

Usage of a Computer Conferencing System by on- and off-Campus Engineering Students

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Abstract: This paper reports on the introduction of a computer conferencing component into a first year study unit in Technology Management at Deakin University, Australia. It was found that significant variations in computer usage were correlated to student study mode, including source of computer access, source of Internet access, hours per week computer usage, regular use of e-mail, regular use of the Internet, and number of times the conference was accessed. Other moderate differences were also noted. Following exposure to the computer conference, on-campus students were more likely to agree computers could assist their learning, and off-campus students were less likely to agree that learning from computers would be better than classes/lectures.

Keywords: computer-based learning, distance education, internet, computer conferencing

1. Introduction

The engineering and technology programs at Deakin University cater for both on- and off-campus students, and, inherently, there are significant demographic differences between the two student groups. It was hypothesized that the differences in the two student groups would lead to differences in computer usage patterns between the groups. It was also hypothesized that the experience of using a computer conferencing system would change the attitudes of students to computers and learning. Educational applications of computer conferencing have been reported for more than two decades [1], [2]. The literature on computer conferencing provides guidance on the successful design and operation of these systems in an educational context. Cifuentes et al. identify six design criteria: (a) grading system, (b) grouping, (c) collaboration, (d) relevance, (e) learner control and (f) technological preparation [3]. Mason & Bacsich identify seven key issues: (1) structuring online interactions, (2) linking use with assignments, (3) limiting the asynchronicity of the medium, (4) enhancing the social environment, (5) training the tutors, (6) using the medium for feedback and (7) implementing and supporting a conferencing system [4]. Other design guides and frameworks are available: [5], [6] and [7].

2. Computer conferencing in a technology management unit

As part of both three year Bachelor of Technology and four year Bachelor of Engineering studies, students at Deakin University take a unit entitled SEB121 Fundamentals of Technology Management in the first semester of the first year of their studies. The commencing enrolment in this unit is approximately 180, and approximately one third of these students study off-campus.

It was decided to introduce and trial a computer conferencing component into this unit for two principal purposes —(a) to increase the amount of tutorial-type activity for students, without incurring the same corresponding level of increase in staff resources that would be required for additional class-based tutorials, and (b) to facilitate some form of interaction between off-campus students, who had traditionally been relatively isolated. The conferencing system used was the FirstClass system from SoftArc. The FirstClass system is based on a client-server architecture; all messages are stored on the server, student access to the conference is by means of a client program. A significant sub-set of the client program functionality is also available by using a Web browser.

3. Hypotheses and methodology

Previous research into student computer usage in the unit SEB121 showed significant variations in computer usage were correlated to student study mode, that is, on-campus or off-campus [8]. It was hypothesized that similar significant differences would be observed in the computer conferencing trial. Additionally, it was hypothesized that student attitudes to computers and learning would change following participation in a computer conferencing exercise. A study was undertaken to investigate these hypotheses.

Because all students would be required to participate in identical learning exercises, a pretest-posttest experimental methodology was employed. Students were surveyed during the first week of the academic semester, and again during the last week of the academic semester. As required by University research ethics procedures, participation in the survey was anonymous and voluntary.

4. Results and discussion

4.1 Response rate

From the total commencing unit enrolment of 179, 122 questionnaires were returned, an overall response rate of 68.2%. The on-campus return rate was 79.1%; the off-campus response rate was 40.0%. From the total end of semester unit enrolment of 132, 81 questionnaires were returned, an overall response rate of 61.4%. The on-campus return rate was 64.0%; the off-campus response rate was 53.1%.

4.2 Demographic information

The overall proportion of female respondents was 13.1% (14.7% for on-campus students and 5.0% for off-campus students); the overall proportion of male respondents was 86.9% (85.3% on-campus and 95.0% off-campus). The small absolute number of female respondents suggests caution in making inferences about respondent characteristics based on gender. The age range of respondents varied widely (17 – 44 years), with an overall mean of 21.1 years and standard deviation of 6.8. The overall commencing age of respondents yielded significantly different distributions between on-campus students (mean = 18.5 years, $s = 2.1$) and off-campus students (mean = 34.4 years, $s = 7.2$) ($t = -9.73$, $P < 1 \times 10^{-8}$). The observed differences are as expected.

4.3 Computer/Internet access

Overall, 99.2% of respondents indicated they had access to a computer (99.0% on-campus and 100.0% off-campus). Of those that indicated they had access to a computer, they were further asked to indicate the source of their computer access. Figure 1 shows the indicated source of student computer access for on- and off-campus students. Off-campus students are largely self-sufficient in computer access (79%), with a small proportion indicating their family as their source of access. By comparison, 60% of on-campus students list their family, friends or university as the source of their computer access. The distributions of source of computer access are significantly different between on- and off-campus students ($\chi^2 = 9.94$, $P < 0.02$).

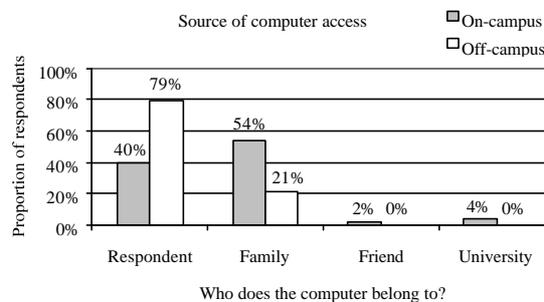


Fig. 1. Indicated source of student computer access for on- and off-campus students

Overall, 90.2% of respondents indicated they had access to the Internet/Web (89.2% on-campus and 95.0% off-campus). Of those that indicated they had access to the Internet, they were further asked to indicate the source of their access. Figure 2 shows the indicated source of student Internet access for on- and off-campus students. For those respondents indicating they had access to the Web, Figure 2 shows the differences in the source of that access between on- and off-campus students. While off-campus students are largely self-sufficient, nearly half of on-campus students are reliant on others (principally the university) for their access to the Internet/Web. The distributions of source of Web access are significantly different between on- and off-campus students ($\chi^2 = 18.39$, $P < 0.0011$).

4.4 Computer usage

Table 1 gives the percentage of respondents, at the beginning of the semester, who indicated they used a computer regularly, used e-mail regularly, and used the Internet/Web regularly. For those respondents that indicated they used

a computer regularly, Table 1 also gives the mean and standard deviation of the reported average hours per week computer usage.

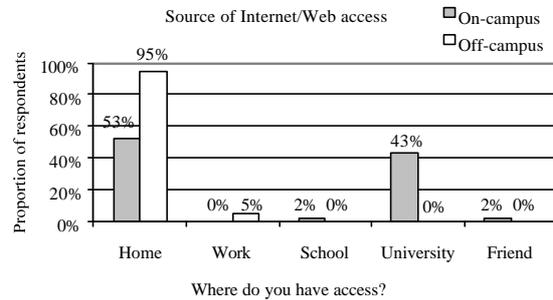


Fig. 2. Indicated source of student Internet access for on- and off-campus students

Table 1. Reported computer usage for on- and off-campus students, at start of semester

| | Overall | On-campus | Off-campus |
|----------------------------|--------------|--------------|---------------|
| Use a computer regularly | 77.0 % | 74.3 % | 90.0 % |
| Mean reported usage | 9.1 hrs/week | 7.0 hrs/week | 19.8 hrs/week |
| Standard deviation | 9.5 | 5.7 | 15.8 |
| Use e-mail regularly | 38.8 % | 33.3 % | 68.4 % |
| Use Internet/Web regularly | 52.1 % | 45.5 % | 88.9 % |

Table 2 gives the mean and standard deviation of the reported average hours per week computer usage at the end of semester for both on- and off-campus students.

Table 2. Reported computer usage for on- and off-campus students, at end of semester

| | Overall | On-campus | Off-campus |
|---------------------|---------------|--------------|---------------|
| Mean reported usage | 12.0 hrs/week | 9.8 hrs/week | 20.4 hrs/week |
| Standard deviation | 10.8 | 6.6 | 17.6 |

The commencing indicated average hours per week computer usage varied widely (0.5 – 50 hours per week), with significantly different distributions between on- and off-campus students ($t = -3.41$, $P < 0.004$). As at the start of the semester, there were significantly different end of semester distributions of reported average hours per week computer usage between on- and off-campus students ($t = -2.36$, $P < 0.031$). Additionally, there was a significantly higher reported usage at the end of semester compared to the start of semester for on-campus students ($t = -2.77$, $P < 0.0065$), but no significant change in reported off-campus computer usage ($t = -0.046$, $P > 0.96$).

In both cases, the proportion of off-campus students indicating themselves as regular users of e-mail and of the Internet/Web is approximately twice that for on-campus students. The regular use of e-mail was significantly different between the two student groups ($t = -3.01$, $P < 0.006$). As for e-mail usage, there was a significant difference between the reported regular usage of the Internet/Web between on- and off-campus students ($t = -4.86$, $P < 0.00003$).

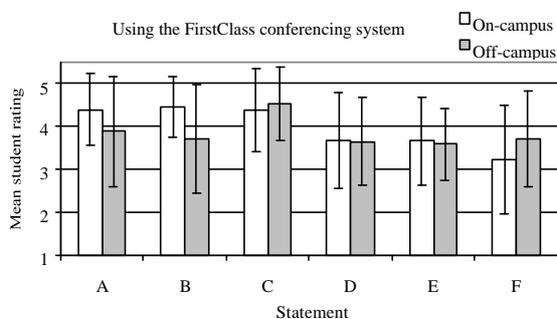
4.5 Conferencing system usage

Table 3 gives the mean and standard deviation of the reported number of times respondents accessed the FirstClass conferencing system over the semester. Table 3 also gives the reported principal method of accessing the conferencing system, either by means of a Web browser or using the FirstClass client program.

Table 3. Reported conferencing usage for on- and off-campus students

| | Overall | On-campus | Off-campus |
|-------------------------------------|------------|------------|------------|
| Mean times accessed conference | 14.0 times | 11.2 times | 24.8 times |
| Standard deviation | 9.4 | 5.7 | 12.5 |
| Main access via Web browser | 45.7 % | 35.9 % | 82.4 % |
| Main access via FirstClass client | 45.7 % | 54.7 % | 11.8 % |
| Used both Web and FirstClass client | 8.6 % | 9.4 % | 5.9 % |

Respondents were asked to indicate their agreement (by selecting one of five points on a Likert-style grading scale) with a series of statements relating to their use of the FirstClass conferencing system. Figure 3 shows the mean and standard deviation of the indicated responses from both on- and off-campus students, based on a grading scale of 1 = strongly disagree, 2 = partially disagree, 3 = unsure, 4 = partially agree and 5 = strongly agree. Table 4 shows the numerical data on which Figure 3 is based, along with an indication of the statistical significance of the difference between on- and off-campus student responses.



- A - The FirstClass system was easy to access
- B - The FirstClass system was easy to use
- C - The FirstClass system helped me complete the assignment
- D - I regularly read the messages posted by other students
- E - The assignment helped me to understand the unit material
- F - Using FirstClass would help me in other units I'm studying

Fig. 3. Student perceptions relating to use of the FirstClass conferencing system

Table 4. Numerical data on which Figure 3 is based, including an indication of significance

| Statement | On-campus | | Off-campus | | Significance |
|-----------|-----------|-----------|------------|-----------|----------------|
| | Mean | Std. Dev. | Mean | Std. Dev. | |
| A | 4.38 | 0.84 | 3.88 | 1.28 | t=1.5, p<0.155 |
| B | 4.47 | 0.71 | 3.71 | 1.27 | t=2.3, p<0.034 |
| C | 4.38 | 0.96 | 4.53 | 0.85 | t=0.6, p>0.5 |
| D | 3.67 | 1.12 | 3.65 | 1.03 | t=0.1, p>0.9 |
| E | 3.66 | 1.03 | 3.59 | 0.84 | t=0.3, p>0.7 |
| F | 3.22 | 1.26 | 3.71 | 1.13 | t=1.5, p<0.143 |

The reported number of times students accessed the FirstClass conference had a wide range (3-60 times), with a significantly different distribution between on- and off-campus students ($t = -4.23, P < 0.0006$). Figure 3 and Table 4 summarize student perceptions of the FirstClass conferencing system. Overall, there was moderate agreement (partially agree or greater) that:

- the FirstClass system was easy to access;
 - the FirstClass system was easy to use; and
 - the FirstClass system helped students complete the conferencing assignment.
- Overall, there was less strong agreement (between unsure and partially agree) that:
- students regularly read messages posted by other students;
 - the assignment helped students understand the unit material; and
 - FirstClass conferencing would help with other units studied by the students.

Some moderate statistical differences (see Table 4) were observed between on- and off-campus students; off-campus students were less likely to agree the system was easy to access and easy to use, but were more likely to agree FirstClass would help them in other units they were studying.

4.6 Attitude to computers in education

Respondents were asked, at the beginning of the semester, to indicate (yes or no) their agreement with a series of statements relating to the application of computers to teaching and learning. Table 5 shows the indicated responses as a percentage of total respondents for both on- and off-campus students.

Table 5. Agreement with statements relating to computers in teaching and learning, at start of semester

| For teaching and learning at university... | On-campus | Off-campus |
|---|-----------|------------|
| Learning from computers could never replace classes/lectures | 51.0 % | 35.0 % |
| Computers could never assist my learning | 3.9 % | 0.0 % |
| Computers could assist my learning | 79.4 % | 90.0 % |
| Learning from computers would be better than classes/lectures | 5.9 % | 20.0 % |

As at the commencement of the semester, and following the use of the computer conferencing system during the semester, respondents were asked to indicate (yes or no) their agreement with a series of statements relating to the application of computers to teaching and learning. Table 6 shows the indicated responses as a percentage of total respondents for both on- and off-campus students.

Table 6. Agreement with statements relating to computers in teaching and learning, at end of semester

| For teaching and learning at university... | On-campus | Off-campus |
|---|-----------|------------|
| Learning from computers could never replace classes/lectures | 54.7 % | 41.2 % |
| Computers could never assist my learning | 1.6 % | 0.0 % |
| Computers could assist my learning | 92.2 % | 76.5 % |
| Learning from computers would be better than classes/lectures | 1.6 % | 11.8 % |

At the start of the semester no significant difference was found between on- and off-campus student agreement with statements in Table 5 relating to computers in teaching and learning, however, off-campus students were moderately less likely to agree that ‘computers could never assist their learning’ ($t = -2.04, P < 0.044$), though the level of agreement was low for both students groups, that is, most students felt computers could assist their learning, and off-campus student were more likely to hold this opinion. At the end of semester no significant difference was found between on- and off-campus student agreement with statements in Table 6 relating to computers in education.

Examining the summary results presented in Table 5 and Table 6 appears to show some evidence for changes in attitude to computers in teaching and learning over the semester, but statistical analysis of the source data reveals that the changes are limited. The increase in agreement with the statement ‘computers could assist my learning’ by on-campus students from 79.4% to 92.2% is significant ($t = -2.45, P < 0.016$), indicating that experience in using computers in their learning has improved the attitude of on-campus students. A similar sized fall in agreement with this statement by off-campus students, from 90.0% to 76.5% is less significant ($t = 1.10, P > 0.28$) because of the smaller number of off-campus students. The decrease in agreement with the statement ‘learning from computers would be better than classes/lectures’ by on-campus students from 5.9% to 1.6% is moderately significant ($t = -1.54, P < 0.125$), indicating that the dual experience of the reality of university studies and of actually using computers in learning has reduced the small number of on-campus students who believed learning from computers would be the best mode of education. A similar fall in agreement with this statement by off-campus students, from 20.0% to 11.8% is less significant ($t = -0.69, P > 0.49$) because of the smaller number of off-campus students. Taken collectively, these results suggest that a semester of experience in using a computer conferencing system as an assessable component of studies has increased an initial moderate level of support for computers in teaching and learning held by on-campus students, and tempered an initial high level of support for computers in teaching and learning held by off-campus students.

5. References

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