



Working, worrying and winning on the WWW

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1. Introduction

Much of this paper is in the first person as I want to try and counter the impersonal nature of electronic communication. I want to show how similar Internet-based teaching and learning can be to any other forms of learning. I shall use the term 'digita' campus instead of 'virtual' campus, because I believe that real learning should take place and, really, there is nothing virtual about what happens on the Net. I shall also share my most horrific Net failures, because it is from them that I learnt. Then, just so that you don't give up in disgust, I shall share some of the great joys.

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2. Context

This literature study explores the learning context within which Web-based learning in South Africa is situated.

2.1 Learning needs in a changing world

International trends

The international move from an industrial society to an information society has given rise to a shift of emphasis in various fields, as summarised by Reigeluth (1996).

Table 1 Shift to an information age (Reigeluth, 1996)

INDUSTRIAL AGE	INFORMATION AGE
Standardisation	Customisation
Centralised control	Autonomy with accountability
Adversarial relationships	Co-operative relationships
Autocratic decision making	Shared decision making
Compliance	Initiative

Conformity	Diversity
One-way communications	Networking
Compartmentalism	Holism
Parts-oriented	Process-oriented
Teacher as 'king'	Learner (customer) as 'king'

There is a clear shift from a provider-centred model to a user-centred model. In discussing these users, Ference and Vockell (1994:25) indicate that adult learners are active learners who bring a wide variety of prior learning and life experience. They are already experts in various fields and rely on existing experience to solve problems. They prefer hands-on experience and are task-centred, focusing on dealing with real-life problems and actively seeking out solutions. They are value driven and need to know why they should learn something before embarking on a learning task. They learn to seek out new skills and have a need to be directly involved in planning and directing their learning activities. They are often externally motivated by factors such as better salaries and increased positions, and internally motivated by factors such as self-esteem, career satisfaction, and the overall quality of life.

National needs

- The South African Green Paper on Higher Education Transformation (1996) aims to bring higher education in line with world trends by calling for the following.
- Open and flexible programmes, concentrating on resource-based learning that are modular and credit-based with multiple entry and exit points, are advocated within a range of delivery methods.
- Horizontal and vertical mobility will be facilitated by incorporating adequate routes of articulation, including flexible entry and exit points in the higher education system.
- Intermediate qualifications within multi-year qualifications are envisaged, leading to a laddered set of certificates, diplomas and degrees.
- Integration of academic development approaches in mainstream programmes will be encouraged.
- The focus in the curriculum should be on South Africa as a developing and modernising African country in a period of transition.
- Increased access should lead to improvement of throughput and completion rates.

A synthesis of adult learning needs and the direction of post-secondary education as spelt out in the South African Green Paper on Higher Education Transformation (1996) shows how closely the two are related.

Table 2 Correlation between adult learning needs and national needs

	Active learner	Experience based	Expert	Hands on	Task centred	Problem centred	Solution driven	Value driven	Skill seeking	Self-directing	Motivation external	Motivation internal
Open access		✓	✓		✓	✓	✓	✓	✓	✓	✓	
Flexible content		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Resource-based		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Modular and credit-based		✓			✓			✓	✓	✓	✓	✓
Multiple entry and exit points		✓	✓					✓	✓	✓	✓	✓
Horizontal and vertical mobility								✓	✓	✓	✓	
Range of delivery methods	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Integration of academic development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

It is clear that traditional contact education cannot address all these issues. Universities are therefore turning to information and communication technologies (ICT) to explore the possibilities offered by such

technology in overcoming some of the barriers traditionally associated with distance education.

2.2 Needs associated with distance learning

Galusha (1998) categorises the following 'Barriers to learning in distance education'. The most important need associated with distance learning is the need to overcome the barriers involved. Any digital university would do well to design for eliminating as many as possible of the barriers listed below.

Student barriers

These include financial, family and work-related barriers, as well as a lack of support from family and friends, employers, colleagues and teachers (Galusha, 1998).

Faculty barriers

The most important of these is the lack of staff training. A further barrier is the attitude of the institution to distance lecturers who are sometimes seen as less prominent as their contact-teaching peers (Galusha 1998).

Organisational barriers

The first organisational barrier is a lack of funds. There are three important cost factors: initial costs, maintenance costs and upgrade costs.

The second problem lies in the technology itself. Platforms could be unstable or incompatible.

Course barriers

Distance courses are often regarded as inferior (Galusha, 1998). What often makes them inferior is poor design. Often the materials used for contact teaching are simply converted into electronic form. This way no value is added.

2.3 Internet: problems and solutions

This section considers the problems and possibilities of the Internet. Aspects include recruiting of new students, administration, production, storage and presentation of coursework, interaction with students and other services. The success of using the Internet in this role, however, depends not so much on the technology as on the design (Clark, 1994). The designer, in turn, needs to consider the possibilities and constraints of the medium (Reiser, 1994) in order to exploit its possibilities and work around its restraints.

Attraction

To attract users to a new medium, an air of familiarity needs to be established. This is best done through the use of visual metaphors. Metaphors draw on models to interpret the world and make related connections that may not be obvious (Viau 1994). For this reason many digital campuses mimic their physical counterparts in various ways. Metaphors based on familiar concepts, for example books and desktops and even classrooms help bring familiarity to new and potentially confusing systems (Ebersole, 1997)

Administration

In a digital classroom the presenter often cannot 'see' the learners and does not know if they are still on course, or if they are experiencing problems (Cronjé, 1997). The flexibility of asynchronicity results in procrastination when students are too busy to log-on regularly, which can result in falling behind with respect to deadlines (Hiltz & Wellman, 1997). If WWW courses replace or reduce contact time, they should provide for the handling of course and learning management issues like clarification of objectives and available resources. These are usually clarified by questions or discussions in more traditional, face-to-face learning situations (Draper, 1997).

Course material

There is a temptation for course designers simply to convert their existing notes into HTML format and to post them onto the Web. This ignores the principles of instructional design as set out by Merrill (1991):

- Learning is constructed from the experience of the learner. Hannafin and Peck (1988:48) also stress the importance of the existing knowledge of learners and believe that 'learning may be more efficient when the instruction is adapted to the needs and profiles of individual learners'.
- Interpretation is personal. There is no shared reality. Individual learners make different interpretations of the same material, based on their own previous knowledge, experience etc.
- Learning is an active process whereby experience is converted into knowledge and skills. Learners should therefore not be 'taught' but given learning tasks which they can only complete by acquiring certain knowledge and skills.
- Learning is collaborative, which means that it is enhanced by multiple perspective.
- Knowledge is situated in real life and that is where learning should take place
- Testing should be integrated with the task.

Other providers of online education experiment with solutions such as Java and Shockwave that allow interaction, but remains contrived and slow (Foks, 1995).

Library materials

As an information repository, the Web has too much, rather than too little information. Laurillard (1993) concurs with Merrill (1991) that learning is more than aimless exploration or simple retrieval of information. Construction of learning is more than recombining associations between bits of information and mere quantity of references may not necessarily correlate with quality of analysis. To counteract information and sensory overload and assist users to discriminate between reliable and unreliable information on the Web, attention needs to be given to information literacy (Underwood & Karelse, 1996). Digital campuses therefore often contain annotated collections of links to other sites of interest.

Presentation

Web-based classrooms do not have lecturers who do stand-up training. The lecturers only 'appear' as the narrator does in a novel. Not only is the 'appearance' of the lecturers different, but also their function. Merrill (1991:24) argues that, 'organisation during learning aids in later retrieval of information, and elaborations generated at the time of learning new information can facilitate retrieval' (my emphasis). This implies that it is not the course presenter who should be organising the information, but the learner. The role of the presenter is to guide learners in the process of organising their learning, while at the same time allowing them to elaborate. This calls for a much more open design. The learner needs to be given more control.

Use of the Web is likely to result in increased student participation in the production of course materials that improve and expand through their cumulative effort (Donahoe 1997). The exposure to growing databases provided by the Web and increased interaction among learners will encourage constructivist and collaborative work with learners contributing to the pool of knowledge (Donahoe, 1997).

Interaction

In contrast with traditional lectures, communication via the Internet is usually asynchronous. That is to say, the transmitting and receiving of the message take place at different times. Both partners in the process need not be engaged at the same time. In essence this means that the learners can schedule their own learning time. Bill Gates (1995:66) indicates a general human preference for asynchronous interaction: 'It is human nature to find ways to convert synchronous communication into asynchronous forms. Before the invention of writing, 5 000 years ago, the only form of communication was the spoken word and audiences had to be in the presence of the speaker or they missed his message.' This means that communication takes place mainly though pre-designed Web sites and e-mail.

The following advantages and disadvantages of electronic mail (Cronje, 1996) need to be considered.

Table 3 Advantages and disadvantages of electronic mail

ADVANTAGES	DISADVANTAGES
Quick delivery	Possible misinterpretation
Reliable delivery	Lack of non-verbal cues
Accurate (digital) transfer	High initial cost
Inexpensive	Maintenance, upgrade and training costs

Easy to append and forward	
Easy to store & sort	

According to Laurillard (1996), tutorials conducted via ICT result in a higher proportion of student time to tutor time compared with contributions in traditional face-to-face tutorials because individuals have more opportunity to contribute as the asynchronous text-based medium extends the moment to contribute. Students can return to the topic after they have given it thought.

The use of Web-pages to support electronic mail brings the following advantages and disadvantages (Cronjé, 1996)

Table 4 Advantages and disadvantages of Web pages

ADVANTAGES	DISADVANTAGES
Contains much useful information	Static – page turner
Multimedia capability	Slow – hungry for bandwidth
Can store large amounts of data	Searching and browsing is often overwhelming
Easy remote access	Not everyone has access
Always available	Non-interactive
Extensive search capabilities	

Davis (1997) distinguishes the following three types of communication facilitated by ICT:

- Impersonal, useful for task-oriented, instrumental communication
- Interpersonal, as used in social communication
- Hyperinterpersonal, which allows for individual to self-present and edit.

Other services

In addition to the disadvantages of the WWW and e-mail as listed above, Hiltz and Wellman (1997) suggest that ICT is useful for instrumental relationships rather than social supportive ones. They (1997) mention some other limitations of ICT.

- ICT is limited by lack of visual and social cues and presence;
- ICT is good for communication of information, opinion and suggestions; but
- ICT is less suited for communicating agreement or disagreement; and
- ICT is worse for social-emotional tasks.

It therefore becomes necessary to create a supportive atmosphere by encouraging co-operation in a virtual environment.

In this way ‘virtuality’ may also develop an element of ‘negotiated reality’ (Turoff, 1997:40). The users of the computerised system negotiate an agreed upon reality. Thus a virtual classroom might emulate an actual classroom if it becomes an online learning environment to facilitate the accomplishment of learning goals as well as a community where members can exchange information, provide and receive support and develop a sense of belonging (Hiltz & Wellman, 1997).

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3. Working: the digital campus

Digital campuses mirror actual campuses even in their development. Firstly there is the organic campus that has grown over time to accommodate changing needs over the years. It has little dead-end streets and awkwardly designed buildings squeezed into the available space and modified beyond recognition as their initial purpose has become redundant and they have been put to different uses by subsequent generations. The second is the designer campuses – mass produced and modular, with standardised structures that can easily be modified to cover a wide variety of needs.

Digital organic campuses are typically designed by ad-hoc teams of enthusiastic lecturers and computer staff and the development is stopped as soon as functionality becomes bearable. 'Modern' digital campuses are

shells, designed by software companies and filled by lecturers working from instructional design blueprints.

When, one wants to design a learning task where the objective is the linking of knowledge and navigating through information, the Internet becomes the ideal (virtual) learning environment.

Kozma (1987:22) says that 'to be effective, a tool for learning must closely parallel the learning process; and the computer, as an information processor, could hardly be better suited for this'.

It would seem that the various digital campuses, for example Lotus Learning Space, WebCT, E-Groups, etc. all try to accommodate the aspects mentioned in the literature study. Regardless of their nature, be it organic or modular, the architectural features shared by all these institutions include a main entrance, an administration block, lecture halls, a library, ancillary services and recreation areas.

3.1 Entrance

The main entrance serves both to attract visitors (and therefore potential students) and to control access. People who arrive at the entrance are usually categorised as staff, students or visitors, and on that basis gain different levels of access to the campus.

3.2 Administration

The two main aspects to be administered are finances and student records. A sophisticated system is required to allow these two elements to meet, so that a service is provided only to paid-up students. Other aspects that require administration, of course, are the staff, the alumni and the campus itself.

3.3 Lecture halls

Virtual lecture halls contain much the same elements than do actual lecture halls. Staying with the metaphor of the actual classroom these could be grouped as boards, desks, equipment and lockers.

Boards

Classrooms have chalkboards, bulletin boards and posters. Chalkboards are for real-time interaction. Bulletin boards are for a-synchronous interaction. Posters are for stable content.

Desks

There are two types of desks: teachers' desks and learners' desks. Desks form the principal site of operation. At the desks are information processors, data resources and communication facilities. In a 'real' classroom these are pencils, textbooks and the voice and ears. In a virtual classroom these are word processors, databases, spreadsheets and graphic packages; electronic data, links to Web sites; and e-mail.

Lockers

Lockers contain items that do not necessarily form the mainstream activities in the classroom. This includes hobbies, previous work and bits of useless, if sometimes humorous information. Also in the locker would be prizes of any sort.

In an actual classroom, the equipment in the lockers would be protractors, stencils, compasses, etc. In a virtual classroom they are graphic manipulation tools and Web site generating tools.

3.4 Library

The library (also called the resource centre) could contain actual documents, or links to other sites. The other sites could simply be information sites or they could link to online books or journals.

3.5 Ancillary services

Ancillary services include aspects such as academic support services that help students with academic, social and financial aspects. These services are sometimes extended to include employment agencies, student exchange programmes, etc.

3.6 Recreation areas

Recreation areas could be individual and cooperative. In a brick-and-mortar campus this could range from benches under trees to coffee shops and cinemas. In virtual campuses these could amount to 'arcade games', 'chat rooms', etc.

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4. Worrying

The questions I ask concerning teaching and learning in cyberspace and that are relevant to this paper are the following

- Can a 'classroom' be successfully simulated on the Internet?
- How closely could a course delivered by e-mail and the Web mimic a real-life classroom?
- What design factors best facilitate learning via online Web-based material?
- Will students who have been used to contact teaching adapt to the virtual classroom?
- To what extent could co-operative work be done over the Internet?
- To what extent will technology and technological literacy affect the learning process? Motivation?
- To what extent can a Web-delivered course provide materials, models and metaphors that elicit sufficient motivation to learn?

The first question was easy enough to answer. Yes. The simulation can be viewed at <http://hagar.up.ac.za/rbo/classrm.html>.

The second question you can answer for yourself by taking the following guided tour of the classroom.

4.1 RBO880 virtual classroom

The first Web-based course to be presented at the University of Pretoria took place in January 1997. The situation in which this pilot study took place was that of distance education rather than mass education. There were only 15 participants, but they were dispersed from Pietersburg in the north to Cape Town in the south, creating a radius of approximately 1 000 km around Pretoria. The students were second-year members of the Masters' degree programme in Computer-Assisted Education. The complete curriculum can be found at <http://www.up.ac.za/academic/education/didactics/general/medcaecurriculum.html>.

All the participants were highly computer literate but of diverse Internet literacy. One student had built up an extensive electronic network, mainly through electronic mail, listservers and bulletin boards. Others had 'surfed' the World-Wide Web extensively and were familiar with search engines, etc. Some students, however, were connected to the Internet on the first day of the course. What follows now is a description of the RBO880 classroom in terms of the campus components listed earlier. Although what is described here amounts to a classroom rather than a campus, it shares a number of campus qualities, since this was the University's only virtual learning space. Over a period of three years ten other classrooms were added, resulting in an almost fully fledged virtual campus. Later the University used it as a model to develop a Web-CT-based virtual campus.

4.2 Entrance

Initially the 'main entrance' to the RBO classroom consisted of a single text-only HTML document called 'Welcome.html'. The document can be viewed at <http://hagar.up.ac.za/rbo/welcome.html>. This document welcomed students to the classroom, explained to them what would be expected of them and gave them a link to the virtual classroom. The 'keys' to the classroom took the form of a separate e-mail message giving the complete URL of 'Welcome.html' as well as the password with which students were able to upload documents to their own 'desks'. Security was established by assigning different directories for lecture materials and student work. Students could only access their directories and not those that formed the actual classroom. The only exception was that the picture of the blackboard was stored in the root of the student directory and not in the classroom directory so that students could alter it at will. A security hazard was that students could accidentally or deliberately erase each other's work.

4.3 Administration

The administration of the original classroom was primitive. All the administration was done by the course leader using MS Access where necessary and then cutting and pasting data into a freeware HTML editor called AOLPress. The instructor kept track of the students by ticking off their progress on a paper-based checklist.

4.4 Lecture halls

The lecture hall or 'virtual classroom' itself was the main attraction of the course. It followed very closely the metaphor of an actual classroom. It can be viewed at <http://hagar.up.ac.za/rbo/classrm.html>.

Boards

In the front of the classroom was a chalkboard on which students were encouraged to add their own graffiti. Clicking on the board would reveal the objectives of the course. The 'pin board' to the left was a link to the roster containing deadlines and to the right a list of individual and co-operative tasks.

Desks

The teacher's desk took students to the instructor's home page where they could find a mailto link to the instructor, as well as biographical information and a whole collection of links that were of interest to the instructor, regardless of whether they were of any use to the students. The link to 'C@tts' called up the home page of the alumni association and the resource cupboard contained links to HTML editors, graphics editors and useful Websites.

The learners' desks were originally all identical. Learners were instructed to customise their desks by creating their own picture and then 'filling' the desk by creating a Web site containing

- 'Your ears (mail to: ...)
- Your utility bag (links to handy utilities such as HTML editors, search engines, clipart libraries, etc.)
- Your textbooks (links to useful sites)
- Your work (interesting work you have done in other M.Ed. modules)
- Your hobbies (links to sites of special interest to you)
- Your class work (your answers to all the objectives of the course)
- Your portfolio (a link to the portfolio of your examination project)' (RBO880 Curriculum, 1997).

'Your ears' was the most important feature of the virtual classroom. A serious shortcoming of the World Wide Web is the static nature of a Web page. It is always presented in a completed state (despite the 'under construction' signs that often appear on them). This means that another channel needs to be created for ephemeral communication. In this case a listserver was set up. It was done in such a way that a reply to any message to the list would automatically be sent to all course participants. In this way a discussion group was formed that led to great interactivity between students and the instructor.

Lockers

In the 'Resources' cupboard students could find links to a free Web-page authoring tool, AOLPress, and various shareware utilities with which to create and edit graphics, upload their Web pages to their 'desks', compress large files, etc.

4.5 Library

The library contained about 50 links to useful Web sites. These were categorised according to the various syllabus themes. The links appeared in two documents. They were listed directly after each learning task so that students could get to work immediately, and they were listed alphabetically in the form of a bibliography.

4.6 Ancillary services

The most significant ancillary service provided in this course was in the form of e-mail listservers. Students were encouraged to join a free e-mail based Web-orientation course where they learnt how to create HTML documents, how to use search facilities, etc. They were instructed to join an academic listserver, ITForum that held monthly discussions on topics of interest to instructional designers. An incidental ancillary service occurred purely by chance as a doctoral student from an overseas university was invited to join the class as

an observer. As an outsider she could provide useful insights into what was actually happening in the class. Her knowledge of the Internet also enabled her to share useful information with students. As this information came from an outsider, it was perceived by students to be support rather than tuition.

4.7 Recreation areas

In the initial classroom recreation took the form of jokes students emailed to each other, or of links to amusing sites that students had to add to their desks (their hobbies). In later developments students were encouraged to participate in a virtual carnival and later even a virtual Halloween party.

4.8 Process

To maximise students' experience of the Internet, they were initially instructed by post to send an electronic message to the course address once they had been connected. Once such a message was received, the student was sent a welcoming note and asked to write a brief curriculum vitae and a statement of intent (What skills do I bring to the course? What do I want to get out of the course?). This document had to be illustrated with 'keystroke art'. Responses were then forwarded to all subscribers to the course by the listserver.

Once all the students were on board and had published their statements of intent (this took one week), they were instructed to join the listserver ITforum. They were also given the WWW address of the syllabus and study guide. To promote some interactivity between the students themselves, they were divided into co-operative learning groups. This information was sent to them in both MSWord6 'doc' format and WordPerfect 5.1 format via an electronic mail attachment and was uu-encoded. They had to read their manuals or consult their network administrators to find out how to uu-decode the information.

The individual learning task for the course was for each student to read through the prescribed literature and then to design a 'sustainable' classroom Internet project which would last three months. Once the proposal had been posted and discussed by the group, they had to execute the project and report what they had learnt. To keep students surfing, bonus marks were awarded based on the number of Universal Resource Locators (URL – Web addresses) they could supply, together with good descriptions of what could be found at the particular site. These URLs were added to the home page on the University's 'Hagar' Web server.

4.9 Observation and reflection

One of the factors that affected the course positively, and would, of course impact on any results, was the fact that the students knew one another well. They had been divided into co-operative learning groups for the past year, and much effort was made to get them to work together. The result was that almost all of them mentioned in their statements of intent that they were pleased to see who else was on the course. They were looking forward to face-to-face meetings during the contact tutored modules on other subjects of the course, which would occur while this module was in progress. It must be stressed, therefore, that, although no face-to-face contact was allowed between the students and the instructor, contact between students could not be avoided.

The statements of intent provided valuable insight both in the students' existing knowledge, and in their creative ability in terms of producing 'keystroke art'. This also sparked off the first spontaneous discussion, as it had been called 'ASCII art' in the initial letter, and Pam was quick to correct this technicality. The second level of discussion followed when Johan brought over a debate from ITforum and expressed his concern about the lack of academic neutrality exhibited by some of the participants who were well-respected authors whose articles had been prescribed to the students in previous modules. After some discussion in the electronic 'classroom' Johan plucked up enough courage to confront the 'gurus' directly on the listserver. Here he received his first lesson in 'Netiquette'. He had expressed his disgust with the intolerance shown by participants to the listserver – and was promptly asked if this wasn't intolerance in itself. It was about two days later that Jill and Patsy met via electronic mail and made their meeting public. One responded to a message which the other had posted on ITforum but, instead of replying directly, the reply was posted back to the listserver, and all 600 participants of the forum were treated to this private communication. Surprisingly these were the only large-scale misfortunes suffered during the course. Annette had trouble subscribing to ITforum. After many attempts it was decided that the problem was technical and had to do with software compatibility between her mailer and the listserver software. Eventually e-mail was sent directly to the moderator of the list who subscribed her manually.

The uu-encoded document presented a problem for a number of students. The process of extracting it had to

be explained a number of times. This is where contact teaching would have made things easy. It would just have been a case of pointing to the right buttons or menus. Most mailers, like Pegasus Mail actually do this automatically as it is extracted, and the students would not know that it had occurred. Panic had set in and, as it was two days before an on-campus session for another subject, they were asked for their response to a suggested face-to-face lecture. Just a few needed that, so we had a five minute discussion instead, during which their fears were alleviated and the wording of the project explained. Most of the students' problems had to do with the definition of 'sustainable'. When it was explained to them that the project had to have a life-time of at least three months, and had to be more substantial than just an exchange of e-mail (key pals) between learners from various countries, they seemed satisfied.

It was also at this stage that four participants left the course. They had problems with the stability of their Internet connections and did not feel comfortable about continuing while they were not always sure of getting their messages, or being able to access the Web. The lesson learnt here is that the technology needs to be stabilised before the start of the course. Students should not have to get to know the interface at the same time as they have to learn the content. This has important implications in a third-world context where users are not likely to be computer literate.

The University network was undergoing upgrading which led to the Web server's being unavailable, much to the discomfort of students who thought that their own machines had gone wrong. This led to frantic messages being sent both to the 'classroom' and to individual members 'around the back'. Again, in rural communities where communication links may be unstable, this could lead to even more consternation.

Something was beginning to develop which had been anticipated. Students were forming their own support systems independently both of their co-operative learning groups and of the classroom listserver. They were e-mailing other members and asking help without the knowledge of the rest. This communication is laudable, but the problem was that it was impossible for the researcher to determine its extent. This may well be an area for further research – factors contributing to individual communications outside the electronic classroom.

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5. **Winning**

In conclusion, the original research questions are re-visited.

5.1 Can a 'classroom' be successfully simulated on the Internet?

It was quite possible to simulate a 'virtual classroom' bearing in mind that 'visual cues' were lacking. One of the primary advantages of the discussion group was that as is the case in a real classroom, students could benefit from each other's questions. In a traditional, postage-driven distance education situation, each student asking the same question would receive an identical, individual reply. Only if a critical number of students have asked the same question, would the question and answer be forwarded to everyone.

The biggest problem in the virtual classroom was the absence of a virtual blackboard. Although it is possible to send straightforward text messages by electronic mail, it is more difficult to send tables and graphics. It is recommended, therefore, that the electronic discussion group be augmented by a Web site, which acts as a blackboard.

5.2 How closely could a course delivered by e-mail and the Web mimic a real-life classroom?

The activity in the classroom was similar to a real classroom in that students addressed one another (through the RBO880 classroom e-mail list) considerably more than they approached the course leader directly. What was often interesting was the tone of the address. The presenter was often addressed as 'Sir' in the same way as school pupils would address their teacher. Also he was often referred to in messages as if he was not reading the list. One student commented: 'We can even "get silly" and go off the topic at times – just as one does in a real classroom situation.'

5.3 What design factors best facilitate learning via online Web-based material?

The highest proportions message types, arranged hierarchically, are presented in the following list.

- Provided information
- Asked questions
- Presented problems with which they needed help
- Made suggestions to help solve problems presented by others
- Expressed appreciation and thanks for the help provided on the list by others.

Lightheartedness and humour was a feature of the classroom's e-mail interactions. This contradicts Hiltz and Wellman's (1997) contention that CMC is less suited for social-emotional tasks. This could be because of the face-to-face familiarity which had already been built up between students in previous contact modules. The online classroom was similar to the M.Ed. face-to-face modules, where humour was often a feature on the part of students and the presenter.

5.4 Will students who have been used to contact teaching adapt to the virtual classroom?

Students adapted quite quickly to the virtual classroom, although they frequently referred to and looked forward to actual face-to-face contact.

In some ways the virtual classroom brought the instructor closer to the students. The instructor is included in the working group while, in a traditional classroom, the instructor is excluded.

Some factors which need attention though, is the lack of visual feedback. The instructor does not know who is 'in the classroom' at any given time. This is why deadlines are important. They form virtual feedback sessions where the instructor learns who is still on board.

Students' results were compared with those of three previous modules that they had completed with the same course facilitator. A graph of the comparative distribution of the four course results is presented in Figure 1.

Figure 1 Box-plot of distribution of four course results of M.Ed. students

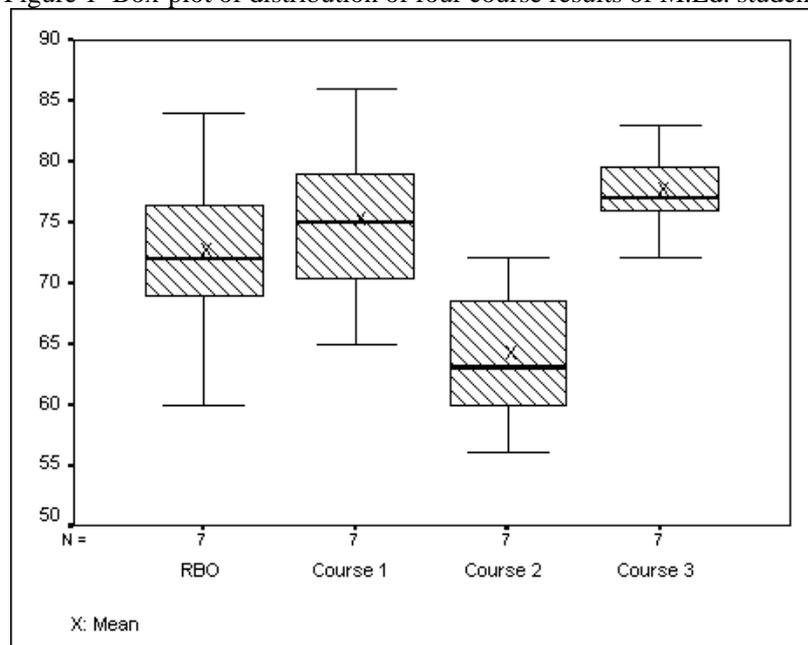


Figure 1 shows some overlap between the distribution of the results of the RBO course and those of the other courses, although the mean (marked on the graph with an X) and median (the horizontal line through the hatched box) of the RBO course was below those of two of the other courses. For four of the seven students the RBO mark was their best or second best result out of these four courses. Students considered that their marks were a fair reflection of their knowledge and abilities.

It could be argued that these findings support Clark's (1994) contention that the medium does not influence learning. It is interesting to note though, what it does influence in affective terms.

5.5 To what extent could co-operative work be done over the Internet?

Co-operative learning worked exceptionally well. It helped a great deal in breaking the isolation which students might have felt had they been left to work in isolation. More research is needed as to the nature of the messages which students in co-operative groups send one another, bypassing the discussion forum. Aspects that interfered were time and network stability. Surprisingly, distance was not seen as an obstacle to cooperation.

5.6 To what extent will technology and technological literacy affect the learning process?

A very stable network and a high degree of technological literacy is essential. All the students who failed to complete the course did so on account of their unfamiliarity with the technology. Whenever students felt uncomfortable, it was as a result of unstable technology. Although they were burdened with a great deal of work and still had to complete other modules, this did not cause them nearly as much discomfort as did the fact that they could not access the Web site, or were unable to receive certain messages.

5.7 To what extent can a Web-delivered course provide materials, models and metaphors that elicit sufficient motivation to learn?

The metaphor of the classroom was chosen to give students a familiar base from which to explore the Web-based course. The classroom design with its virtual cupboard, desks and blackboard gave a visual form and provided students with a site that was simple to relate to and to navigate.

Some students chose to perpetuate and extend this metaphor in their own hand-in Web-based projects. One student used graphical images to portray a real desk top and related objects including files and pencils. Two other students used graphics as links to their virtual desk-tops that represented themselves at desks, one presented bare feet as they would appear in reclining with feet on the desk top, and another student had a photograph of herself seated at her real desk.

Students did not merely 'learn about' virtual classrooms. To quote Viau (1994), they 'lived' it for 20 weeks using the actual tools and material involved in learning via the Internet.

5.8 Recommendations

It is essential that students be familiar with the basics of their own mailers, browsers, etc. It may be an idea to start the course with a number of exercises in this respect.

The remote network **MUST** be stable. It is highly disconcerting for students, who are concerned about learning as much as possible, to find themselves let down by technology.

The same goes for the Home network. Moreover, should maintenance or other eventualities render the Home network offline, students should be informed in advance.

Deadlines must be given for every task, and progress should be monitored. One of the reasons for asking for a progress report was that not enough deadlines had been published along the way and there was no way of knowing where each student was.

Co-operative learning works well, particularly in instances where students have had time to build a relationship of trust in the past.

Allowing students to define the scope of their own projects works well. Comments from their peers are valuable. It may be necessary for the mentor to shape the project in terms of the size, as some students overestimate what can be done in three months.

A Web site is a good place to store large quantities of information for non-interactive purposes. Creating ownership by allowing students to add their own URLs contributes to the interactivity of a usually passive site.

An online discussion group works well particularly when it is augmented by a lively forum such as ITforum. Students may not wish to air their views in public, but they might be prepared to discuss it with their classmates.

Other recommendations from students included calls for:

- a friendly atmosphere in which learning is made easy;
- a clearly specified set of learning outcomes;
- a well-specified learning task, the completion of which will lead to the mastery of the learning outcomes;
- sufficient information resources to complete the learning task;
- adequate tools with which to construct the learning task;
- a supportive tutor to coach, assist and consult;
- fellow students with whom to discuss the work;
- ample opportunity to interact to express opinions and ask questions; and
- interesting but relevant diversions.

The key to the success of the project, however, lay in the flexibility of the design, allowing students to do more or less what they wanted to, provided they used the tools which they had to learn to use.

5.9 Final word

All in all, the success of the course was summarised by Annette, in this unsolicited response which she wrote 'on behalf of her classmates':

"Thank you for a wonderful module in which the world opened for me in the most dramatic way of which I could only dream. Since December 1995 I experienced something which cannot be described in words... In January I had no idea what you were talking about when you said "it's easy, you just take an existing Web page and overwrite your own text..." Today I even downloaded a program and I can do it. I talk to the world overnight and people look at me with longing eyes when I speak of the Internet, WWW and email... If this were the only module I had done of the M.Ed. (CAE) it would have been worth it. I am no longer that monkey swinging from a branch about to fall off. Your course was a breathtaking experience... What about a follow up'.

This glowing testimonial to the course is encouraging in terms of quality assurance, when the quality of the course is evaluated.

Although the Internet is still slow and primitive, it is the Information Superhighway in its infancy and we need, right now, to start developing our skills of exploiting the medium to our best advantage.

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6. Note

The contributions of the students to the Masters' degree in computer-based education, and particularly that of Patsy Clarke who studied the messages for her dissertation, is gratefully recognised.

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The Web show developed by Johannes Cronje is available at:

<http://hagar.up.ac.za/catts/abc/museum.html>

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