material is limited and partially reflects the degree with which management actively monitors, rewards and assists in the learning process

2) *retention* of the instructional material, even if the assessment process is actively pursued by the learner, *is not well sustained* beyond a specific session

3) *low self-management* of the learning process based on a lack of understanding by the learner of his/her own level of knowledge with respect to occupational requirements, and the ability to select a course of self-study that meets short and long term instructional needs

4) difficulty for management and training staff to adequately *strategically* assess and proactively meet identified training needs

5) a lack of *responsiveness* by management to new or changing training needs

To be successful, a training or learning environment should center on providing a framework which meets the challenges identified above. The environment should be designed to support sound instructional processes, facilitate meaningful learner management of their own learning process (and consequently ownership), provide appropriate support for the development and distribution of content, and ensure the transparent accrual and assessment of training data. It may sound like the holy grail, but I think it is possible providing one keeps in mind a few important principles, and re-examines the traditional instructional paradigm on which most learning technology is based. Let's deal with the principles initially:

1) Cognitive science research strongly supports the contention that learning is an active process of constructing meaning. In other words, learning takes effort, engagement, commitment and time before personally meaningful representations are developed

2) Learners have a broad range of backgrounds and prior exposure to the domain in which the instruction will take place, which in turn has profound implications for how instructional processes are engaged by the learner

3) A related principle is that novice learners - since they have little or no prior knowledge - have great difficulty in three areas:

- being able to discriminate between critical and non-critical information
- the retention of new information or concepts (short term memory is usually cited to be limited to approximately 7 discrete new "bits")
- fitting new information into a cohesive and meaningful whole which results in low comprehension and retention rates

4) Learning should be recognized as a both a private and public process. Private in the sense that no learner should feel penalized, humiliated or intimidated about engaging in a learning process; public in the sense that effort, achievement and progress should be recognized and actively rewarded.

The atomic science of "traditional" instructional design

The "traditional" approach to instructional design generally ends with some hierarchical representation of the content, through which "knowledge" is broken down into what are felt to be the constituent atomic "bits". The representation of that information in an instructional or learning environment generally results in a succession of menus and sub-menus roughly emulating the hierarchy. The typical end-user experience is to select a major category, select a sub-heading within that category, and so on until an instructional sequence is encountered. Even if the navigational elements are structured in such a way that successive "drill-down" isn't required (through search, site maps, dynamic menus etc.), the presentation of the content generally follows this kind of format.

"So what's wrong with that?", you ask. My answer is "Nothing, or a lot, depending on the context in which the learning product is used and the instructional objectives that it is trying to achieve". If the need is to supply specific reference material to the end-user, then the kind of indexed presentation of content described above is productive. But I'd argue that the context in which an index is appropriate is usually limited to a targeted information seeker. If we're talking about instruction - by which I mean the integration of information into a cohesive and meaningful whole - then I think that instructional design demands a more sophisticated approach. Meaningful learning, even in a training context, is not about absorbing small "info-bytes", but about struggling to understand, at a conceptual or holistic level, the underlying context and principles that relate that information to a larger picture.

The incorporation of this view into the implementation of a learning system can be accomplished, but it needs a more sophisticated approach to instructional design and content representation that moves beyond the traditional "atomizing" of instructional material to an equal focus on the **inter-relationships** between concepts. That focus not only supports better learning, but it also allows for a level of abstraction that makes a single learning system broadly applicable (a topic that will be discussed in a future article). The key is understanding that instructional systems are dynamic environments which can actively exploit learner interactions to help support instructional processes.

Some Suggested Guidelines

The following list represents some of the guidelines - derived from cognitive science research -that should be applied to the design of an on-line learning environment:

- the meaningfulness of new information is determined by the degree to which it can be linked to existing knowledge frameworks; developers have to explicitly address methods by which the learner is encouraged to actively construct - and articulate - those frameworks as they apply to the material to be learned. This can be referred to as the process of "activating" prior knowledge.
- learners need a substantial level of support in accessing and understanding the relationship between the currently accessed instructional component and an overall conceptual framework into which new material can be integrated. These relationships, therefore, must be constantly demonstrated and reiterated.

- the “cognitive load” that a learner can carry is based on the level of expertise: novice learners cannot attend to more than a very small amount of new material at any one time. This amount increases with expertise. The design of a learning system should, therefore, account for these differing needs.
-

- practice, practice, practice!!! The amount of supported practice is a critical determinant of learning, especially during any early stage of learning. Lower level cognitive and psychomotor skills must achieve some degree of “automaticity” before higher order skills can be successfully learned and utilized. This does not, however, negate or deny the importance of linking lower level concepts to higher level conceptual frameworks.
-
- the system must be designed with learner, management and organizational needs in mind, especially with respect to data accrual, analysis and distribution. These should be transparently linked to privacy protocols, access and security mechanisms, curricular components, organizational structure, and work-flow processes.
-
- in turn, data should support a commitment by management to the active monitoring, recognition and rewarding of learning processes, where such monitoring does not interfere with learner privacy. In many cases, the data accrual and analysis mechanisms can be build to identify and respond to the achievement of specific benchmarks, making the monitoring process less intrusive, cumbersome and labour intensive.

Coupled to these are a few broader (and to some extent obvious) considerations:

- people appreciate good design, functionality, and performance
- people only use systems that offer substantial benefit over other services/sources
- monolithic or non-modular approaches are not sustainable
- always think holistically and synergistically - there may be many ways in which a learning infrastructure may feed - or be shared by - other corporate divisions or partners

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Using Web Authoring to Increase Student Engagement

Abstract

Trainee Teachers use GeoData's WebQuiz application to create interactive web pages that they then use in their teaching practice in schools. The software enables them to create and refine quizzes of questions (multiple choice, text entry and true/false) on a floppy disk which can subsequently be placed on the internet by their tutor. The quizzes are then freely accessible to anyone on the worldwide web. The activity promotes a deeper knowledge and understanding of the topic of the quiz and creates a focus for collaboration and sharing of resources.

Introduction

The GeoData Quiz is an interactive Windows application that has been developed with the support of a number of departments within the University of Southampton. The design philosophy behind the application was to create a generic tool for questioning students in the University networked Windows environment, replicating and extending typically used question formats. The Quiz application has successfully been used for the formal assessment of hundreds of students in a single afternoon, including the medical, biology and education departments.

The quiz program presents information from quiz configuration files which determine the application behaviour and specify an arbitrary number of questions using several standard templates. Quizzes are fully modifiable by course tutors and trainees either by editing the files directly, or using the associated QuizWriter application. Available question types are True-False, Fill the Gaps, Multiple Choice and Identify features from an Image. Current facilities include practice and assessed questions (with optional scoring and feedback), variable tries per answer, flexible answer matching through the use of wildcards and accepted variations, and multimedia linking. Facilities for enforcing exam conditions include preventing users from exiting or restarting the application, options for ensuring all question parts are completed before continuing, and quiz file encryption.

The WebQuiz extends the implementation model of the Windows program, allowing quizzes to be seamlessly delivered via the web. This is achieved through the WebQuiz web server program (CGI) and requires no special technology at the user's end, other than a browser and internet connection.

The students involved in this particular application are trainee teachers. They are attending a one year post-graduate course preparing them for teaching computer relating work in secondary schools (grade 7-13). The delivery of teaching materials is becoming more and more focused on the internet as more schools develop their own intranets and internet connections. All trainees, therefore, produce web pages of information for pupils. They have to create presentations (usually using PowerPoint) and deliver those across the internet. Creating a quiz using the WebQuiz is one of many Directed Activities that they have to complete as part of their training to be an IT teacher.

The Directed Activity

Trainee teachers have to:

Directed Activity 4
Creating web based assessment materials
In preparation, complete the Quiz at http://www.soton.ac.uk/~pgce/it/quiz
and identify with your curriculum mentor a topic for a web based quiz.
Plan, implement and evaluate a quiz of 10 questions.

Some enterprising trainees go to commercial sites providing quiz authoring and quiz feedback facilities. These prove successful but their application is more limited because they do not have as much control over the data processing as do the trainees using the WebQuiz. Other alternatives include using Visual Basic and Javascript within an HTML webpage. This option is only open to trainees with those programming skills and again this has less functionality. The most able students are limited because the University does not allow the inclusion of CGI programs on user workspaces. The majority of trainees use the WebQuiz.

The reaction of trainees to the writing of quizzes is mixed. Nearly all are enthusiastic regarding the product. That is, they see the value of interactive web pages that can give immediate feedback and reward to learners. They also express a sense of achievement in 'publishing' to such a wide audience. Some trainees find the process frustrating. Particular gripes arise because the authoring tool is not wysiwyg. The screen display is a windows dialogue box and bears little resemblance to the final web page output. There are difficulties because the authoring interface requires the use of technical terms such as FillGaps, MCGaps and FillImageGaps meaning fill the gaps, multiple choice and multiple gaps based upon an image. Some students abandon the front end completely and edit the quiz configuration file directly in Notepad. A single quiz question definition contains between 5 and 30 lines.

```
[Question1]
 Type=FillImageGaps
 Title=A Sound Recording and Playback Program
 Instructions=Type in what you think the icon does:
 Image=s.bmp
 Gap1=play
 Gap2=record
 Gap3=begin;start
 Gap4=finish;end
 Gap5=stop
 Gap6=position
```

Trainees with programming experience thought this to be very simple. Inexperienced trainees appreciated the opportunity to operate with scripts. There remains a pedagogic issue regarding training in that there is not a direct connection between script editing and web page viewing. The script had to be submitted to the tutor (by e-mail attachment) who then FTPed it to the GeoData site. Trainee teachers report that they become more involved in the topic in which they are creating a quiz.

Taking it to the classroom

The process was successful in the classroom. Some trainees created quizzes that were then used with their pupils. Although there has not been a rigorous reporting procedure, anecdotal evidence suggests that the pupils are stimulated by the activities. An important feature of the WebQuiz is the ability to allow the pupils to 'mark their own work'. When the feature is enabled the quiz becomes a teaching tool. The pupils study the questions and optional images. They make their guess and can then check their answer. The same quiz can be used as a testing device. The pupils make their guess and continue. They have no chance to mark their work and they get no feedback. At the end of the test the final score can be suppressed by the quiz designer. In this way, a whole class of pupils can be working on the quiz without the problem of one pupil's mistake helping the next pupil get the right answer.

The feedback from the quizzes takes several forms. The simplest is the pupils seeing whether they have individual question right or wrong. The optional scoring system can award marks to individual questions thus allowing harder questions to be weighted higher than easier questions. The final score can indicate overall performance. That score can be automatically e-mailed to the pupil completing the quiz or to the author of the quiz. The most sophisticated feedback records log files tracking the performance of the individual on each separate question, the time taken to complete the activity and the name (identifier) of the computer used.

Conclusions

The WebQuiz enables computer users with little or no knowledge of web page construction to create interactive web pages. However, the quiz authoring interface requires improvement. The act of creating a quiz engages the author more deeply in the knowledge and understanding of the topics in hand and, therefore, it could be said, makes their teaching of the topic more effective. The WebQuiz gives accurate details of an individual pupil's performance, offering greater opportunity for individualised teacher feedback and support. The teacher can make better judgements of overall pupils' performances and therefore better plan future lessons.

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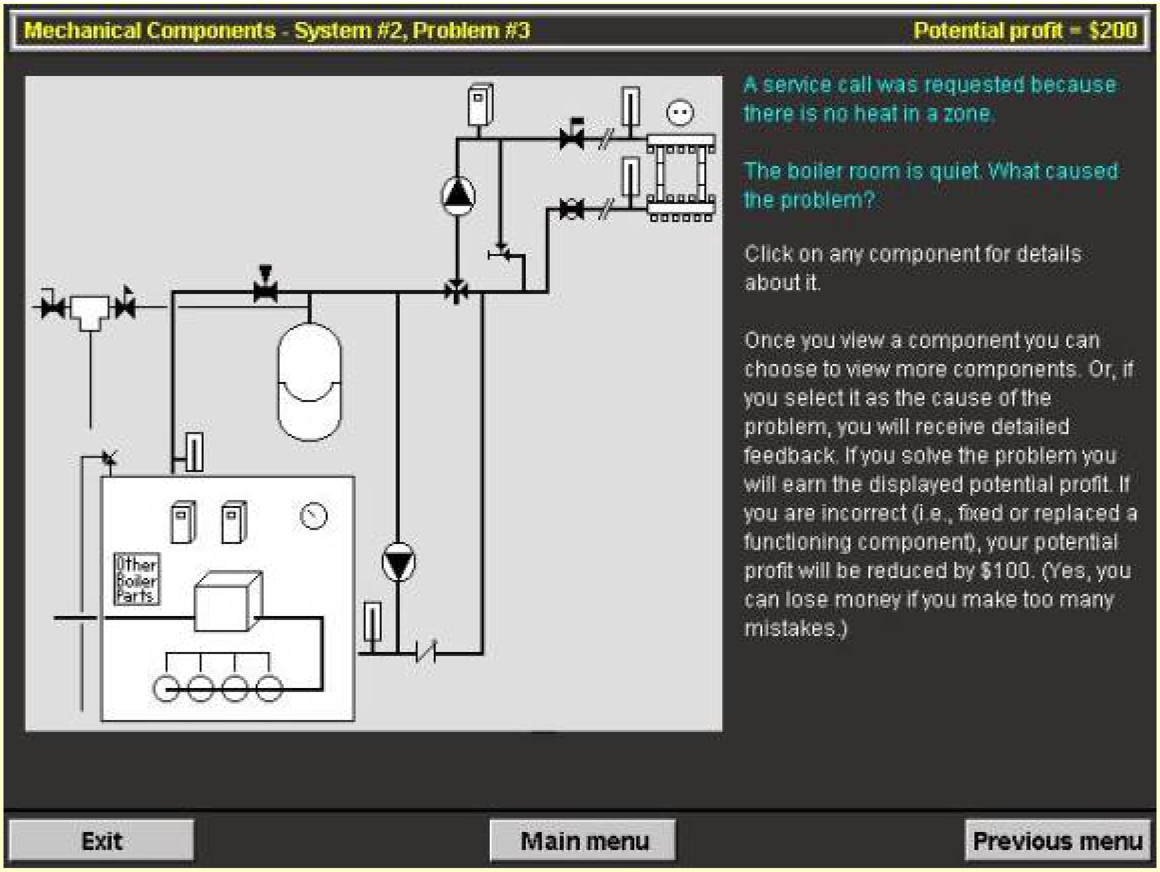
Teaching Troubleshooting Skills With Technology

I work as a Project Leader/Instructional New Media Designer for the Group for Advanced Information Technology (GAIT) at the British Columbia Institute of Technology (BCIT). In my area of GAIT, we have been using technology to solve instructional problems of both external and internal clients since 1984. Our mandate that is to help our workforce be highly trained. We work on a cost-recovery basis to achieve this goal.

Clients approach us when they cannot train employees through traditional teaching methods. Solutions often require simulation and troubleshooting skills to be taught. In one example, we created a new instructional model to train learners how to troubleshoot hydronic heating systems. In the field, the learners could follow the schematics and install hydronic heating systems. However, eventually something in the system malfunctions. The learners were not receiving essential troubleshooting skills. The problem was that learners were being trained on systems that were fully-functioning. Instructors were not taking out components, breaking them, and then saying to the learners to go and find out what was not working. If they did it for one learner, the other learners would need to do this independently. If this was done for one component, what about the other 20 components? What about the other 30 types of related systems? This was an excellent problem to solve using instructional technology. The solution was an easy-to-use highly-interactive program that ensured learners understood the logic needed to troubleshoot both the mechanical and electrical components of hydronic heating systems.

The main menu’s first option is an introduction. It provides a compilation of pre-requisite information on each component, including what it does, how it works, causes of malfunctions, why service calls are requested, how you can determine if there is a problem, and how you fix the component. There are also five increasingly complex mechanical and electrical hydronic heating systems.

On the schematic diagram of each system, learners can click on any component to see a high-quality photograph of the component and some text details regarding troubleshooting logic. Learners can, at this point, choose to see any other component. Alternatively, they can state that the component failed. In this case, the learner will get one of three possible answers. The first probable answer is "Maybe" and it comes with detailed diagnostic feedback – as if an expert was beside the learner. Learners are then told to go and check other components. The idea is that you cannot yet make that conclusion if you do not know some specific pieces of information (i.e., knowing if there is a call for heat, is there heat coming out of the boiler, the pressure …) Once learners have the other required information, they can get the other two possible answers, a yes or no. Regardless of whether they are right or wrong, they will receive detailed feedback about why they are right or wrong (again as if an expert was guiding them). With four problems to solve for each electrical and mechanical system, there is ample opportunity to thoroughly learn troubleshooting skills.

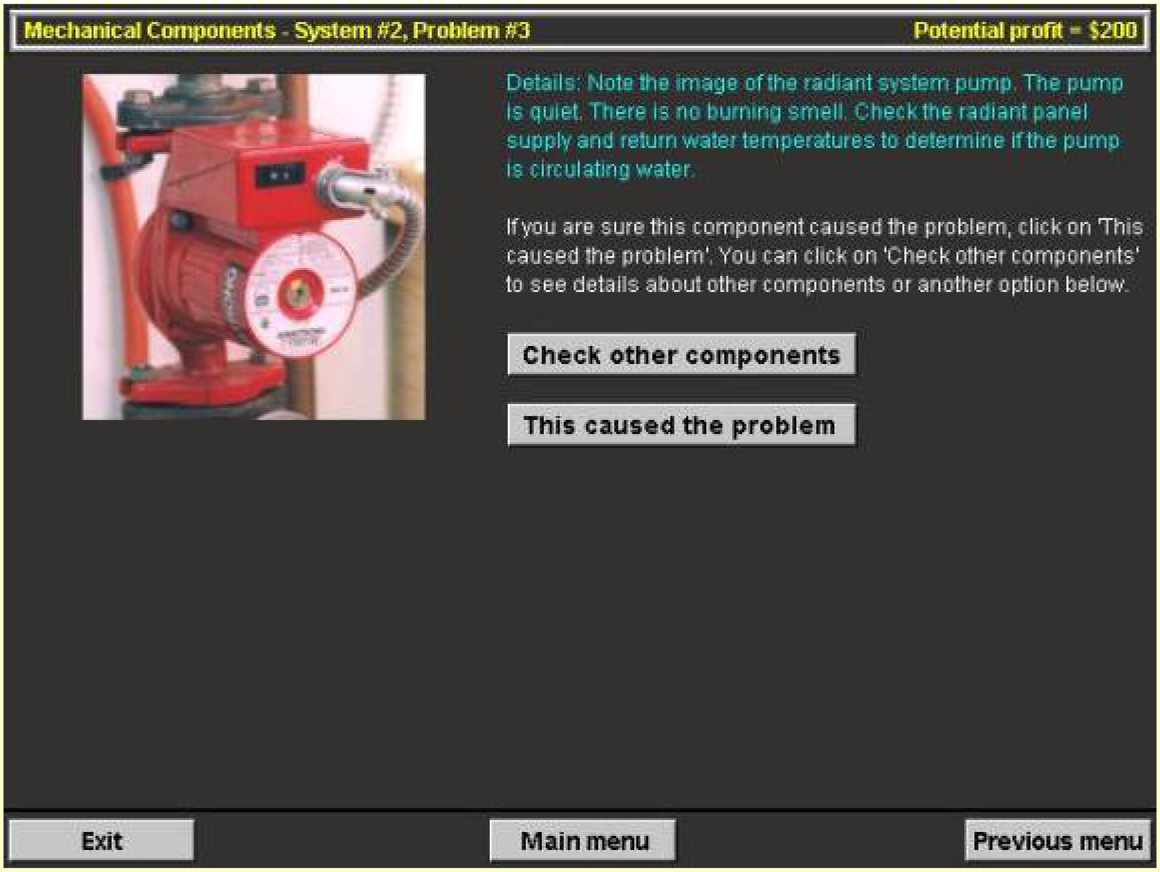


The software also simulates the real world by adding the potential to earn $200 profit. Anytime learners state that a component caused the problem and they are wrong, they lose $100. The idea is that they lost money because they replaced a functioning component. After two wrong conclusions learners can only break even and they will lose money with more incorrect replacements.

Note that this instructional model can be adapted to create software to train individuals how to troubleshoot other systems (e.g., hydraulic or pneumatic systems).

Instructional new media technology (or computer-based training) has existed for many years. Due to poor instructional designs, it is often stereotyped as teaching trivial skills, being unfriendly, and/or boring. This product has a number of exemplary features:

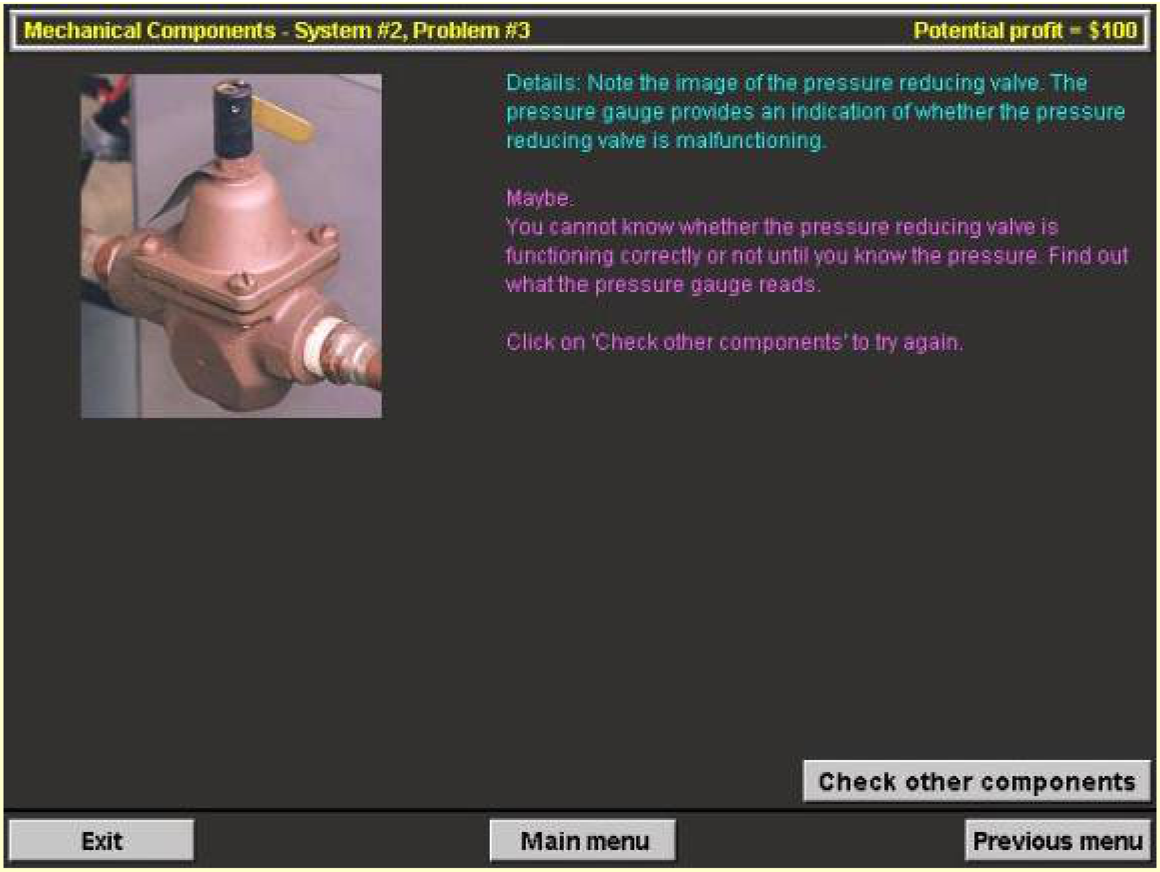
- The program effectively teaches high-level troubleshooting skills.
- The product is intuitive and very easy to use in that students do not need to first learn how to use the program. We design from the philosophy, "if we have to explain how to use it, we have done something wrong".
- The program maintains student interest through a high level of interactivity and the "potential profit" game. Note that we define interactivity as activities that require learners to think (rather than simply being able to choose menu items or links).



All of our programs follow solid instructional design principles that guarantee learning will occur (assuming the learner wants to learn in that you cannot force someone to learn). We do not use glitz. We use video, audio, animation, photographs … when it will enhance learning.

We have created other products because of logistical problems. For example, there may only be a few experts in North America who do not have the time to travel around training individuals or it is too expensive to send individuals off-site for training. One of these products was a computer-based tutorial teaching Canadian Aviation Maintenance Technicians "soft" skills (such as how to work on a team and how to deal with a lack of resources). The end goal of the training was to help them prevent errors from occurring.

If you would like to learn about designing and developing computer-based training materials, I can somewhat biasedly recommend my textbook entitled, "Practical Guidelines for Creating Instructional Multimedia Applications" published by Harcourt Brace.



We, the GAIT lab, would like to partner with industry to create more instructional new media software. Note that any product created may have significant market potential. If you have trouble teaching some material and we (BCIT) cannot teach something, it is likely that few others can. So, there is a good possibility that others will need the training software. An ideal project would be one that you can use to train your employees, BCIT can use to train its students, and has market potential.

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Thinking Space Required

ICT Continuing Professional development for education change managers

MirandaNet is an international fellowship for educational inquiry, established in 1992, which provides professional development peer support for those who are using advanced technologies as a catalyst for change in teaching and learning. MirandaNet Fellows are managers of change in classrooms, schools, colleges, universities, education regions, government and industry.

MirandaNet Fellows work closely with industry to develop innovative solutions for teaching and learning. Since 1999 the MirandaNet Thinking Space team, based at The Institute of Education, University of London , has been researching and developing the applications of Think in partnership with Oracle. The team focus is Think.com, a web based learning environment designed for schools jointly by Oracle USA's development team with Professor Stephen Heppell at Ultralab in the UK. Oracle has invested over $10 million in the development of this on-line community software, which is free to students and teachers as part of the Oracle Millennium Promise. Already 13,000 early adopters in the USA and UK are providing feedback to the Thinking Space research and development team.

The sixty strong Thinking Space team is drawn from schools, local education authorities, teacher education establishments and companies. Evidence about the impact on professional development of web based learning environments is emerging from a variety of perspectives:

e-mentoring
learning progress
issues for agents of change
copyright and licensing
web based collaborative learning environment evaluation

Publications from the first year's work include a handbook about using Think in the classroom and a book about building learning communities on-line. Approximately £2.6 million is being invested by Oracle in this research, development and evaluation phase. In addition, Compaq, the computer hardware company, is partnering the innovative development of mentoring using electronic communications (e-mentoring) as a means of increasing the number of teachers and students who can participate in on-line communities.

In 2000-2001 the Thinking Space team will be running 6 seminars in London about the practical applications of Think.com in the classroom. There will also be 3 policy seminars for educators who are involved in the change process as well as a peer e-mentoring service and expert Hot Seats on the MirandaNet website.

Dates and information is available on http://www.mirandanet.ac.uk or
contact enquiries@mirandanet.ac.uk
Free Think registrations: http://think.oracle.co.uk

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History Finds Home on the Internet

It's time for history students of all ages to rejoice as MultiEducator Inc. announces the launch of the largest history web site on the net, http://www.HistoryCentral.com. Drawing on materials developed by MultiEducator, Inc. over the last decade, HistoryCentral.com brings history alive.

A key component of HistoryCentral.com is the timeline of major world history events beginning in 10,000 BC and ending with 1999. Links are provided to related web sites and to additional information at HistoryCentral.com.

"A History of America's Wars" is a highlight of the site. It includes subsections on each of America's wars from the Revolutionary to Desert Storm, including text entry and photos. Select entries, such as the Battle of Antietem, include multimedia shockwave presentations.

Particularly timely is a complete history of US Presidential elections, offering state-by-state tallies, and graphs of the electoral and popular vote. The section is currently tracking the 2000 elections with updated polls and pertinent candidate information. This election component also links to a biography section covering the lives of the American Presidents and their First Ladies.

Another feature of the site is NationbyNation.com, providing historical, economic, demographic, and geographic information on all countries of the world. Four hundred primary source documents are available on the site. There's also an almanac of the 20th century to supply year-by-year

information including entertainment awards, sports achievements, and other events. The biography section includes profiles of the "500 Historymakers," the most important people of the century.

A particularly attractive feature of HistoryCentral.com is the provision of specialty sections for teachers and students, as well as a useful and informative "History in the News" module.

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Basic understandings for developing learning media for the classroom and beyond

This article addresses basic understandings for teaching with technology in the classroom and beyond. These understandings are based upon my professional experiences, scholarly activities, and field-based research ascertained during the following teaching activities these past five to ten years (Stammen, 1995):

1. A research fundamentals course for beginning master-degree students from 18 different programs on campus. Gay's (2000) text provides an interactive web-base for tests, forums, and supplemental links. This course is offered over the state's Interactive Video Network (IVN). E-mail is used to communicate about assignments.
2. A master degree-level course on Instructional Media, Models and Methods using Newby's text (2000) supplemented by and a post-master-degree course about advanced Instructional Models using Joyce's (2000) text and supplemented by Kearsley (2000). These two courses are not always taught over IVN, but e-mail and my (1997 to 2000) web-based resources are used when applicable. The texts have extensive web-based resources.
3. Two other courses about utilizing multimedia in the classroom and beyond. One is a self-contained web-based course for distance-education students. The other is an independent-practica web-based course tailor-made to meet an individual's pre-assessed needs for developing learning media

Electronic media technologies, the World Wide Web notwithstanding, offer an opportunity to rewrite and reconsider content in order not to give more of the same with the new media. This proposition suggests new electronic technologies have given us the opportunity to think of ways to reach and teach in ways we have never had before. Media have less to do with efficiency as a teaching tool than with the way they alter the conception(s) of learning and instructing. New communication developments are often touted more than educational benefits. Creativity (synectics), imagery, teaching strategies, learning styles, instructing models, and intellectual dimensions are issues to take into consideration for developing computer-based learning media.

Technologies in and of themselves do not automatically change the nature of teaching and learning; rather, it is the way educators integrate such technologies into curriculum that brings about change. The role of the instructor is changed because the medium forces learner-based environments to be developed due to the technological infrastructure. It is difficult for educators who are trained to work with static "print-based material" to convert their educational material over to dynamic "interactive-electronic data."

Most educators are not used to creating text to meet learners' needs. They were trained to select the appropriate text to meet the selected lesson plan. If a transition is not made from such practices, the modules placed on the electronic media are likely to be instructor-based rather than learner-based. This will not work from the student's perspective engaged in individual learning with media. Media is only a technological tool used to enhance learning and/or extend learning beyond a classroom situation. Media is not the educator.

Technology does not replace good instruction. Thus, pedagogy is always in demand to structure the learning within the evolving media to provide the needed intrapersonal dimension to meet individual educational needs. Thus, it is important to understand how to tailor-make and customize delivery for special groups. Educators know this, but it is difficult to follow when developing learning media. The instructor must be knowledgeable about skills necessary to develop the proper strategy to accomplish learning objectives. Media services should provide a rich resource to help increase the knowledge needed to meet educational objectives.

Likewise, it is important to understand the capability of the endeavors undertaken. In other words, an instructor must learn the magnitude of the work involved while planning to develop media for distance education. The time demand to interact with students asynchronously is extensive because the replication power of computer-based technology helps expedite responses which can overburden an unsuspecting instructor.

It is important to understand how to work the content to make learning happen with the media. Working the content means to select the appropriate visual, image, color, graph, sound, or phrase to cause the learning to happen. The objective is to make the best learning moment occur for the students. It means designing creations to ascertain the "teachable moment."

Computer-based education and training has made technical people interested in pedagogical-instructional design, techniques and skills, learning styles, and dimensions of intelligence. The computer-multimedia presentation programs now common on the Web have likewise created an interest among educators to understand technical issues inherent with computer multimedia. Common instructional design models emphasize understanding how to work the content for the media.

It is necessary to understand that the active dimension of programming for an audience is simplicity with an active audience asking questions. This also entails developing the proper strategy to accomplish learning objectives with the understanding of how to tailor-make and customize for special groups. The distinction here is a caution about making multimedia lessons too difficult or complex for the intended learners. It is more about student acceptance and systematic communication needs inherent in learning, reflecting, and forming a new comprehension during the process. The art and science of effective instruction involves working the content to provide stepwise learning experiences with checks along the way to assure that each step is learned. It is important in media-based learning to assure that students are well-trained in fundamentals to the extent they eventually consider high-level complexity in simple terms.

Technology utilization for educating takes formative research, segmentation, and augmentations. The learning must be provided in parts that build comprehension of concepts. That is segmentation. For interactivity, the parts must be developed in comprehensive increments so students can show stepwise growth to achieve the purpose of the course in regard to knowledge, skills, and techniques. That is augmentation.

In review, these basic fundamental understandings do not involve so much how education will be changed by electronic media as how the wisdom of education ought to influence electronic media. These tools can enable an educator to cope with the knowledge explosion. However, educators who choose to use these media must accept the fact that they entail larger pedagogical responsibilities than if they merely assign text chapters to read and seek feedback through workbooks completed. These basic understandings also infer that educators who develop technological products for learning must have considerable technical knowledge and skills to use them effectively. As mentioned, one needs to understand the material and understand how targeted students think about what is presented. Also, one needs to be able to comprehend learners' interpretations of problems, their mistakes, and their puzzles. Instructional developers must have the capacity to probe thoughtfully and tactfully to achieve the purposes intended and find ways to solicit feedback that checks for understanding.

Ideally, products educators produce on the media must be presented in ways that engage learners' minds to help them frame fruitful hypotheses and discard unfruitful ones. The essence is the human interaction, which can create a social impact resulting from the widespread adoption of information technologies.

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TRAILS: Facilitating Learning in The New Learning Environment

Recent years have seen an ever growing interest in both the business and academic communities in the use of the World Wide Web to promote learning. Trainers and teachers alike are attracted to a technology which can combine the immediacy and collaborative opportunities of face-to-face learning with the kind of open and distance learning opportunities previously provided by (disk-based) computer based learning solutions. Aside the world of specialists in the area, however, the focus of much of this attention is almost exclusively technologically orientated (What commercial learning management software? , What functionalities go towards making an effective web-based learning environment?) overlooking other essential and inseparable issues which may be broadly described as being pedagogical (e.g. "How have the roles of the teacher/trainer and learner changed in the web-based learning environment?" and "What kind of pedagogical techniques work online? etc.) and cultural (e.g. "How does the emergence and growing popularity of web-based learning relate to other technology-spawned changes in our society at large?" and "What is the place and nature of learning in this changing society?"). In the context of this perceived gap The **DEIS** Department for Education Development in The Cork Institute of Technology, Ireland in conjunction with **LRS** (The Learning and Research Services Unit) in the University of Oulu, Finland and **BCT** (Barcelona Centre de Tecnologies), Barcelona, Spain have developed a new course, entitled *TRAILS*, which will address these issues and train teachers and trainers to facilitate efficient learning in the Web-based Learning Environment.

As implied in this explicit aim the project group have been eager to put across to students that becoming an instructor in a web-based learning environment is not just about putting something "out there" in cyberspace but of *facilitating* a process, of interacting with students, helping students interact with the material and each other, and of doing so in such a way as to ensure that learning occurs without wasted or unnecessary effort on the part of either instructor or student.

Core modules for TRAILS are provided in the following areas:

- New theories of learning (Pedagogy)
- New learning opportunities offered by the World Wide Web (Technology)
- Recent changes in the social organisation of learning and attitudes to learning (Culture)

Together these core modules are meant to provide a cross-disciplinary basis for a holistic analysis of web-based learning environments.

In addition to these 3 core modules of the course we also provide a short unit of material to help participants find their feet in terms of the structure and administration of the course ("Course Orientation").

A further module, "ICT Skills", is provided in order to bring participants up to a base level of understanding as regards information and communication technology such as the Internet and World Wide Web, the basic features of PC and Mac computer operating systems etc.

Finally a collection of "Resource Material" is made available to participants throughout the lifetime of the course, consisting of a series of recommended categorised web links related to the whole area of web-based learning and the New Learning environment in general.

Although course participants can take online "auto-corrected" comprehension tests on some of the above material, the material as a whole does not represent a corpus of knowledge to be memorised and later reproduced for credits or points. While it is intended that the material be informative it is also intended to give rise to more questions which will ultimately lead participants and tutors alike into a cycle of reflection and discussion.

A structure is provided to formalise this cycle of reflection and discussion in the form of a case conferencing element. Each course participant is required to introduce a case study on a particular subject which is related to the core material and, ideally, to their own professional experiences as teachers/trainers, for discussion by other students.

The next element of the course requires participants to complete a project which will involve the development and, where, possible, the *delivery* of web-based units of learning. The precise details of the project are defined through a project plan which will outline what the participant hopes to achieve in his/her project. The project plan can be seen as a learning contract between learner and tutor, it will dictate the intended outcomes of the project phase and the relative success of the project will be judged against the standard it provides.

In a further effort to encourage discussion and peer-learning each course participant is given access to the project folders of other students and asked to offer comment on materials being developed. There is also an online project discussion forum where participants can share knowledge and insights.

Although the course is a pilot, it is accredited. Participants who successfully complete the course will receive a certificate from The University of Oulu, Finland.

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Multi-modal Interfaces for Second Language Learning

Abstract

Computer-based learning in second language acquisition is well established. Systems have been designed which particularly help with the recognition aspects of language, that is reading and listening. However, language learning with computer-based instruction is not so well established in the generative aspects of language, that is writing and speaking. It is the thesis of this paper that the generative aspects of language learning can be improved by the use of appropriate multi-modal system. In particular there is huge scope to provide students with feedback on the production of a written word and spoken utterance using technologies based upon speech and character recognition. This paper proposes an integrated architecture for language learning with such a multi-modal interface.

1. Review of Computer-Based Language Learning

Computer-based learning has proved effective in a range of subjects. Robyler et al. (1988) found that computers reduced the amount of time for learning subjects and also improved academic motivation. Computer software specifically to facilitate language learning first appeared in the early 1960's on main frame computers and began to be developed on more widely accessible computer platforms in the 1980s. Since then a variety of applications dealing with most of the language skills, have been developed and evaluated. There are a plethora of theories, opinions on language learning in this relatively young field (Ellis 1994). In general there has been a shift from the drill and practice of language laboratories to a more communicative approach to second language education via computer-based language learning.

Computer-based language learning is also made particularly exciting by the advent of multi-media. This provides a variety of highly appropriate mechanisms with which to tutor language including sound, animation, written text, video and graphics. The mechanisms may be used to present new material, provide feedback, test existing knowledge together with a variety of other possibilities. Computerised language learning has also been greatly assisted by the Internet. The Internet facilitates the use of the specific language in an authentic setting. For example students can read web based news reports allowing them to participate in the culture of the target language and see how cultural background can influence world view. It can also be used to acquire geographical, historical, social/cultural, economic, and political information.

It is notable that of the four macro language skills of speaking, listening, reading and writing, the receptive skills of listening and reading are more commonly addressed by computer aided learning programs than the generative skills of speaking and writing. This is to be expected since being on the receiving end of a freely generated input would be a tough task for the computer to handle. However, the possibility of providing such instant, individual feedback is perhaps one of the greatest strengths of the computerised learning environment. In the context of language learning there are exciting, and as yet unexplored possibilities, in terms of providing feedback on the generative aspects of language (writing and speaking) using appropriate multi-modal systems.

Zhang (1998) cites many commercially available software packages that are able to assist with language learning. However this paper observes that none of them offer adequate support for the generative aspects of language learning and that a multi-modal interface is a natural progression towards an integrated computerised language learning environment that supports the learner in the generative aspects of language learning.

2. Feedback in Learning

Perhaps the biggest and most general contributions that computer-based learning makes to education, is with respect to the possibility of students directing their own learning and receiving instant, direct and individual feedback in a manner most appropriate to the student. Most studies report the benefits of on-line feedback. Robinson (1992) argued that feedback which is guiding, and which leads or encourages students to be able to discover their own errors, should lead ultimately to higher achievement levels than that which only discloses errors and gives the correct answer. This is particularly the case with second language learning. Nagata (1993) researched the effects of intelligent feedback, using a natural language processing system to respond to learners' written errors. Intelligent feedback was preferred although

Van der Linden (1993) found that sophisticated feedback was sometimes confusing especially for weaker students. The ideal solution would be for the student to tailor the system to make it provide the type of feedback that was most beneficial to their own individual learning styles. The method of presenting feedback is also important. Bationo (1992) investigated the effect of four different kinds of feedback on 56 undergraduates studying French. Again there is the possibility of tailoring the interface to utilise the preferred media for providing feedback is an exciting possibility in computer-based instruction.

This work recognizes that feedback is particularly important in learning, especially for self-motivated, adult learners perhaps directing themselves through a course of study in isolation from an expert. In particular it aims to address the problems of providing assistance with the generative aspects of language learning, by providing feedback on the inputs received from a multi-modal interface. While this is an ambitious project when the complexities of natural language are considered in their entirety, it is a more tractable problem when only certain aspects of the generative components of language are considered. In particular this work proposes to focus upon the formation of individual sounds and characters in the generative aspects of language. Inputs from individual learners are obtained and input signals compared with reference signal(s), in order to highlight discrepancies in the patterns. Providing feedback to the learner will support low level acquisition of the generative aspects of language learning.

3. Computer aids to language writing

Many computerised aids exist to assist with reading skills ranging from the simple presentation of a picture and written word, to a sophisticated analysis of sentence grammar, text and its translation. However there are no computerised aids that synthesize handwritten output and provide reading examples in something other than typed text. This can be a very important component of language reading, particularly when the character base of the language is different to the learner's native 'alphabet'. Thus there is a need for handwriting synthesis to provide experience in reading texts written in a variety of styles.

Among the on-line aids to writing are the aids that assist with the construction of (Chinese) characters. The well-defined stroke order in this language is important for learning to correctly write the character. There are a number of drill and practice like aids which require the student to repeat the construction of a character copying from samples. They show the order in which strokes must be written where the student is encouraged to correctly form the character in spatio-temporal terms. One step beyond the basic drill and practice is the animated approach of flashcards where the Chinese character is presented together with translated meaning. An animation of how the character is constructed may also be provided showing in dynamic graphic terms how the character is built up.

This paper suggests that the ultimate step is a multi-model interface to enable the learner to actually construct the character utilising some form of a pen-tablet. Correct character construction is particularly vital in a language (e.g. Chinese) where the method of constructing a character is an integral part of correctly writing the language, or when a learner is being taught to write in a cursive script after having only known the printed version of the text. To date there are no such systems to assist with learning to write in an on-line dynamic context. A pen-based platform capable of recognising learner's handwriting is thus a natural extension to the current computerised learning aids in existence. The learner can practice writing in an on-line context receiving instant feedback regarding the construction and final shape of the characters.

4. Computer aids to language speaking

Many computerised aids to language comprehension exist enabling a student to practice speaking skills. Internet resources exist with conversations can be read and also the associated audio files played to obtain a bi-modal presentation of the conversation. There even exist a few programs that are able to synthese language and produce audio output for other forms of the language.

As with the generative form of the written language there are relatively few aids to assist the learner with language speaking. One very simple on-line resource to aid pronunciation is to present conventional diagrams that illustrate the position of the mouth to achieve certain sounds (http://www.wfu.edu /~moran/ z_GIF_images/ Difficult_Sounds.gif). There is also scope to combine the illustration with an audio demonstration of what the sound should be like. But as yet there is little progress in recognising the utterances of a learner and providing feedback on those utterance.

Lack of support with the generative aspects of language speaking is not surprising since inherent speaker variability makes speech recognition difficult to achieve and very difficult to provide feedback to a learner's speech even on the basis of pronunciation of isolated words. It would be highly ambitious given the complexity of natural language to make a full-blown speech recognition system possible. However there is scope to provide support with pronounciation. In a drill and practice context the utterance of a student may be compared with the idealised sound and feedback provided on the basis of discrepancies in the sound signal generated by the student and the important characteristics of the reference signal.

5. A multi-modal integrated architecture for language learning

An architecture is proposed that combines the four elements of language learning (speaking, writing, reading, listening) in a computerised environment that permits multi-modal input and output. Most notably the architecture makes use of written and spoken inputs (via microphone and a pen-based platform) providing feedback to the learner regarding the generated language. There is scope for both low level and high level feedback in terms of the "utterances" so generated. It is surprising that such a multi-modal environment for language learning has not already been developed, especially for the written aspects of language learning in languages such as Chinese where the whole rationale for learning a stroke order is based upon the familiarity that repetition creates which enables a character to be recalled. The motor movements of writing the character together with feedback concerning its correct form and shape are considered vital aids to enabling the written language to be acquired. In a similar way the tonal nature of the language is a particular challenge to learners and computerised analysis may provide beneficial feedback concerning the correct production of tones.

6. Conclusion

This paper has identified an important application area for multi-modal interfaces in the area of an integrated language learning environment that is able to provide tutoring feedback to the learner in the macro skills of language learning. It has also provided a preliminary demonstration of analysing input signals from language learners obtained from a system utilising a multi-modal interface.

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Conference announcements

The Center for Internet Technology in Education (CiTE)
2nd Annual Conference
"The Evolution of eLearning: Educational Technology for this Generation and the Ne(x)t"
March 7-9, 2001
Denver, Colorado, USA
http://citereg.ecollege.com/

Workshop: Web based Platforms for Cooperative Learning
April 23-25, 2001
Casa Diocesana de Vila, Porto, Portugal
http://bscw.gmd.de/pub/english.cgi/d21316834/english.html

2001: A Digital Odyssey
June 16-19, 2001
Denver, Colorado, USA
http://www.odu.edu/dl/nutn/

IEEE WETICE Workshop on Knowledge Media Networking
June 20-22, 2001
Massachusetts Institute of Technology (MIT), USA
http://welcome.to/KMN

WebCT's 3rd Annual Conference "WebCT 2001: Transforming the Educational Experience"
June 22-27, 2001
Vancouver, British Columbia, Canada
http://www.webct.com/2001

Learning Styles Conference
June 25-27,2001
University of Glamorgan, Wales, UK
http://www.elsinnet.org.uk/conference2001/index.htm

2nd International Conference on Technology in Teaching and Learning in Higher Education
June 27-29, 2001
Samos Island, Greece
http://nlu-ln01.nl.edu/conferences/

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