

PERFORMANCE AND SUPPORT COMPARISONS IN ONLINE AND FACE-TO-FACE COURSES

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ABSTRACT

This paper compares datasets derived from student performances and perceptions of the learning environment in a University of Oxford Diploma in Computing, offered in two modes; both, part-time. In one mode students attend face-to-face classes, in the other students study at a distance, online, with support offered by tutors. Performance is measured in terms of continuous assessment and examination results. Students' perceptions of support and the role of teaching staff were determined by questionnaires. We found little significant difference between performances on the two modes of delivery; but students did perceive some differences in academic support. We conjecture that the nature of the academic support may be related to the attrition rate on the online version of the course.

INTRODUCTION

The University of Oxford, Department for Continuing Education, currently offers a part-time diploma in computing which may be studied in two modes:

- Face-to-face;
- Via the Internet.

The face-to-face version of this course (subsequently, referred to as the **class-based** version) has been running successfully for several years (<http://www.conted.ox.ac.uk/computing>). Students study two modules, one per year on a part-time basis. They attend one, two-hour class each week over two, thirty week, years. They also attend three weekend schools, where they work in teams and have concentrated study sessions. The course is assessed on the basis of how students perform in written assignments and an annual examination. The overall grade is derived from an aggregate of the results over the two years. The class version of the course is limited to about sixteen students.

The University began to offer a parallel, Internet-based course, in 1999 (subsequently, referred to as the **Internet-based** version). See (<http://www.conted.ox.ac.uk/courses/computing/promo/Contents.htm>). The intention was that, where possible, the Internet course should exactly mirror the class version. Subject matter, assessment and examinations were to be as similar as possible—to the extent that they should, effectively, be interchangeable.

The two courses could not be identical in all respects. Some of the key differences are shown in Table 1.

One difference indicated in Table 1 is that Internet students are allocated to a small tutor group, involving about fifteen of their fellow students and an academic tutor who offers practical and educational advice to students as their studies progress and who marks all their assignments. The tutor group sizes were deliberately chosen to echo the size of a typical class-based cohort of these courses. Students remain in their tutor groups throughout the course and tutor groups are the basis of

TABLE 1
KEY DIFFERENCES BETWEEN COURSE VERSIONS

Class	Internet
Three weekend schools per year (total, 6 days) Educational material delivered as lectures and handouts.	One, six day, summer school per year. Purpose written educational material presented via the Internet.
Direct support in the form of personal contact with the lecturer for each topic. Assignments marked by the topic lecturer. About 15 students per course.	Remote, electronic support through email and conferences offered by an allocated tutor. All assignments marked by the student's tutor. About 100 students per course.

the group working that occurs at the annual, week-long, summer schools.

This paper considers two issues:

- A comparison of how well students perform in the two modes.
- Students' perceptions of the level of support offered in the two modes.

The first point is discussed in the assessment and performance section in which detailed results for a typical cohort of students of these courses (the group graduating in 2003) are presented. In doing this we treat the class-based students as though they were just another Internet tutor group. The question becomes—can we identify *this* set of students on the basis of their recorded scores?—We give a statistical analysis of our data—addressing the question as to whether there is a difference between class-based and Internet-based performance. This analysis complements other work in the field [Dutton, Dutton, Perry, 2001/2002; Dziuban, Mooskal, 2001; Flood, Lockhart, Thomas, 2003; Gagne, Shepherd, 2001; Schulman, Sims, 1999; Thirunarayanan, Perez-Prado, 2002; <http://scienceonline.terc.edu/research.html>].

We discuss students' perceptions of the courses in the support and experience section. This data is based on responses to a questionnaire which has been widely used within the University, and elsewhere.

A number of studies comparing online and face-to-face versions of courses exist but we know of very few longitudinal studies of exactly the same course presented in different modes. One paper, describing a comparative study of a science course delivered face-to-face and

online [<http://scienceonline.terc.edu/research.html>] found no significant difference between the students in a pre-course test, but the online students performed significantly better in a post-course test, a result echoed in [Thirunarayanan, Perez-Prado, 2002].

ASSESSMENT AND PERFORMANCE

To date, there have been three cohorts of the Internet version of the course who have graduated. Figures 1 and 2 present average assignment and examination scores respectively for each year (module) of each cohort.

The graphs show that in the case of all three class-based cohorts, students' average assignment scores are lower in Module 2 than Module 1 whereas in the case of all three Internet cohorts, students' assignment scores are greater in the second year than in the first. No similar trends are found for the average examination scores. The only significant difference when comparing the mean

FIGURE 1
AVERAGE ASSIGNMENT SCORES

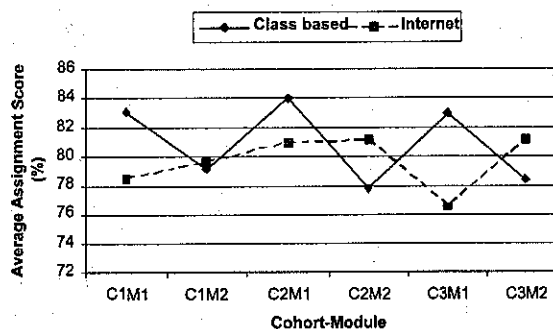
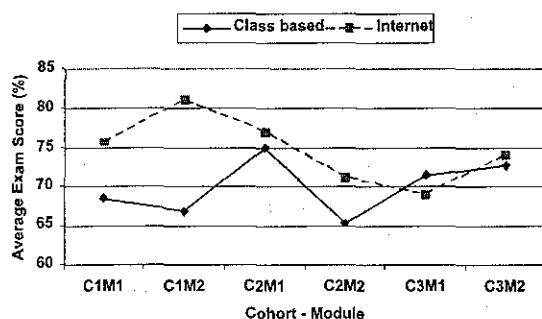


FIGURE 2
AVERAGE EXAM SCORES



examination or assessment score between the two groups (with a p value of less than 0.01 using a two-tailed t-test) occurs in the examination score of Module 2 of Cohort 1, where the class-based examination score was fifteen percentage points lower than that of the Internet students. The t-test was chosen because, while the course is the same for both versions in each year, it can be modified in minor ways from year to year. Otherwise the outcomes on the two modes were similar.

Table 2 gives average overall scores in years 1 and 2 for each of the six tutor groups of the third Internet course cohort (Cohort 3) and also for the class-based students studying at the same time.

The numbers of students involved in the groups A to G were: 10, 15, 14, 12, 9, 10, and 11, respectively. The class-based students form group B. We tested the null hypothesis that each group was drawn from populations with the same mean. Using one way ANOVA, the p-

TABLE 2
AVERAGE SCORES, IN GROUPS.

Group	Average overall year 1 scores	Average overall year 2 scores
A	75.3	77.6
B	77.9	76.1
C	78.3	78.5
D	74.3	75.9
E	77.1	78.7
F	73	74.9
G	82.4	84.1

values obtained were 0.14 for the overall results in year 1 and 0.49 for the overall results for year 2. Thus there is no significant difference between the overall scores of the class based group and the Internet tutor groups.

SUPPORT AND EXPERIENCE

Existing Support Structures

Both delivery modes for this course offer two kinds of student academic support. Authoritative support is provided by the class lecturer for class-based students and by the appointed tutor for Internet students. Peer-support is provided informally by incidental contact for class-based students and by means of an organised electronic conferencing system for Internet students.

Class-based students obtain the bulk of their support from their lecturer. During the two years of the course, a student would attend lectures on a series of different topics - each given by one of a number of lecturers. Some additional electronic help occurs, using emails, and students sometimes approach the course director for further guidance, but these activities are incidental and unstructured. Peer contact is social, informal and episodic; although class students have organised electronic support amongst themselves in recent years.

Internet students are allocated a personal tutor and a place in the corresponding tutor group of approximately fifteen students. Tutors provide authoritative academic guidance and mark individual assignments. Tutor-student contact is entirely electronic, and involving a conferencing system and emails.

The Internet course includes peer interaction and support as an integral part of its structure. Tutor-group tasks and discussions are typical aspects of the work but student support for these activities is patchy. There is some informal contact with the Internet course team, using emails, and a few formal academic interactions using the conferencing system and organised to handle such things as revision for exams. Internet students also spend the bulk of their summer school week working in teams and are assessed in that week on a team basis.

Class-based lecturers are normally University teachers with particular interests in the subject matter they cover. They participate in both formal and informal staff development during the year.

Internet tutors come from a rather wider range of professional areas. All are expert in the subject matter of

the course, and most have previous experience of teaching and electronic support. Tutors are formally interviewed, before appointment, receive at least two days training each year, and are monitored by the course team and external examiner.

Staff development involves pedagogy, assessment and academic administration in both modes of the course, and the work of lecturers and tutors is moderated by exactly the same group of course examiners.

Demographics

The Internet course attracts students from all over the world, although that is mediated by the fact that non-EU students pay significantly higher fees, and all Internet students must attend a week-long summer school each year.

A significant percentage of Internet students do not have English as a first language—up to 20%, in some years. The percentage of such students in the Class-based course is often higher than that.

The class based version of our course regularly attracts a high percentage of women students—rarely less than 50% of the class. About one third of the students have been female in most years of the Internet class.

The entry requirements for the two courses are the same and admission to either course is controlled by the same people. Both modes attract students with a mean age of approximately 35 and are from similar occupational groups. Thus, the demographics of the students on the two versions of the course are broadly similar [Flood, Lockhart, Thomas, 2003].

Student Perceptions

Student perceptions of the course were obtained through a Course Evaluation Questionnaire (CEQ), (<http://www.learning.ox.ac.uk/iaul/IAUL+3+5.asp>) which covered:

- teaching,
- attainment of goals and standards,
- appropriateness of assessment and workload,
- the development of key skills.

The CEQ is based upon a questionnaire, which has been successfully administered to several hundred full-time students of the University of Oxford and which was developed by The Institute for the Advancement of University Learning, University of Oxford. (<http://www>

.learning.ox.ac.uk/iaul/default.asp). The CEQ consists of more than fifty statements to which students signify their:

1. strong agreement,
2. agreement,
3. neutrality/don't know,
4. disagreement,
5. strong disagreement,

on a Likert scale of 1 to 5. Mean values below 3 indicate agreement with the statement whereas values above 3 show disagreement.

A number of the statements on the CEQ relate to the students' perception of the support they obtained from their tutor. Table 3 shows the means and standard deviations for the responses from the Internet students who began their studies in January 2001 together with the cumulative responses from the three cohorts of class-based students (1999-2002).

The data suggest that all students had a positive experience and obtained good support from their tutor or class lecturer.

For many questions, the means for the class-based course are lower than those for the Internet course showing that they agreed more strongly with the statements (Statements 2 and 8 were posed in the negative so a higher score shows more disagreement with the statement).

Generally the CEQ reflected smaller variability among the class-based students than we encountered from the Internet tutor groups (this may relate to differences in homogeneity of students between the two groups), but each individual Internet group presented a consistent viewpoint across the majority of questions asked. For example, the responses given by groups A and D were generally all above the mean for the whole Internet cohort (indicating a less satisfactory experience) whereas those of groups F and C were mainly below the mean for the whole cohort (indicating a slightly better experience). This suggests that there was some variability in the support given by individual tutors.

Some weight is added to this assertion when we look at the attrition rates of the groups shown in Table 4. Groups A and E experienced the highest drop-out rates.

The drop-out rate for the Internet-based version is higher than the class based version. This is consistent with drop-out rates on other online courses [Cornell, Martin, 1997]. The CEQ was also used to look at the use of IT in the

support of student learning. Table 5 shows the average responses to the appropriate statements. Note that the use of web boards applies only to the Internet-based course. Statement 2 relates to peer-to-peer interaction whereas statement 3 relates to instructor-led interaction discussed earlier.

Both sets of students were positive about the support provided using IT. However, they said that instructor-led

activities were more beneficial in supporting their learning than peer-to-peer group interaction.

The individual group data shows considerable variability in students' perception of the utility of electronic conferencing with average responses to statement 2 going from 1.85 to 4.33. We know from personal observation that some groups were more active than others and that the tutors play an important role in maintaining that activity.

TABLE 3
PERCEPTIONS OF TUTOR SUPPORT ON THE CLASS- AND INTERNET-BASED COURSE

Statement about tutor		Class based		Internet based	
		All (14)		All (26)	
		Mean	St Dev	Mean	St Dev
1	Gives helpful feedback	1.92	0.49	2.58	0.90
2	Gives marks only; no feedback	3.43	0.94	3.38	1.16
3	Provides motivation	1.93	0.62	2.54	0.99
4	Understands difficulties	2.5	0.85	2.35	0.85
5	Is good at explaining	2.23	1.09	2.15	0.83
6	Makes topics interesting	1.86	0.53	2.04	0.72
7	Comments on work	2.71	0.83	3.00	1.02
8	Questions are asked about facts only	3.86	0.53	3.54	0.71

TABLE 4
ATTRITION RATES

Cohort	No. of students at the start	No. of drop-outs
Class-based (B)	15	1
Internet-based (all)	66	14
Group A	10	4
Group C	14	1
Group D	12	1
Group E	9	4
Group F	10	2
Group G	11	2

TABLE 5
IT SUPPORT ON CLASS AND INTERNET COURSE

Statement	Class based		Internet based	
	All (14)		All (26)	
	Mean	St Dev	Mean	St Dev
1 IT helped me learn	2.29	0.83	2.0	0.69
2 Tutor group interaction via the web board helped my learning			2.77	1.03
3 Web boards are effective in supporting my learning			2.23	0.86

CONCLUSIONS AND FUTURE STUDIES

The comparison of the first three cohorts of the Internet version of a course in Computing has shown little significant difference in student performance when compared with their corresponding class-based versions. The only significant difference found was in the examination performance of the first cohort in its second module.

This contrasts with the results in [Thirunarayanan, Perez-Prado, 2002; <http://scienceonline.terc.edu/research.html>]. In the case of [<http://scienceonline.terc.edu/research.html>] the significant difference found there applies to the first year of presentation of the course.

When we examined the perception of support by Internet students, we have found some small but consistent differences between tutor groups in the perception of:

- support offered by tutors, and
- the use of a web board for communication.

With these preliminary results in mind we want to explore further the tutor's role in providing support to Internet students, and to examine the reasons behind our attrition rates, in particular whether they can be related to tutorial support.

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