Developing an Asynchronous Learning Network

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ABSTRACT
Deakin University, Australia, has committed resources over a number of years to developing the use of information and communication technologies in all aspects of teaching and learning. This paper focuses on the development over a four year period of an Asynchronous Learning Network (ALN) for distance education students studying undergraduate introductory macroeconomics. The research is based on quantitative and qualitative data gained from student evaluations, academic staff interviews, participation levels and an analysis of the online communication. Key findings from the research relate to the quality of the learning environment, the level of communication, and the role of academic staff in the learning experience. Strategies discussed for the successful use of an ALN include the nurturing of a collaborative learning environment, the adaptation of curriculum and pedagogy, the role of assessment, and the role of academic staff training and development.

Keywords
Computer Mediated Communication, Collaborative Learning, Learning Environment, Distance Learning, Asynchronous Learning Network, Online Environment

Introduction
This paper reports on the development of an Asynchronous Learning Network (ALN), to improve the learning environment for a large distance education cohort of undergraduate students in a dual mode university. From the practical experience gained a number of key issues affecting the learning and educational experience for both teachers and students have arisen. These include the quality of the learning environment, the level of communication and the changing role of the teacher in the learning experience. Strategies to address these key issues are discussed, including the development of collaborative learning, adapting curriculum and pedagogy, the role of assessment and the role of training and development for teachers. The analysis is based on both qualitative and quantitative evaluation of the learning experience for distance education students of introductory macroeconomics.

Background
Deakin University in Australia was established in 1974 to provide both campus-based and distance learning opportunities for school leavers and mature age learners throughout Australia. The distance education programs were delivered via high quality learning resources that promoted interactivity between learner and subject matter (print, audiotape and videotape). New communication technologies developed during the 1980's led to the use of
Computer Mediated Communication (CMC) to provide solutions to some of the pedagogical problems caused by geographical isolation, and enhance the learning environment for distance learners at the University. Calvert (2001) provides a comprehensive review of this development and the current paper addresses some of the issues raised from the practical perspective of the teaching staff and distance learners.

Within Deakin, the Faculty of Business and Law began using CMC in its postgraduate programs in 1993 and undergraduate programs in 1996. Prospective students in the Bachelor of Commerce degree, (a general undergraduate business program), are advised of the need to be able to access a computer and connect to the internet. Deakin expects all students to arrange their own computer access while recognising the possible need to provide assistance in exceptional circumstances. Hence, CMC is now used in all Faculty teaching programs to provide students studying remotely, both within Australia and internationally, opportunities for greater interaction without loss of flexibility. Introductory macromacroeconomics is a compulsory first year unit for students in the Bachelor of Commerce program.

With greater emphasis in education today on learning rather than teaching, the focus is on activity that is associated with high degrees of interactivity and engagement, and which provides a motivating environment based on a well structured knowledge base (Chalmers and Fuller 1995). Laurillard (1993) describes teaching as mediating learning and suggests the importance of a conversational framework in media supported learning that provides for discursive, adaptive, interactive and reflective forms of communication in academic dialogues. The WWW and online applications offer considerable prospect for the support of these forms of communication.

The development of an asynchronous learning network as reported in this study, has enriched the environment for distance learning, presented numerous challenges to both academic staff and students and improved the overall quality of the program delivered.

The Learning Environment

An Asynchronous Learning Network (ALN) is defined by Mayadas (1999) as an environment that

"combines self-study with substantial, rapid, asynchronous interactivity with others. In ALN learners use computer and communications technologies to work with remote learning resources, including coaches and other learners, but without the requirement to be online at the same time."

An ALN may also incorporate a proctored examination at a specified time and place, or occasional synchronous online chat sessions.

The use of technology reported in this paper provided a genuinely flexible learning environment since communication was asynchronous, whereby users could participate at a time and pace convenient to them and appropriate to the task. The software used to store and administer this online communication was FirstClass, a computer conference system from Centrinity Inc (www.centrinity.com). This software also supports hyperlinks or "hot links" to Web-based resources, which can be incorporated into the discussions or suggested by the academics as additional reference material.

Communication could occur at three levels: at a general level within the Bachelor of Commerce (BCom) conference, which was used by all students enrolled in the BCom program; at a more discipline specific level within the unit of study; and at the accompanying tutorial group. The BCom conference contained subconferences used for academic, administrative and social purposes, thus providing a context for the study of individual units. The unit conference replicated an open general classroom with both administrative and teaching information conveyed through this avenue. The interactions ranged from a discussion of key concepts contained within the unit of study to administrative matters relating to assessment or additional references, etc. The unit conference contained subconferences which had specific purposes such as the Resources folder, which contained additional reference material, including relevant Web sites; the Assessment folder which contained tasks and their solutions; the Noticeboard for important administrative announcements; and a Current Issues, folder used to stimulate discussion of the application of the theory being studied.

Students working within small groups as part of the academic program also had a group conference with access limited to the group members and the tutor. The role of the tutor was to monitor the interaction and provide direction when necessary, that is, e-moderate the learning environment.
CMC and Introductory Macroeconomics

The introduction of an ALN provided the opportunity to address the difficulty students traditionally experience with first year economics and the decline in the popularity of economics as a field of study. (Cowie et al. 1994; Brue 1996). CMC was used to develop collaborative learning in both the teaching and assessment of first year macroeconomics to distance education students. This was based on fortnightly exercises that students completed in a small group, formed independently of factors such as geographic situation, previous experience and common areas of study. Students did not experience University organised face-to-face interactions at any time during the course delivery.

Students were required to apply course theory to the set task with ten percent of the total assessment awarded for these collaborative activities. Students could discuss in their groups the areas with which they faced difficulties. The aim was that students would experience increased support, motivation and learning through actively solving economic problems collaboratively.

Comments and discussion were encouraged to promote interdependence and increase the level of support and motivation experienced by students. Group ownership of the exercise was encouraged as each member of the group shared the same mark for the exercise yet individual accountability was also present, since students ultimately held responsibility for any question assigned to them. The key elements identified in the literature as promoting collaborative learning, namely interdependence, individual accountability, interpersonal and group skills and group processing were encouraged.

In the early years students had the choice of learning using the traditional method of printed course notes, phone contact, assessment via assignments and a final exam; or learning using the online conferences to provide, in addition to the above, communication with both other students and teaching staff. It was deemed necessary to offer this choice as making it compulsory to have access to a computer and the internet could have been challenged on equity grounds, although it can be argued that computer literacy is an essential skill for a commerce graduate.

Table summarises the participation levels over the four years of the study. The numbers participating in the first three years were lower than anticipated leading to the decision in 1999 to make the online tutorials compulsory, with non-participation resulting in zero marks for that component of the assessment. This was also made possible by the improvement in the technology and its reliability. However, students whose circumstances genuinely did not allow them access to a computer could apply for special consideration, thus transferring the 10% assessment weighting to the final exam.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total students</th>
<th>Participant students</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>227</td>
<td>49</td>
<td>21.6</td>
</tr>
<tr>
<td>1997</td>
<td>286</td>
<td>61</td>
<td>21.3</td>
</tr>
<tr>
<td>1998</td>
<td>279</td>
<td>60</td>
<td>21.5</td>
</tr>
<tr>
<td>1999</td>
<td>239</td>
<td>181</td>
<td>75.7</td>
</tr>
</tbody>
</table>

(These numbers differ from those who completed the unit due to the withdrawal of some students during the semester.)

*Table 1. Student participation in the online program at the commencement of the semester*

Methodology

Evaluating the use of computer conferencing in a collaborative learning activity involves the analysis of many interacting variables, some of which can be measured using quantitative techniques, while others require qualitative analysis to enable a more comprehensive evaluation. This research combines both techniques using data collected from a variety of sources to increase the depth and coherence of the study. The study has been conducted over four years from 1996 to 1999 although no analysis was conducted in 1998. The data sources were -
- Surveys of students.
- Interviews with the teaching staff.
- Quantitative data derived from enrolment records for the four years of the study.
- Quantitative data derived from analysis of all messages sent by students in the last year under study (1999).
- Informal feedback from email and telephone conversations with students.
Table 2 indicates the response rate to the survey mailed to students completing the unit.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>%</th>
<th>Using CMC</th>
<th>Not Using CMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>28</td>
<td>33.7*</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>1997</td>
<td>24</td>
<td>12.1</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>1999</td>
<td>46</td>
<td>30.1</td>
<td>36</td>
<td>10</td>
</tr>
</tbody>
</table>

(In 1996, only 83 students were surveyed. These students had responded to a survey conducted at the commencement of the semester.)

Table 2. Number of respondents to the student survey

Limitations of the Study

While the survey data provided feedback, the study did not use a randomly selected sample and this creates inherent self-selection biases. Further, students opting for the method incorporating electronic delivery, may well be the more highly motivated students, willing to accept a challenge, who will perform well regardless of the mode of study adopted.

The number of students participating in the online program over the first two years was below expectations, reflecting technical difficulties faced by students and lack of access to and confidence with the technology. The technical situation was much improved in 1999 and tying assessment to the program improved the student numbers, although this resulted in some unwilling participants who may have negatively impacted group dynamics.

Key Issues Arising from the Use of Technology

Feedback from both academics and students has highlighted the following key issues arising from the development of the online environment.

Quality of the Learning Environment

To enhance the learning environment, technology should be used to provide more than just another source of information. It can be used to foster a deeper approach to learning by actively engaging students in the learning process thus placing the focus and responsibility onto the student. Students need to meet this responsibility with the appropriate commitment required for a tertiary education.

Analysis of the data collected over the three semesters highlights the changes made to the learning environment (Table 3). In the first two years of the program, the open access to the tutor/lecturer was claimed to be the greatest benefit of the program. In 1996, 83% of respondents involved in the tutorial program claimed easier access to teaching staff and other students was beneficial and improved their understanding of the material. Sixty-seven percent of the respondents thought the feedback from group members and generally being part of a group was beneficial but only 33% would argue strongly in favour of this aspect. Half the students were positive about the program overall, while about the same number focused on the extra work created.

<table>
<thead>
<tr>
<th></th>
<th>1996</th>
<th>1997</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to Lecturer and Students</td>
<td>83%</td>
<td>87.5%</td>
<td>66.7%</td>
</tr>
<tr>
<td>Group Membership</td>
<td>67%</td>
<td>62.5%</td>
<td>53.5%</td>
</tr>
<tr>
<td>Program Overall</td>
<td>50%</td>
<td>75%</td>
<td>77.8%</td>
</tr>
</tbody>
</table>

Table 3. Features of CMC that participants found useful

For those respondents engaged in CMC in the second year of the program, all felt part of a group and for 62.5%, a social bond developed. For 87.5% easier access to teaching staff and other students was important and helpful with their study, viewing the feedback received from the group as useful, although it did not necessarily mean that students kept up to date with their work. Seventy-five percent of the respondents did not feel their workload
had been increased, nor their flexibility reduced. The overall benefits of the program outweighed the costs for all participants.

In 1999, when participation became compulsory, 66.7% of those participating in the program felt there was benefit in having access to staff and fellow students and 53.5 felt being part of a group enhanced their learning. This decrease from previous years may reflect the frustrations of working in a group when participation was not voluntary. Overall the program had a positive impact for 77.8% of the respondents, although one third felt extra work had been created and their flexibility reduced. Seventy-eight percent of respondents rated CMC an appropriate tool for assessment.

In 1996, 40% of the respondents not adopting CMC felt it would be of great benefit in terms of both contact with academics and students, and their understanding of the economic concepts. In the second year, 94% felt that access to a group would have been of assistance but this would have increased the workload for 81% and decreased the flexibility for 93%. Overall 81% of respondents not adopting CMC were satisfied studying as an off campus student, although almost 33% admitted to not keeping up to date with their studies.

In 1999, half of the non-participating respondents would have preferred not to have group work as part of their assessment. Eighty eight percent were happy to study on their own and 60% felt access to teaching staff was fine using the traditional methods of communication. Only 40% of them felt that CMC was an appropriate tool for assessment. The group environment added pressure to keep up to date for 20%, although the time factor with work and study and home commitments was a concern for 50%. Thirty-three percent of the non-participants would have preferred CMC for optional discussion of the course material and as a communication tool between teaching staff and students.

For all respondents there was no noticeable difference in the amount of time spent studying economics. Thirty seven per cent spent between six and eight hours per week on their studies, while a further 30% spent the expected nine to ten hours per week. It would appear that the online program does not add significantly to the time students devote to study. Fourteen per cent of the participants contributed to three or four of the tutorial exercises, yet had no discussion with other group members, although 16.6% claimed to have more than one discussion per week to complete the assessable exercises.

Feedback contained both positive and negative comments about changes to the learning environment. One student claimed it was a “great way to study.....the support provided by staff and other students in my tutorial was imperative for my learning...”.

Complemented by another student’s comment that off campus students “… need all the motivation we can get....” while another felt that since “students were not always cooperative.....waste of time trying to get them to discuss the lessons.”

The feedback from students reflects the group to which they belonged. Some groups operated very effectively, communicating well with each other and their tutor, while others struggled to have much activity. As one student commented:

“i was fortunate to be involved in a very active tutorial group which made studying macroeconomics much more enjoyable.....”

A more common type of comment is summarised by the folio wing:

“i felt very pressured at a couple of points due to work commitments ......Overall I think the result was good because I was forced to keep up and maintain a steady pace.”

In addition to the increased communication, the program also benefited from the extra resources made available by the technology and the ability to reinforce the self review questions given in the printed study guide. Many links to the World Wide Web were incorporated into the online resources thus giving students the opportunity to access current issues and data.

The program overall received general support from those participating. Suggestions for change related to the number of assessed exercises. Some argued for more to increase participation. As one student claimed:
"input into the tutorial group by some members was spasmodic and unreliable, detracting somewhat from its value. I would like to see more tutorial work as it forces a bit of discipline."

However, increasing the extent of the assessable program is constrained by the need to balance the workload with the need to maintain flexibility for both staff and students.

Over the three periods surveyed, the majority of participants recognised the value of taking a more active role in dealing with the course content and expressed favourable opinions on this aspect of the environment. Analysis of results in 1999 indicated a higher failure rate among non-participants with 41% of these students failing the unit compared to an overall failure rate among distance education students of 24%. Of those successful non-participants only 11% received a credit grade, (i.e. a mark between 60% and 70%). No higher grades were obtained, yet 18% of the total distance education student body received a credit and a further 14% a distinction or higher. While many factors are attributable to students' overall grades, the major reason given for non-participation, namely the time factor, would appear to be significant. For those students willing to commit themselves to the program and their studies, the survey responses indicate a degree of satisfaction with their experience in this learning environment.

### Level of Communication

With the higher number of students engaged in the program in 1999 an analysis of the online activity was undertaken to determine if there was any relationship between the level of contributions, number of discussions and overall group dynamics.

Analysis of messages indicated that students used the conferencing system frequently as a means of communication with 2128 student messages in the group conferences (Table 4). This was an average of 15 messages per student, which is just over one per week. As expected there was a large variation in usage of the facility, with the busiest group having 543 messages and the quietest only 38.

<table>
<thead>
<tr>
<th></th>
<th>Least</th>
<th>Most</th>
<th>Total</th>
<th>Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st half semester</td>
<td>38</td>
<td>408</td>
<td>1860</td>
<td>81</td>
</tr>
<tr>
<td>2nd half semester</td>
<td>0</td>
<td>135</td>
<td>268</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>543</td>
<td>2128</td>
<td>92</td>
</tr>
</tbody>
</table>

*Table 4. Number of messages from students within the tutorial groups*

Communication was highest when the assessable exercises were due; that is during the first half of semester. During the second half of semester, students were required to complete an individual assignment so the emphasis changed from collaborative learning. Despite this, it was surprising that the communication decreased to the extent observed, as the expectation was that students would continue to use the established groups for communication with both teaching staff and other students, particularly when completing revision. Overall, 87% of messages were posted during the first half of semester and if one particularly active group is removed from the sample this increases to 92%. In the second half of semester, tutorial work was still provided, however, without assessment attached the willingness to complete this online diminished (Table 5). Only 6% of students completed all five tutorials online.

<table>
<thead>
<tr>
<th>Number of tutorials completed</th>
<th>Number of students</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>8</td>
<td>6%</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>7%</td>
</tr>
<tr>
<td>3</td>
<td>33</td>
<td>37%</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>28%</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>22%</td>
</tr>
</tbody>
</table>

*Table 5. Student participation in the tutorial program*

Although the level of discussion diminished greatly, analysis of the message histories indicates that 72% of students continued to read the messages containing the solutions to the non-assessable exercises. Thus while students were not actively engaged in collaborative learning, they remained within the online environment to take advantage of the resources provided.
Role of the Academic in the Learning Experience

Rather than being the centre of activity, as in the traditional teaching environment, the role of the teacher in the online education process focuses on facilitating, moderating, and working with groups. Salmon (2000) provides a detailed summary of the role of the online teacher, or e-moderator, in this new environment. This is a different model of the tertiary educator than has been experienced by many academic staff in their own education and teaching experience. Thus their perception of the role university staff should play must undergo considerable change that, for some, can be challenging.

Tutors, as in the past, had the support of academic staff to assist with any difficulties encountered. Frustration was experienced when students did not respond to encouragement to participate. As one tutor commented:

"I felt my role was helpful and appreciated in the groups which worked well together. My role seemed to be ineffective in the groups which were less successful."

A broad range of skills is required and academics with already heavy teaching and research workloads found it difficult to allocate sufficient time to acquiring or enhancing the skills necessary for stimulating uses of CMC. The availability of time to explore the educational design and development of online teaching environments was raised repeatedly when academics were asked about the major challenges they faced.

"Finding time to be aware of what is available, how to incorporate it in my teaching and having the time to tailor it for my use."

A major benefit of the online environment was the ability to easily update or replace course materials during semester, thus making course content more dynamic. However, adapting curriculum to the online environment was a slowly evolving process. Changes were made to suit the new environment but, with time and resources, more could have been done. Increased flexibility in performing teaching responsibilities was also possible given the place and time independent nature of the online communication.

Strategies

The experience gained during this study suggests the following strategies are important in creating an effective online learning environment.

Developing Collaborative Learning

Educational research identifies peer interaction as a critical variable in learning and cognitive development at all levels (Harasim 1990). Kaye (1992) claims the strengths of collaborative learning through discussion and conversation include the sharing of different perspectives, the obligation to make explicit and communicate one's own knowledge and understandings to others and the motivational value of being a member of a healthy group. CMC is an effective medium to provide the social aspect of learning emphasised with collaborative learning.

Active participation strengthens learning. A learner is regarded as present online only when he or she makes a comment. The cumulative record of message contributions provides greater potential for reflective thought, analysis and review of earlier contributions than participation in face-to-face seminars. This experience supports the claim of Kaye (1992) that although the para-linguistic cues of face-to-face or telephone communication are missing, the medium offers greater communication richness than the more familiar forms of textual communication. The interaction develops written communication skills, enhances in-depth processing and recall of course material, and prepares students for examinations demanding written responses.

All students have not readily accepted the development of a collaborative learning environment, despite its advantages. Some students prefer to work on their own and educators need to be aware of the different learning styles that exist within any student body. Independent learners are likely to resist pressure to work in a collaborative environment and this must be considered when assigning marks to different parts of a unit.
Adapting Curriculum and Pedagogy

Contemporary educational thinking encourages educators to change the way courses are delivered and in some courses, the content. Parker (1997) reports on the tendency of many university teachers using technology for teaching to reformat oncampus course material and learning strategies into an online form. This tends to underutilise the technology and the learning opportunities. This is supported by the findings of a recent study by Edwards and Clear (2001), which demonstrated that CMC should be integrated not just in online teaching materials but also in learning activities.

Experience gained during this study suggests that using open-ended questions that require the students to engage in critical thinking and reflection enhance the success of collaborative learning. The ability to do this may be constrained by the level of study, the theoretical nature of the course material, the maturity of the students and the time frame within which the study must be completed.

Change requires enthusiastic commitment and cooperation from all. Calvert (2001) suggests one of the three principle sources of providing the impetus for online developments is staff. Enthusiastic staff members with the provision of infrastructure and support are likely to embed online elements essential to learning outcomes into their programs. However, adapting the curriculum faces an additional constraint in obtaining consensus within the teaching team. As Calvert (2001) discusses, Deakin University has implemented course teams based on the UK Open University model. The theory of obtaining collaboration between academics to facilitate learning, manage the environment and deploy resources is difficult to achieve in practice.

Role of Assessment

In the four year study, there has always been some assessment attached to the work developed using CMC. Although many students would prefer to use the technology solely for communication, teaching staff believe that to develop and improve the learning environment, more than just communication is necessary. Thus a purely communication tool has not been contemplated.

Providing an alternative piece of assessment to the non-participants created extra work for the academic staff, both in terms of ensuring equity and in keeping track of students. In 1999, it was decided to tie the assessment to the online activity and offer no alternative. The tutorial group work was assigned 10% of the total marks, which some students elected to forfeit to avoid participating online. The tutors and many of the active students argued for more marks to be assigned to the group work to force greater participation by all students. The question remains as to what percentage of marks should be allocated but there is no doubt that unless some marks are awarded, participation will be very low.

Role of Training and Development

The principle of learning by doing for teaching staff was applied from the introduction of the ALN. While this was adequate initially for the highly motivated early users, professional development and systematic training has proved necessary, as the use of CMC becomes an integral part of our teaching programs. Professional development programs that simulate the teaching context in a realistic way and allow creative ‘learning by doing’ in a non-threatening environment will assist academics to understand the potential benefits of using CMC (Graham, Goodwin & Scarborough 1999). The broad nature of the training necessitates institutional commitment to providing adequate resources for training programs and teaching relief while academics acquire new and enhanced skills.

As the number of participants increased, the employment of tutors to assist with the groups created more time for the senior academics to focus on developing and changing pedagogy to enrich the online environment. The tutors felt adequately supported in their role of encouraging group participation with the use of an online conference for teaching staff to assist with questions on course material and to give solutions to the tutorial exercises. The skills required for successful online teaching are not necessarily those of the traditional teacher, however they can be developed through training and experience. (Salmon 2000) provides a valuable summary of the progression of skill development required of an e-moderator.

Appointing a CMC coordinator to not only assist students to get online, but also academics to use and develop the new learning environment facilitated the development of the online environment reported here. Basic
operational knowledge of the software tools can be given on a "just in time" basis followed by instruction on more advanced features of the software as academics become more proficient.

Conclusion

The experience of developing an ALN for introductory macroeconomics suggests the open learning environment can be enhanced provided it is an integral part of a pedagogical strategy that incorporates collaborative learning, adequately rewards efforts, and is appropriately resourced. Such a development takes considerable time and commitment from both the institution and individual staff members. However, regardless of the effort by teaching staff and the strategies adopted, the extent to which students participate in the ALN depends on their level of motivation and individual learning styles. Student motivation will always be a variable element but further research could be undertaken to establish the strength of the links between student learning style and participation in the ALN.

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