DEVELOPING CONVERGED LEARNING ENVIRONMENTS FOR ON AND OFF-CAMPUS STUDENTS USING THE WWW

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ABSTRACT

One of the promises of the use of new technologies in university education has been the convergence of on and off-campus teaching and learning. Technology has been mooted as the means by which students who study a subject away from the campus can join the learning space with their on-campus colleagues. To date, there are few examples of how the convergence might be achieved. This paper describes a project at Edith Cowan University that is exploring ways in which innovative forms of learning supported by computer-mediated communications can realise this promise.

The majority of the projects describing CMC as a learning support in university have focused on particular communication styles such as discussion groups, interactive chat rooms, bulletin boards and document sharing. In the majority of the settings, the learning environments have tended to be characterised by the repeated and consistent use of a small numbers of communication applications. The Collaborative World Wide Web Environment Support System (CWEST) project at Edith Cowan University is looking to create more diverse forms of usage for curriculum applications. It is an instructional support tool that will facilitate the implementation of a variety of WWW-based collaborative learning activities. It is intended that CWEST will enable customised collaborative WWW learning environments to be created quickly and efficiently. CWEST is planned to provide a series of templates of collaborative WWW-based learning activities and a means for a teacher to choose a template and to enter the customised details to create customised WWW pages and associated CGI scripts to support the planned activity.

This paper describes the forms of converged learning environment being explored and the planned functionality of the CWEST system needed to support this. The paper also describes outcomes from preliminary explorations of use of the various collaborative learning spaces in on-line settings where both on-campus and off-campus students have shared a common learning space.

KEYWORDS

Computer-mediated communications, on-line teaching and learning, World Wide Web, university learning, collaborative learning.

1. INTRODUCTION

For many years, on-campus and off-campus teaching and learning programs in the university sector have been discrete and separate. Even in instances when the same course has run concurrently, the students enrolled in either type of learning have often received quite different forms of instruction and delivery based around usually the same content. The main factor limiting the delivery forms has been the difficulties associated with communication among the remote learners. Since communication plays a critical part in teaching and learning, this impediment has traditionally minimised and limited the learning opportunities for the off-campus students.

The recent emergence of powerful telecommunications technologies, their resulting infrastructures and applications have created many opportunities for the university sector to address this problem. More and more we are seeing programs being developed which aim to create converged learning environments, learning spaces where there is little discernible difference between the courses delivered and received by on and off-campus students.

The achievement of convergence between on and off-campus courses has been further enhanced in recent years through the creation of flexible forms of program delivery and learning. While the term is used frequently in descriptions of technology-based programs, it is quite expansive and encompasses many aspects. Nikolova & Collis (1998) describe five dimensions of flexible learning as:

- flexibility in time of course participation;
- flexibility in content in the course;
- flexibility in entry requirements;
- flexibility in instructional approaches and learning materials; and
- flexibility in course delivery and logistics.

It is clear that for a course to be considered truly flexible requires significant freedoms and controls for the learners. Much of what is currently proposed and planned for university teaching, while providing more than traditional levels of freedom, is far from being flexible in many of these areas. Converged learning environments, however, require limited levels of flexibility and with astute use of communications technologies, are possible within the existing boundaries of most university teaching and learning programs.

2. A CONVERGED LEARNING ENVIRONMENT

In order to create a learning environment which can cater simultaneously for on and off-campus students, an instructional design is required that provides consistency for both groups in terms of content delivery and communication. In on-campus learning environments, content is often provided through teacher instruction in the form of lectures and seminars while in off-campus settings the content is usually provided in more student-centred forms through print or on-line material. In on-campus settings, communication can be direct between the teachers and students and among the students, while students who study off-campus are far more limited in the ways they can communicate with others. Seeking a flexible option which can cater simultaneously for both these settings is a challenge with many potential directions and solutions.

The World Wide Web and emerging on-line technologies provide us with a number of possible paths for progress here. The solution that we have chosen to explore in our group is the use of a learning space where the course content is delivered through problem-based learning strategies. Such a process appears to provide the forms of flexibility required for content delivery and creates an environment where computer-mediated communication can be used to support the learning processes of both the on and off-campus students.

2.1 PROBLEM-BASED LEARNING

Problem-based learning organises curriculum around authentic contexts and settings. It encourages students to act as stakeholders in the problem as they gather and apply knowledge and skills from multiple disciplines as they devise viable solutions (eg. Sage & Torp, 1997). Problem-based learning as a teaching strategy is supported strongly by the learning theories describing situated learning and situated cognition (eg. Brown, Collins & Duguid, 1987) and other forms of contextual and engaged learning as described by Lave and Wenger (1991).

Problem-based learning provides a learning setting where the content and information for a course does not have to be delivered in formal or directed ways. It supports a setting where students are provided with access to various forms of information and where the learning task encourages and supports their reading and processing of that information. This form of learning is equally suited to on and off-campus students and is well supported by conventional forms of content delivery including textbooks and on-line resources. It must be noted, however, that this form of learning is not suited equally to all disciplines and is used in this instance as one example of an alternative form of delivery to the conventional practice of lecturing.

2.2 COLLABORATIVE AND COOPERATIVE LEARNING

The use of computer-supported and WWW-based collaborative learning is not new. There are many well described projects where learning enhancements have been gained from such applications (eg. Harasim, Hilz, Teles, & Turoff, 1995; Collis, 1997). In the local scene many teachers have reported on learning advantages through computer-mediated communications and network supported learning (eg. Freeman, 1997; McPherson, Bennet & Priest, 1997). Collaborative learning environments provide many opportunities for teaching and learning and in particular in supporting problem-based learning. They provide the means to create engaging and dynamic instructional settings (eg. Del Marie Rysavy & Sales, 1991; Slavin, 1996) and research frequently shows clear educational advantages being derived from collaborative activities among students. When students work in groups and small teams, the interactions frequently engage higher-order thinking and lead to critical reflection by the students.

There are many reasons why collaborative learning should provide assistance and support to learners in a collaborative environment. Vygotsky (1978) suggests that collaboration helps individuals to make progress through their *zone of proximal development* by the activities in which they engage. While talk is an important medium for sharing knowledge and ideas (eg. Clements and Nastasi, 1992), significant learning can be achieved through interactions supported by electronic communication and discourse. Such communication enables and encourages learners to confer, reflect and helps to develop meaningful learning. Much of our previous work with the WWW has explored its capabilities of supporting collaborative and cooperative activity (eg. Oliver, Omari & Herrington, 1998a; Oliver, Omari & Herrington, 1998b) and it was a natural progression for us to plan to use this work in developing our ideas and infrastructure to support converged learning.

2.3 COMPUTER-MEDIATED COMMUNICATIONS

Successful communication channels in a converged learning environment demand high levels of functionality and rely heavily on the use of computers and telecommunications networks for support. Hodgson (1993) lists the facilities and components of CMC to include remote databases and information sets, electronic mail and conferencing and messaging systems. In planning our converged learning environment, we have explored the range of communications possibilities supported by the WWW and structured our planning and design to use these to the maximum advantage. At all times we have been guided by a desire to create a learning setting which affords the same learning opportunities to both on and off-campus students. Important in our considerations have been the forms of technology and infrastructure accessible to students. At the same time we have recognised the need to use these technologies to support the creation of a virtual classroom where both sets of students can become active and contributing members.

As we commenced our planning and development, we recognised that the development of a WWW-based infrastructure capable of supporting a large range of communication and student interactivity would be the single most important factor in the project. This led us to an exploration of the forms of collaborative and communicative activity taken for granted in face-to-face classrooms that we would have to, and could, replicate through WWW technologies. It became evident that the communication system which we developed would be the major factor underpinning the success of our project and we chose to name this proposed system The Collaborative World Wide Web Environment Support System (CWEST).

3. CWEST

The first stage in specifying and planning the functionality of CWEST was to identify the forms of collaborative learning which could reasonably be supported in an on-line environment. The forms of collaborative learning activities that are traditionally used in classroom teaching include such activities as partner activities, round robins, structured controversies, group investigations, jigsaw investigations, value lines, debates, simulations, role plays, panel discussions, concept mapping and brainstorming (eg. Bonk & Reynolds, 1997). Our reading also explored the forms of computer-mediated communication and collaboration which have been used in on-line formats. For example, virtual seminars, on-line classrooms, games and simulations, computer-supported writing, notice boards, on-line seminars, discussions, synchronous chat rooms, debates, role plays, group conferencing, nominal group techniques, forums, on-line video-conferencing and project groups (eg. Kaye, 1992; Mason, 1993). We also had access to activities of our own developed through specific applications of WWW technologies. For example, URL postings, dynamic WWW links and file sharing (eg. Oliver, Omari & Knibb, 1997).

The project is based on the framework of communication, collaboration and cooperation described by Tiessen & Ward (1997). This framework places each of these activities as important components in effective learning spaces and provides a basis to explore the full range of functional elements supported by the WWW many of which have not yet been applied to structured collaborative learning environments as proposed here. At this stage we are focussing our efforts towards communication technologies that are readily accessible and useable by students with minimal configurations of equipment. It is likely in future years these will be extended to include more recent developments as streaming audio and video.

For a converged learning environment, the communication components need to be able to be easily selected and implemented into the learning environment. This suggested the need for a development system which can seamlessly and quickly create the various components for the teacher. Our plan is to specify a template design for a range of communicative elements as described above and to build a system capable of building these for the teachers. The plan for the CWEST project is to develop a WWW-based program which can create customised learning environments for each of the templates. It is proposed that this tool will enable selection of the form of collaborative or cooperative space required, for example, a debate, a structured controversy etc which will then provide a means for the user to enter details specific to their planned use. For example, to set up an on-line debate, the program would accept such information from the user as: the name of the unit; the debate topic; and specific instructions for students.

When this information is submitted the program will create the necessary WWW pages and CGI scripts needed to support his activity. These would be the debate instructions, the pages where the students could submit their arguments, and links to show the responses of the students in various forms. These pages would be created by the program and the teacher given a URL where they could be accessed. This URL could then be given to students on the normal WWW pages for the unit and would link through to the debate where all the associated pages and links would be available and operating. The program would sit and reside on a single server together with all the required CGI scripts creating and maintaining the necessary pages and providing a flexible and completely hassle-free environment for teachers wishing to use cooperative and collaborative WWW-based learning spaces.

The current work in the project involves an exploration of the various communicative elements in classroom settings to refine or design of their functionality, customisation needs and associated pedagogies and implementation strategies. Table 1 provides a list of a number of the planned templates together with descriptions of the supported learning activities and possible customisation elements and items which CWEST will support. We are now actively seeking funding for the full development of CWEST and in the meantime are exploring the use of the various collaborative and communicative activities in classroom and off-campus settings to refine both the functional requirements and implementation strategies. In the next section, we will describe several of the activities we have used to date and the ways in which they have enabled and supported the converged learning environment.

Table 1

A Sample of the Proposed Collaborative and Communicative Templates for CWEST

Template	Activity	Customisation
URL Posting	A dynamic WWW bulletin board to which students can post URLs and descriptions to complement and aid the inquiry and research of others.	• unit title, topic description; • instructions; • information to be posted eg. URL, student name, student email, URL description.
Electronic Discussion (unthreaded)	A bulletin board to which students can post responses to a discussion question or topic. Students' responses can be viewed by others and part of the discussion can be responses to what others have said.	• unit title, topic description; • instructions; • topic or issue to be discussed; • information to be posted eg. comment, student name, student email etc.
Debate	A statement is made, students can submit arguments to support the argument or to dissent. The various arguments are displayed in a public space.	• unit title, topic description; • instructions; • topic or issue of the debate; • information to be posted eg. arguments, rebuttals, student name, student email etc.
Electronic Discussion (threaded)	A bulletin board to which students can post responses to a discussion question or topic and to propose new discussions (threads) from this.	• unit title, topic description; • instructions; • topic or issue of the debate; • information to be posted eg. arguments, rebuttals, student name, student email etc.
JigSaw	A series of bulletin boards supporting group development and inquiry across several areas within a specific learning domain. Learners collaborate in discrete groups to inquire and research sub-components of a bigger task.	• unit title, topic description; • instructions; • main topic, sub-topics, references and literature sources • format for student submissions, eg. name, email, data, information etc.
Personal Reflections	A topic is presented to students for consideration and reflection. A bulletin board provides a forum for posting anonymous responses of a contentious and critical nature. Students are encouraged to refute and rebut arguments.	• unit title, topic description; • instructions; • main topic, sub-topics, references and literature sources • format for student submissions, eg. type of response, data, information etc.
Concept Mapping	Students explore concepts, relationships and links in large knowledge spaces through a process of identifying keywords, terms and issues in a topic and exploring relationships and linkages between them. In a virtual environment, students post to a public space where the list grows.	• unit title, topic description; • instructions; • main topic, sub-topics, references and literature sources • format for initial student submissions, eg. type of response, data, information etc. • format for responses of concept and sematic maps.
Nominal Group Techniques	Students explore a concept or issue and generate and priority rank their ideas. They then post to public boards, their ideas in rank order. Group discussion follows to gain consensus on a final set of ideas and their rank importance.	• unit title, topic description; • instructions; • format for initial student submissions, eg. type of response, data, information etc. • format for ideas posting and ranking; • format of second board, instructions, procedures.

4. THE PILOT STUDY

We have been exploring a number of possible communicative elements in a pilot study to ascertain how successfully they can support converged learning environment ahead of the development of CWEST. Each of the activities uses a form of dynamic bulletin board supporting asynchronous communication across the WWW. For each element, our explorations have been focussed on the forms of learning activity supported by each and issues associated with their successful use.

4.1 UNTHREADED DISCUSSION BOARD

The communicative element we have been using to support one part of the problem-based learning environment is an unthreaded discussion board. In this setting students are given a problem to pursue in groups and are required to post a group solution to the bulletin board by a certain day of the week. Figure 1 shows the format of the problem and the dynamic bulletin board where responses show. The various pedagogies we have been using with this activity include having students make their postings by a certain day and having all learners read the responses and to reflect on the various solutions and to create a summary which provides a synthesis of the material that has been submitted. In this way, the on-line learners can involve themselves in an activity where ideas are shared and communicated and broad understandings synthesised from the ideas and solutions posted by the whole class. Thus the fundamental elements of what is typically an on-campus learning activity can be extended to include students studying in an off-campus mode. In fact, the activity doesn't have to identify from whom the solutions have come and the mix of ideas becomes quite seamless.

In our pilot activities, this form of activity has worked well to providing a support for the problem-based learning approach. We have organised students into small collaborative consisting of students study on campus and others off-campus. The students communicate through email to develop a solution which is posted by the group leader to the discussion board. In the class activity, the various solutions are discussed and compared in face-to-face settings. Students studying off-campus complete this activity as an independent learning exercise in the first instance and synthesise their own meaning from the posted responses. Email can then be used for information exchange and interaction. While this may lack some of the richness of discussion that can be gleaned from the on-campus seminar, it still provides the off-campus students with access to the ideas and values of other students.

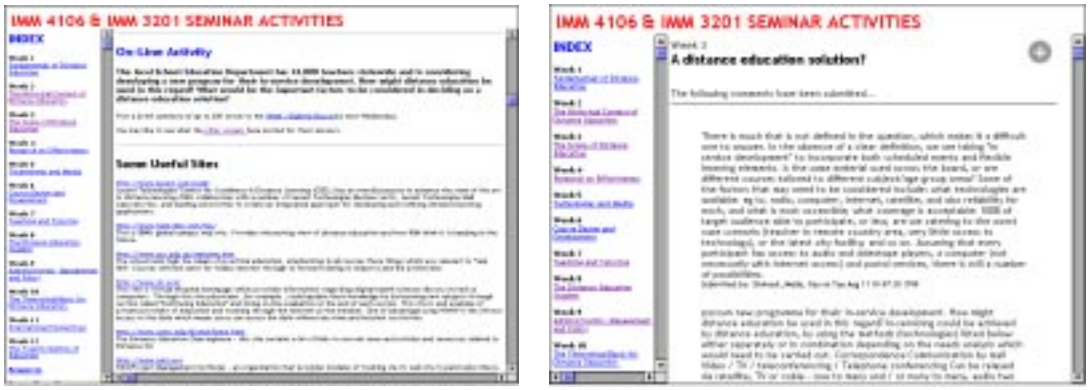

Figure 1: Collaborative Problem Solving

4.2 ON-LINE DEBATE

The on-line debate functions in a similar manner to a face-to-face debate. An issue is posed for students to consider and to take a stance. Students are required to argue a case for or against the issue and to submit individual responses to the bulletin board. This activity is used regularly in face to face settings where it functions to provide a means to inquire and explore issues where beliefs, values and personal opinions are important. As with a classroom debate, students can reflect on the responses of other students and can give their views in a manner that encourages reflection and organised argument.

The screens below show the interface for the on-line debate and the parallel frames used to display the submitted arguments. In this activity we have found it very useful to have students follow-up the exercise through independent activities whereby they are required to judge the quality of the various arguments and to decide a winner based on the quality and quantity of the information which was submitted. The follow-up activity provides a useful means to synthesise and organise the information and was found to be a very successful way to draw the activity to a close. The on-line debate in our pilot study functioned well to provide a joint communication space for all students. While it lacked the interactivity and spontaneity of a live event, the information and arguments that were brought forward and the level of reflection and comment by the students suggested that it served its purpose well and will be a useful component in the in the CWEST system.

Figure 2: On-Line Debate

4.3 PERSONAL REFLECTIONS

One of the interesting components of groupware is a facility that enables individuals to post comments to a public space in an anonymous fashion. As a communicative element in a teaching environment, this activity can serve many purposes. We created a facility that could support this kind of activity and in our pilot study used it to enable students to reflect on their feelings and opinions on an issue and to post their personal impressions. Students were asked to comment on an issue that many would have felt restrained to do had their responses not been anonymous. The activity provided them with a degree of security in their responses and provided a wealth of valuable information for the group to consider. It enabled the students to see a private side of others in the class and to gain an impression of their different motivations and philosophies.

This activity was one which once again enabled the participation of all members in the class and one where the joint participation was fruitful and valuable. It was clear in the implementation of this activity, that the largest difficulty teachers would face in using this in a learning setting, would be to craft the appropriate question or problem. As with all our pilot activities, it became apparent that in all the forms of communicative and collaborative learning activity we were looking to support with the CWEST technology, its success in the learning environment would still depend heavily on the quality of the teaching and learning program in which it was placed and the specific learning activities designed by the teacher for each element.

4.4 URL POSTINGS

A further collaborative activity that we have used previously and continued to trial in our pilot study is one which requires students to seek out useful information from the WWW and to post the URL to a public bulletin board together with a brief description of the information contained. We have used this activity in previous learning environments and have continued to explore various uses for it. In our earlier studies, we found some problems in implementing this activity due to the time and effort such tasks pose for students (Oliver & Omari, 1997). The activity seemed to offer considerable potential in the learning environment as one that encouraged inquiry and research and enabled students to collaborate and share resources.

In our first implementations, we found that many students were focussing their efforts on finding URLs to post rather than on finding relevant information and posting the URL as a task of secondary importance. Once again, the learning activity needs to be designed in a fashion that enables the students to see value in the task. In this pilot study we have created alternative activities for the URL posting which have recognised the information as the prime component in the task.

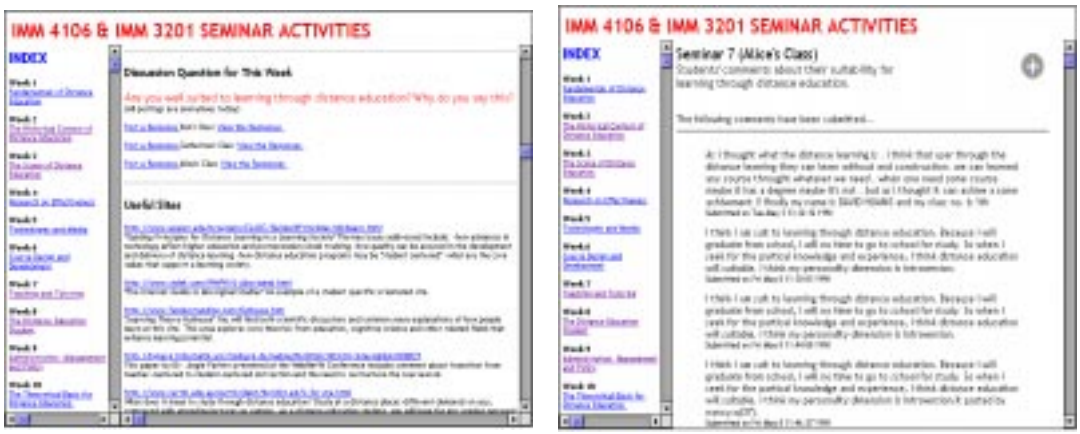

Figure 3: Seminar Activities

There are many more possible communicative elements for the CWEST system than have been described here. We are yet to create elements to support such collaborative activities as concept mapping, jigsaws and nominal group tasks. Our current activities involve explorations of the possible forms for such activities and appropriate implementation strategies. As our understanding of the use of these activities in on-line environments is built through experience, we will be able to more fully define their functional requirements for the CWEST system. It is likely that we will continue to find many new and innovative communicative activities that can be added to the CWEST set of templates at any time.

4. SUMMARY AND CONCLUSIONS

This paper has described the rationale behind, and the motivation for, the CWEST system, a development tool for the communicative elements supporting flexible and open learning using the WWW. The aim of the CWEST project is to create a tool that will enable university teachers to create collaborative on-line learning spaces. It is intended that CWEST will enable teachers to develop a wide range of customised collaborative on-line learning activities. It will do this through the provision of customisable templates and a facility to generate and place the necessary files and scripts onto a WWW server.

The motivation behind our work is to find ways to enable the creation of converged learning environments for on and off-campus students. The proposed functionality and flexibility of the CWEST system, however, will enable teachers to use it in a variety of ways for their own purposes. It is a tool that will provide creative teachers with a wide variety of instructional prospects.

We are currently exploring the various forms of communication that CWEST might offer in conjunction with the software development process. This paper has described the preliminary development of a range of collaborative learning spaces and discusses aspects of their implementation in a pilot study. The current phase of the project is the development of the software and associated teaching materials. We sense that a big part of our future work will be to develop appropriate instructional design strategies that will enable teachers to take full advantage of the opportunities which will be afforded by the tool.

5. REFERENCES

Bonk, C. & Reynolds, T. (1997). Learner centred web instruction for higher order thinking, teamwork and apprenticeship. . In B. Khan (Ed.) *Web-Based Instruction.*. (pp 167-178). Englewood Cliffs, NJ: Educational Technology Publications.

Clements, D. H., & Nastasi, B. K. (1988). Social and cognitive interactions in educational computer environments. *American Educational Research Journal, 25*(1), 87-106.

Collis, B. (1997). Supporting project-based collaborative learning via WWW environment. In B. Khan (Ed.) *Web-Based Instruction*. (pp 213-220). Englewood Cliffs, NJ: Educational Technology Publications.

Del Marie Rysavy, S., & Sales, G.C. (1991). Cooperative learning in computer-based instruction. *Educational Technology Research and Development*, 39(2), 70-79.

Freeman, M. (1997). Flexibility in access, interaction and assessment: The case for Web-based teaching programs. *Australian Journal of Educational Technology, 14*(1), 23-39.

Harasim, L., Hilz, R., Teles, L., & Turoff, M. (1995). *Learning networks: A field guide to teaching on-line.* Cambridge, MA: MIT Press.

Hodgson, B. (1993). *Key Terms and Issues in Open and Distance Learning*. London: Kogan Page.

Kaye, A. (1992). Learning together apart. In A. Kaye (Ed.) *Collaborative learning through computer conferencing: The Najaden papers. (*pp 1-24). Berlin, Springer-Verlag.

Mason, R. (1993). Designing collaborative work for on-line courses. In G. Davies and B. Samways (Eds.), *Proceedings of the 3rd IFIP TC3 Teleteaching Conference, Teleteaching 93.* Trondheim, Norway.

Lave, J. & Wenger, E. (1991). *Situated learning:Legitimate peripheral participation*. Cambridge University Press

McPherson, C., Bennett, S. & Priest, A. (1997). The DDCE on-line learning project. In R. Kevill, R. Oliver & R. Phillips, (Eds.), *What works and why: Proceedings of the 14th Annual Conference of the Australian Society for Computers in Tertiary Education.* (pp 269-275). Perth, WA: Academic Computing Services. pp 381-386.

Oliver, R. & Omari, A. (1997). Using the World Wide Web to support distance education and open learning. In J. Osborne, D. Roberts & J. Walker (Eds.*), Open, Flexible and Distance Learning: Education and Training in the 21st Century. Thirteenth Biennial Forum of Open and Distance Learning Association of Australia.* (pp 354-369). Launceston, Tasmania: Open and Distance Learning Association of Australia.

Oliver, R., Omari, A., & Herrington, J. (1998a). Exploring student interactions in collaborative World Wide Web computer-based learning environments. *Journal of Educational Multimedia and Hypermedia, 7*(2/3), 263-287.

Oliver, R., Omari, A., & Herrington, J. (1998b). Investigating implementation strategies for WWW computer-based learning environments. *International Journal of Instructional Media, 25*(2), 121-138.

Oliver, R., Omari, A. & Knibb, K. (1997). Creating collaborative computer-based learning environments with the World Wide Web. In R. Kevill, R. Oliver & R. Phillips, (Eds.), *What works and why: Proceedings of the 14th Annual Conference of the Australian Society for Computers in Tertiary Education.* (pp 444-449). Perth, WA: Academic Computing Services.

Sage, S. & Torp. L. (1997). What does it take to become a teacher of problem based learning. Journal of Staff Development, 18, 32-36.

Slavin, R. (1996). Research on cooperative learning and achievement: What we know, what we need to know. *Contemporary Educational Psychology, 21*, 43-69.

Tiessen, E. & Ward, D. (1997). Collaboration by design: context and structure, and medium. *Journal of Interactive Learning Research, 8*(2), 175-197.

Vygotsky, L. S. (1978). *Mind in Society*. Cambridge MA: Harvard University Press.

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