

Educational value of e-learning in conventional and complementary computing education.

Ken Eustace
Charles Sturt University
Wagga Wagga NSW Australia
KEustace@csu.edu.au

ABSTRACT

Effective online learning communities using telelearning environments (aka collaborative virtual environments - CVEs), are creating a new curriculum dynamic in e-learning.

A longitudinal study of adult learners seeking alternatives to conventional higher education was carried out with an online university as the major case study. Flexible design and testing of a polysynchronous telelearning framework by the author, examined the educational value of participant interaction and curriculum change. Such a framework provided a social-constructivist platform for dialogue and enabled each participant to use such interaction for deep learning exchanges and rapid learner-centred curriculum change.

This paper discusses the key findings of the study carried out by the researcher, working with colleagues at San Francisco State University (SFSU), AdjacentSchools and Charles Sturt University. Discussion group data is used to describe the learning community discourse and to analyse ideas about educational value, deep learning theories, conventional and complementary computing education e-learning curriculum models, that can be quickly assimilated into teaching practice.

Keywords

Educational value, telelearning environments, peer dialogue, deep learning experiences, conventional and complementary computing education.

1. INTRODUCTION

Conscious and regular examination of who we are, who we talk to, what we talk about, and how we talk about it, matters in learning. International study and new learning technologies presents the higher education sector with a fresh field and new horizon. Flew (2002) identified ten drivers of change in the higher education sector, which includes the use of information and communications technologies (ICT) called telelearning environments.

Polysynchronous telelearning frameworks create a virtual classroom by combining the asynchronous experience of an e-mail discussion list, bulletin board or forum, with the synchronous features of a chat room IRC, ICQ or MOO.

My thesis is that meaningful integration of those features, a polysynchronous e-learning framework, based on strategies which support deep learning behaviours of diverse global learners, using learner-centred approaches, can add educational value for postgraduates working in global online communities.

Current university e-learning practise where print-based distance education materials are rushed online with unclear learning methodologies and a process of annual review, may lead to poor learning community development. ICT products used by universities and publishers, offer various synchronous and asynchronous features, soon to be enhanced by the new wave of broadband multimedia, device networks using ICT as a commercial conduit (Dean, 2002; Peters, 2000). The situation then pushes the need for research into:

♦ the professional development of academics and students and a need to discover those learning theories that apply to online teaching and learning methods using telelearning environments;

♦ the need for universities to constantly refine the distance education curriculum model in relation to telelearning environments.

As students study all or part of their courses abroad, opening up a new frontier, raises a big issue for computing education is its international dimension.

"What are the consequences of this new form of 'universalism' for an institution which, over the centuries, has always upheld the belief in learning without frontiers" - Huisman, J., Maassen, P. and Neave, G. 2001

Eustace, Henri and Weber (2001) presented three case studies on telelearning innovations. Together with the TeleTOP development (<http://www.teletop.nl>) by Collis (2002), all case studies reveal a convergence of ideas where the teachers provide the telelearning environment and students build content and take responsibility for learning. Nolan & Weiss (2002) suggest, that in order to understand how each online course is a learning community, then knowing the history and descriptive features will allow educators to determine the various learning interactions that are needed for success.

Such stimuli drive the need for evaluative research. The ICTed project findings (Lynch & Collins, 2001), under recommendations 4 and 9, in particular, suggest studies like this thesis are required in order to improve interaction with the outside world through longitudinal and retrospective evaluation of e-learning innovation and dissemination. ICT educators need to evaluate their own teaching and learning practises, while their university, while providing support for a limited number of ICT e-learning environments, should not stifle further innovation, by supporting academic staff with a freedom to choose or develop their own tools.

In the author's case, this has meant a freedom to develop and explore a polysynchronous environment, centred on open source, object-oriented software systems. While many universities offer supportive ICT tools, the uptake and application by academic staff, varies greatly for the student experience. Results from student evaluations of subjects using e-learning tools have frequently indicated variance due to poor learning satisfaction and use of unclear learning methods, especially where print-based education materials were put online first and the ICT tools became "added features".

2. SELECTING THE VEHICLE: PAIDEIA UNIVERSITY ON THE INTERNET

The AdjacentSchools learning organisation (GlobalNet Associates, 2002) supports the values of conventional study and adds to it the use of ICT, group learning processes and easier access to resources and services. The organisation prides itself on being able to serve a global community through a system of correspondence, using Internet services as a stimulus for the creation of student portfolios. The organisation has changed since May 1994, when I agreed to undertake this action research/ethnographic study.

The online Master of Arts (Liberal/Policy Studies) course at Paideia, was one of the pioneer "virtual universities" using Web servers, e-mail and conferences via Internet Relay Chat (IRC) or by telephone. Students worked on their own and created Portfolios that they shared with peers and tutors. They were encouraged to participate in weekly peer-led groups, engaged in dialogue about the issues of Liberal and Policy studies. The portfolio framework provided the scaffold to document the student's experiences. Students are encouraged to assume greater political, cultural and economic responsibility and to become more critical of their sources of new knowledge in the sciences, policy issues, history and the arts.

3. RESEARCH DESIGN: THE MAP OF MY JOURNEY

The research design is a mixed methodology, cyclic, three-stage longitudinal study using ethnographic and complementary action research methods. It gives educators opportunities to reflect on and assess their teaching; to explore and test new ideas, methods, and materials; to assess effective approaches; to share feedback with colleagues; and to make decisions about curriculum design, instruction, and assessment plans.

The first stage of the ethnographic field study examined understandings about current practices for student learning in online communities. Following further literature searches my work with building a polysynchronous social constructivist-learning environment, a context-based learning framework evolved over the next two stages. The study has 3 distinct stages or milestones, concerned with design and development of an ICT-based, flexible curriculum for deep learning experiences, through dialogue with peers. The start-up Curriculum used IRC GlobalNet channel and then the Paideia-L Listserv and e-mail as

the ICT tools. Each stage of the action research followed:

Curriculum action 1: Polysynchronous ICT and deep learning alternatives using AussieMOO as an educational and social hub for context and problem based learning.

Curriculum action 2: Global MA curriculum modelling and accreditation as AussieMOO and Web site developments continue for “AdjacentSchools”.

Curriculum action 3: Polysynchronous ICT management techniques for effective learning communities. LC_MOO (2003) as a closed system for professional workgroups; K9 MOO (2003) as an open system for training staff and students; Z-world (2003) for content and knowledge management.

Each stage of the research follows a reflective pattern, leading to a revised plan, identified by a title and questions leading to further actions, observation and reflection in the next stage, (after Griffin, 1998) according to the iterative Deakin model of the action research process, as outlined by Kemmis and McTaggart (1988).

Observations in the start-up curriculum, revealed a strong orientation toward a dynamic and changing learning environment, and underlined the need by some adult learners, to search for alternative approaches in education. The author devised a scheme to assist in mapping the Paideia process in a way that would examine curriculum change and problem-based learner behaviour.

4. THEORETICAL FRAMEWORK

4.1 Computer Supported Cooperative Learning (CSCL) framework

CSCL is a theoretical paradigm for e-learning research that focuses on the use of ICT as a mediating tool for collaborative virtual environments (CVE). It emphasises an understanding of language, culture and the social setting, founded in the social constructivism. CSCL is also worthwhile where problem solving or project-based learning is concerned (Johnson & Johnson, 1999; 2002) with achieving a common group goal. [See <http://www.clcrc.com/pages/cl-methods.html>] Their recent 2002 newsletter states:

“Learning in cooperative groups while utilizing the tools of technology needs to occur in all grade levels and subject areas. Schools need to increasingly utilize technology-supported

cooperative learning (the instructional use of technology combined with the use of cooperative learning).”

The key domain in regard to CSCL theories is related to problem-based learning and project-based learning. Using informer experiences, grounded in the data, questions and a course of action were generated. Problem-based learning (PBL) is an effective technique for motivating students to learn about information and concepts needed to help solve a problem. Students follow a curriculum designed for students to connect their learning to “big picture” problems encountered in daily life.

While most of the theoretical framework is grounded in data, the initial theoretical perspectives that provided a starting point and motivation come from computer supported collaborative learning (CSCL) and my need as a university lecturer (ICT) to study changing practises to teaching and learning due to the emergence of dynamic online learning communities, such as AdjacentSchools and the Paideia approach.

4.2 PBL, ICT and the “lived experience” for effective learning

The process of creating and transmitting knowledge leads to knowledge construction, individual skills development and professional communications, fundamental to knowledge management. Savin-Baden (2000) separates problem-based learning from problem-solving learning, which mostly seeks an answer or a solution linked to curriculum content, by suggesting that the focus of problem-based learning is about:

“organising the curricular content around problem scenarios rather than subjects or disciplines. Students are not expected to acquire a predetermined series of “right answers”.”

In accord with Mason’s (1991; 2001; 2002) desire for more research on the educational value of using ICT, Savin-Baden (2000) alludes to the lack of research which investigates the complex and challenging ways involved in applying a problem-based learning approach and its impact on academic staff, students and their “lived experience”. The conclusion is that problem-based learning should have a core location in computing education curricula. This is where “lived experience” must examine not only an understanding of the self, but also the context and ways in which a student learns effectively.

Mason’s work (1991) set the framework for investigation into the quality of student learning that

takes place in online telelearning environments, through examination of the participant behaviours which reveal other educational goals in the chosen areas like of problem-based learning, critical thinking and broad awareness of issues.

4.3 Educational value

Educational value is defined as the change and positive experiences in learners involving seamless movement to and fro between moments of surface and deep learning, cooperation with others; contributions to the dialogue and feelings of self-worth. Participant interaction in the data is defined as peer discourse (forum posting, conference transcript or website publication) that provides specific cognitive advantages as an ?associate? in a polysynchronous environment.

Taylor (2002) provides some empirical evidence about learning outcomes and student participation with an asynchronous CVE, but reveals little of the educational value of the messaging. The grade-point-average of students (GPA) was used to measure effective learning outcomes and showed a narrow gap between students who were proactive with their forum posting and those who while using or visiting the CVE often enough, did not post as often. The group that do not use the system at all reveal a much more significant gap.

4.4 Evaluating critical thinking and educational value

Educational research has shown that learners can have surface or deep learning strategies. Biggs (1987) suggested a close association of deep learning strategies with active interactive participation and social interaction in an “affective” environment. Critical Thinking can be defined simply as thinking that involves analysis, synthesis and evaluation. Henri (1991; 1995) gives a number of suggestions for assessing the work done in online conferences and the possible ways to assess the cognitive and metacognitive knowledge of conference transcripts. This implies that the synchronous ICT must allow, with permission, users to log all learning transactions for reflective study. Henri strongly recommends that teachers go beyond tallying the number of messages in a conference and instead devise schemes for a more thorough qualitative analysis.

Newman, Webb and Cochrane (1995) describe how a clear link exists between critical thinking, social interaction and deep learning, which are now part of a content analysis method for examining the educational value of ethnographic data. Content analysis of face-to-face and computer conferencing systems, using

critical thinking as a bridge between group learning and deep learning, is a mechanism for evaluating quality of the learning and the educational value of the system.

5. ANALYSIS TECHNIQUES AND FINDINGS

The grep command in UNIX systems was used by the author to do initial analysis and preparation of the log files for analysis. Grep isolates member responses in chat (IRC or MOO) logs, where all occurrences of that players dialogue contributions can be extracted into a single block for content and discourse analysis. Line numbers are added to each player response. Here is a sample of the “grepped” MOO log, using grep to “slice” the content of all contributions from lines 154 -157 by Gina and Allan:

154:Gina says, “how might the moo affect the quality of life....?”

156:Gina says, “in what respect(s)?”

The missing line numbers imply responses from the other players:

155:Allan says to Gina, “oh, drastically.”

157:Allan says, “it gets addicting..”

A simple word count can also added to the end by the following UNIX command:

```
wc moolog1.html >> moolog1g.txt
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```
393 3010 17892 moolog1.html
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There are 393 lines in the file.

5.1 Curriculum of community

Since 1994, the learning community has had a variety of informers contribute to the research data. Data reduction techniques helped to identify 22 key informers during the study. The participant profiles were developed to establish validity practice and triangulation methods in qualitative research. Nolan & Weiss (2002) define a “curriculum of community” where members have a shared sense of mutually building a learning space. According to Nolan & Weiss (2002), the term “curriculum” takes on a new and expanded meaning in online learning communities. A collection of dynamic interactions exists in discussion lists, IRC chat, Websites or with a MOO wizard. Such interactions may vary from system to system and include joining, leaving, participating (posting, discussing, publishing), lurking and researching. Nolan & Weiss (2002) suggest that the curriculum now provides a structure for the learner to locate “learning moments”, existing in several locations in telelearning environments, described in the next sub-sections.

5.1.1 Curriculum of Initiation & Governance

In the Paideia MA this meant that all participants took collaborative charge of the curriculum. As a researcher/participant, my role in this curriculum dynamic was to adopt a number of curriculum location roles as:

- ◆ list moderator (PAIDEIA-L)
- ◆ Webmaster (Apache and ZOPE application servers)
- ◆ IRC Chat facilitator (Channel GlobalINT)
- ◆ MOO wizard (AussieMOO, LC-MOO, K9MOO)
- ◆ ZOPE content manager

The Curriculum of Initiation and Governance required use of prior ICT experiences in providing training information, making decisions on choosing and installing client/server software systems, their aims, management, rules of acceptable engagement for users.

5.1.2 Curriculum of Access Learning moment

This required the learner to become a member by learning about the Internet sites, how to access them and the membership rules leading to citizenship.

5.1.3 Curriculum of Membership Learning moment

Social constructivism allows a member to interact with others in the telelearning environment by using a range of cognitive, knowledge building skills and processes and the CSCL theoretical framework is most significant. This allows each stage of the action research be defined under the learning moments that exist in the membership and Initiation & Governance curricula.

5.2 Analysis of learning in curriculum locations

The research agenda of analysing types of deep learning such as problem-based and context based learning that may be happening in these curriculum locations, may be shaped by many questions (after Nolan & Weiss, 2002, p316). The questions then seek out an understanding of how learning spreads over the curriculum of the community in several locations, polysynchronous and online to interacting in other parts of life.

5.3 Content Analysis using Nvivo?

The original scheme used in qualitative analysis software Nvivo? has sixteen (16) steps for building and analysing the index nodes of each data set. People, Events, Topics, Issues, Perspectives and Modes of learning can provide a starting point. If the Topics are selected at the top of the tree, then instances where participants are following or deviating from the agenda,

Code	Observed action
ACT	Actions of variable duration by a participant (in seconds, days, weeks, months);
ICT	Scaffolding by ICT infrastructure in allowing groups to define and react to setting of topics or themes
REL	Social patterns, relationships and meanings during dialogue that define and direct actions;
PRO	Process changes due to study and research related problem or issue;
SIT	Participant contributions, strategies and adaptation to the situation or problem under study;
PER	Perspectives - ways of thinking (orientation) about people and objects;

the problem or the curriculum model can be measured, using transcripts from each of the stages using the improved CVE in each action research cycle. A 12-point coding scheme emerged. Using the CSCL approach and coordination theory for managing dependencies, the 12 codes are reduced to six, mostly by clustering and merging the existing codes to generate the final reduced set below:

A comparison of the synchronous conference logs vs. threaded e-mail discussion for each topic or task in the study groups is useful in finding answers to these questions. How students are re-directed in their learning tasks via the dialogue was investigated. The issue of re-direction when learning is "off-task" is strong in the data. A comparison of dialogue associated with the ICT tool vs. learning agenda, reveals what or who re-directs the adult learner behaviour in a real-time discussion.

5.4 Conversational frameworks in the data

Laurillard (1999) uses diagrams to describe a conversational framework for the learning process as a way of linking theories on information and learning to the use of ICT in teaching. Participating in an asynchronous Web-based discussion, the framework uses dialogue to connect the conceptual knowledge and experiential worlds of the teacher and the student. The online debate transcript on a topic of “e-commerce and smart cards”, generates problem solving goals which relate to the curriculum or wider and provides a rapid feedback loop. See part of the conversational framework in action below, where John connects conceptual knowledge to his experiential world of medicine:

Antony says, “E-Cash is not essential to E-Commerce. E-Cash is simply another form of electronic payment, for which we already have credit cards. So the replacement of traditional purchasing by E-Commerce will occur irrespective of E-Cash.”

Antony says, “I agree with Janice that the balance between E-Commerce and Traditional Purchasing will be more because of peoples shopping patterns and not because of barriers to E-Cash.”

Antony says, “Despite E-Cash not being critical to E-Commerce, it is set to revolutionise payments methods. This is evidenced by current trends, for example there are over one billion SmartCards in circulation already.”

Antony sits back exhausted

Antony says, “who doesn’t understand and why?”

John [to Antony]: “what types of smart cards are you referring to? Is a credit card a “smart card?”

Janice says, “over one billion Smart Cards are in use ... but where? and what % is that/

Antony sighs, “no, stand by for definition”

Antony says, “(The Smart Card: a plastic card embedded with a microchip that can be recharged with data, for use in making telephone calls, electronic cash payments and other applications.) “

John says, “we are talking about cards in medicine that would have the patient’s history on them”

The conversational framework connects a new concept to the experiential world. By the end of stage two, the framework had evolved into a three school, adjacent education model to cater for the varied learning modalities of adults. This was further tested in the

final stage of the ethnographic study, working with current and former “associates” at AdjacentSchools.

In a second conversational framework during stage 4, the use of problem solving occurrences using discussion attributes, gives a clearer focus and direction for the discussion, coming from the outside and the polysynchronous CVE which has social constructivism at the baseline. This generated the big questions that came from any participant action in the dialogue, on the inside. The discussion with the group at San Francisco State University, (McAfee, Eustace & Sherman, 2001) considered the similarities and differences between several conventional and several “complementary” computing education ventures. The conventional and complementary differ in many of the 9 discussion attributes discussed. Three are revealed in the followingtext:

Discussion attribute 1. Responsibility for sources of information and action upon them

- Conventional computer education has an elaborate staffed mechanism for processing scholarly, journalistic and specialized information.

- Complementary education lacks the resources to provide a comparably massive operation, but it can partially compensate for that by using the fruits of the conventional infrastructure and then being more responsive to current developments.

Discussion attribute 2: Dialogue

- Conventional computer education channels formal dialogue into a rigorous system but it does have ample informal venues for informal dialogue.

- Complementary education focuses on dialogue, which does lack the rigour of either the classroom or the courtroom and their situational equivalents in the real adult world but does have the values of vitality and flexibility.

Discussion attribute 3. Evaluation of the outcomes of systems

- Both systems want evaluation, usually of the same knowledge and responsibility coordinates.

5.5 Challenges

Despite a high level of computer efficacy among informers, they revealed mixed success for coping with learning to use the ICT software environment. Rapid changes in the learning environment such as perspective (cultural and philosophical), context, role, ownership of curriculum, content management, control and depth of learning, are found to challenge informer learning styles and practices. Informers expressed a need to access a variety of ICT tools, offering both synchronous and asynchronous advantages on

demand and a division of opinion existed on user preference - for text only or multimedia interfaces. If “technology as the catalyst for change” put forwarded by Morin (1999), is a held belief in computing education, then what type of future change is my research into polysynchronous telelearning environments likely to cause?

6. CONCLUSION

Fresh fields and new horizons appear as polysynchronous telelearning environments become the generic medium for e-learning. Peer dialogue provides the mechanism for deep learning experiences of educational value as well forging rapid curriculum change and the shift to a system of student management/responsibility of learning, using problem-based learning, project-based learning, peer review and reflective practise. The results also revealed the AdjacentSchools e-learning scaffold to be a useful place for a wide range of educational research in participant observation and testing of e-learning ideas, independent to the institutional view.

The findings present a final polysynchronous ICT model using encore Xpress and ZOPE application servers to enhance the frequency and type of deep learning experiences augmented by online discussion and knowledge construction through portfolio and conference paper publications. Polysynchronous ICT features can add value to the learning processes by providing choice and multiple ways for learners to construct their own learning experiences, despite the variable view the students held of the individual ICT features, in regard to user satisfaction and addiction.

At Paideia, all who study are ?associates?. The old roles of teacher, student and researcher are now just functions of the life-long learner and the transition is being influenced by e-learning and the Internet. The findings from this research have significance for students, teachers and researchers, across the computing education sector and beyond, as the boundaries between our traditional roles are made fuzzy by an evolving and amorphous global and commercial e-learning environment.

For other teachers to implement such a framework, they should consider their own university teaching context, and work closely with colleagues at partner institutions as teaching partners.

6.1 The Conventional and the Complementary: some issues and challenges

The rising tides, like student sophistication, are raising all the boats. The closer connection of academic and the “real world” affects us all. That it affects us differently in conventional and complementary computing education, provides a convergence in terms of how and who we are beholden to, affects what we know and what we intend to do about it. The Global-Net Institute, as part of AdjacentSchools, examined this issue and others during the participant discussion, resulting in a peer review evaluation method, similar to the cast, crew and critics of a play.

Internationalisation of computing education and the rising costs of computing education for students will lead to an increase of more students needing affordable, accessible distance education in the local environment, where none exists. Consortia such as the University of the Arctic (<http://uarctic.org>) illustrate the virtual university solution to problems like affordable access to relevant courses and programs, as pointed out below:

“The University of California, the nation’s largest public university system is being transformed by its need to solicit private dollars from corporations and wealthy individuals” “Fund raising.....has influenced course work, redirected research and brought corporate presence into everyday academia.”

—San Francisco Chronicle, Front Page, June 26, 2001.

The virtual university needs for Africa differ to those of the Arctic countries and to the needs of distance education services in Australia, Canada and the United Kingdom. More research and research support is needed. It is in the area of research support that Global-Net operates and is inclusive of real research and willing involvement with researchers anywhere.

The end result of global expansion may be to offer a higher quality learning opportunity for the needs of the local community, who are now part of the online computing education community, supported by a dynamic polysynchronous telelearning environment. Chat without a review of logged records lowers the educational value that can be achieved by severing reflective thinking from the other online “deep learning” experiences.

Discussion also included the impact of a range of social issues, such as growing institutional and academic suspicion of online degrees, manifested by developing issues and current events in globalisation

(local and global accreditation), knowledge management (re-usable pool of courseware) and internationalisation (cultural perspectives) of computing education, figured regularly upon the informer discourse in this study. Recognition of the changes caused by learning without borders due to the Internet, shows that e-learning is now subject to greater external influence on the learning process, as greater control passes to and from the learner. This was evident in the surprising number of informers attracted to alternative approaches by a current dissatisfaction with conventional university study methods. They are seeking a new way to learn and a need to constantly connect that learning with the local context.

As Nolan & Weiss (2002) concluded, in order to understand how each online community is a learning community, they suggested that knowing the history and descriptive features described in this study, allow educators to determine the various learning interactions that are needed for:

“initiation, maintenance, and indeed success.”

The knowledge and skills of ICT in education has to be coupled to an agenda that will see others follow and seek to form a learning community.

REFERENCES

- Biggs, J. B. (1987). “Student approaches to studying and learning.” ACER, Melbourne.
- Collis, B. (2002). The TeleTOP initiative: New learning, new technology. *Journal of Industrial and Commercial Training*, 34 (6), 218-223.
- Dean, A. (2002). Telelearning: Invention, Innovation, Implications: Towards a Manifesto. E-JIST Vol. 5, Number 2. Accessed 15 March, 2003. <http://www.usq.edu.au/electpub/e-jist/docs/Vol5%20No2/dean_frame.html>
- Eustace, K. (1998). Ethnographic study of a virtual learning community. *Internet Research: Electronic Networking Applications and Policy*. 1998. Vol. 8 Number 1, 83-84.
- Eustace, K, Henri, F and Weber, W. (2001). Experimentation in Telelearning Environments: 3 Case Studies. In Deryn Watson, Jane Andersen (Eds.): *Networking the Learner: Computers in Education*, IFIP TC3 Seventh IFIP World Conference on Computers in Education, WCCE 2001, July 29 - August 3, 2001, Copenhagen, Denmark. IFIP Conference Proceedings 217 Kluwer.
- Flew, T. (2002). *New media: an introduction*. South Melbourne: Oxford University Press.
- Garrison, D. R. (1992). Critical thinking and self-directed learning in adult education: An analysis of responsibility and control issues. *Adult education quarterly*, 42, 136-148.
- GlobalNet Associates. (2002). AdjacentSchools learning organisation. Accessed 15 March, 2003. <<http://www.adjacentschools.net>>
- Griffin, J. M. (1998). School museum integrated learning experiences in science: a learning journey. PhD thesis, University of Technology, Sydney.
- Henri, F. (1991). Computer conferencing and content analysis. In A. R. Kaye (Ed.), *Collaborative learning through computer conferencing* (pp. 117-136). London: Springer-Verlag.
- Henri, F. (1995). Distance learning and computer-mediated communication: Interactive, quasi-interactive, or monologue? In C. O'Malley (Ed.), *Computer-supported collaborative learning* (pp. 15-161) London: Springer-Verlag.
- Huisman, J., Maassen, P. and Neave, G. (2001). (eds) *Higher Education and the Nation State: The International Dimension of Higher Education*. Issues in Higher Education Series, Oxford: Pergamon Press.
- Johnson, D. W., & Johnson, R. T. (1999). *Learning together and alone: Cooperative, competitive, and individualistic learning* (5th ed.). Boston: Allyn and Bacon.
- Johnson, D. W., Johnson, R. T., & Stanne, M. B. (2002). Cooperative learning methods: A meta-analysis. Accessed August 1, 2002. <http://www.clcr.com/pages/cl-methods.html>
- K9MOO. (2003). K9 World Campus and theme park. Accessed 15 March, 2003. <<http://ispg.csu.edu.au:9000>>
- Kemmis, S. and R. McTaggart (1988) *The Action Research Planner*, 3rd edn, Geelong: Deakin University.
- Laurillard, D. (1993). *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology*. London: Routledge.
- Laurillard, D. (2000). *Interactive Learning Environments for Learning Conversations*. Accessed March 15, 2003. <<http://iet.open.ac.uk/pp/d.laurillard/ilt/index.cfm>>
- LC_MOO. (2003). Learning communities MOO: A facility for professional groups and educators in the pursuit of excellence in synchronous workgroup practice. Accessed 15 March, 2003. <<http://ispg.csu.edu.au:8800>>

- Lynch, J & Collins, F. et al (2001). Teaching ICT - the ICE-ed project: the report on learning outcomes and curriculum development in major university disciplines in Information and Communication Technology. Higher Education Division, Department of Education, Training and Youth Affairs. Canberra.
- Peters, O. (2000). "The Transformation of the University into an Institution of Independent Learning". In T. Evans & D. Nation (Eds.), *Changing University Teaching: Reflections on Creating Educational Technologies*, London: Kogan Page, 10-23.
- McAfee, M., Eustace, K. and Sherman, S. (2001). Cyber participation study at SFSU: conventional and complementary higher education. Seventh IFIP World Conference on Computers in Education, WCCE 2001, Copenhagen, Denmark. 29 July - 3 August 2001.
- Mason, R. (1991). Evaluation Methodologies for Computer Conferencing Applications. In: *Collaborative Learning through Computer Conferencing* (A. R. Kaye, ed.). Springer-Verlag, Berlin.
- Mason, R. (2001). New Models for Delivering Lifelong Learning. In: *Access to Knowledge. New Information Technologies and the Emergence of the Virtual University*. (T. Tschang & T. Della Senta, eds.) Elsevier Science, Amsterdam.
- Mason, R (2002). The Global Classroom. In: *Handbook on Information Technologies for Education and Training* (eds. H. Adelsberger, B. Collis and J. Pawlowski), Springer, Berlin.
- Morin, E. (1999). Les sept savoirs necessaires l'education du futur, UNESCO, Paris, p. 18.
- Newman, D; Webb, B; Cochrane, C. (1995). How to measure critical thinking in Face-to-Face and computer supported seminars through content analysis, *IPCT Journal*, April 1995, Vol. 3, Number 2. pp. 56-57.
- Nolan, D.J. & Weiss, J. (2002). Learning in cyberspace: an educational view of virtual community, in Renninger, K.A. & Schumar, W. eds. 2002. *Building virtual communities: Learning and change in Cyberspace*. Cambridge University Press. Cambridge, UK. Pp 293-320.
- Savin-Baden, M. (2000). *Problem-based Learning in Higher Education: Untold Stories*. Buckingham. Open University Press.
- Z-World. (2003). Internet Special Projects Group ZOPE site. Accessed 15 March, 2003. <<http://ispg.csu.edu.au>>

