An investigation into the potential of the use of multimedia development WebCT to enhance the understanding of Information Technology for students, within a traditional 3rd level lecturing environment.

By

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Abstract

This dissertation examines the benefits of multimedia development WebCT, for third level full-time students as a support tool, in terms of its pedagogical benefits, it practical implementation and the design criteria used in its development.

With the widespread availability of computers and the popularity of the Internet, educators have been quick to recognise the educational potential of using the communication tools of the computer to supplement their existing courses or offering full courses on-line. This has led to the development of countless Computer-Mediated Communication environment such as Webct, in a very short time thus revitalising teaching methods by allowing for the utilisation of more modern methods of communication.

The syllabus in principles of Information Technology was placed online using WebCT with visual test and images, online quizzes via the Internet.

The students in the study completed post-test questionnaires and both groups completed exams during the study.

The structure of dissertation is as follows: introduction, literature review, design and methodology, analysis, conclusion and findings, followed by relevant appendices.

Both quantitative and qualitative methods were used to analyse the results of this research. Limitations to the study and possible future research possibilities were also considered.

The overriding conclusion of the research is that the provision of an online management course for third level students did not affect academic performance but may have affected the information sourcing behaviour of the students.

Introduction

There are numerous ways that Information Technology can be used in all levels of education and training. The past few decades have seen the advent of at least one communications technology, ranging from educational television of the 1970's to personal computers in the 1980's and interactive multimedia in the early 1990's. However attention has now turned to the World Wide Web (www). The biggest development in using Information Technology in education and training is the www.

The advent of the www provided Educational Institutions with a new mode for delivery of courses to students, full-time and part-time, by allowing courses to be delivered in a virtual environment. Indeed one has only to browse the www to view countless examples of such courses. This virtual environment represents the delivery of a course in an electronic format that augments or replaces the traditional style class. Such a learning environment gives the students more autonomy and independence, as they are free to take lectures/tutorials whenever they want, as often as they want and from wherever they want. Students are provided with the necessary information to allow them access to the material on the Web and the weekly lecture/tutorial time for the module can be used as tutorials to review the materials that should be covered at that stage of the course.

The purpose of this research is to investigate the benefits or otherwise of developing and providing a subject resource online for full-time students studying Information Technology at Dublin Business School. The development of such a resource web page is wide spread, yet there seems to be little research in to the benefits or drawbacks of providing such a resource.

The origin of the research topic was a desire by the author to provide an online management course resource for Information Technology students. It was envisaged this resource would act as a source of Information Technology theory, but more importantly, a source of practical, applied information. The reason for such an approach was to improve the students' ability to apply theory learned in class.

The study was based on two independent first year classes in a third level college, studying for a National Certificate in Information Technology. The class of 2000 –2001 was used as the control group, while the class of 2001 – 2002 as the test group. The full syllabus was taught in a traditional manner in a lecture hall environment, to both groups. The test group also have the full facility of WebCT, which contained all lecture notes, online quizzes, discussion forum, chat room, internal e-mail, and external links. The logging patterns of the students were recorded, allowing for analysis of usage patterns. The actual pilot study was carried out over 59 days. The control group was taught using traditional style lectures, with notes and materials distributed to the students combined with verbal explanations of concepts backed up with visual aids such as the blackboard and over-head projector. Both group completed exams at the end of their academic year.

The analysis component of the study focused on:

1. The usage of the online resource
2. The performance of the students using WebCT as a resource versus the students attending traditional lectures only.
3. The students' thoughts and opinions on the system.

Both groups were tested in order to evaluate whether the on-line tutorial produced significantly different results from those obtained by the traditional group i.e. whether the tutorial was effective in terms of it's impact on student learning. Finally, the study will report on the qualitative aspects of using an on-line tutorial from a student's perspective.

Literature Review Summary

One of the reasons for the wide acceptance and rapid growth of e-learning has to do with the characteristics of the web as a technology which can combine the immediacy and collaborative opportunities of face-to-face learning with the kind of open and distance learning opportunities previously provided by disk-based learning computer based learning solutions. The "anytime anywhere" and "at your place and at your own pace" characteristics of this new way of facilitating learning make it extremely attractive to education and training provided at all levels, not to mention the individual learners out there continually searching for a convenient access point to open and flexible learning provision.

The integration of web-based learning components with system such as WebCT brings added value to traditional education. Students and faculty benefit from using the communication and assessment tools. Students have a customised approach to knowledge acquisition that suits learning styles and busy schedules. Continual access to resources through online delivery and automated management tools minimise the faculty's cost and time associated with the experience. The advantages of online education make a significant impact in higher education today and as technology evolves promise to deliver even greater benefits in the future.

Whether used to enhance traditional classroom teaching and learning or for distance education, the Internet has forever transformed the way we teach, learn and transfer knowledge in the digital age.

Methodology

Aims and objectives:

One of the main objectives is to examine the benefits or otherwise of the provision of a Principles of Information Technology subject using WebCT as a subject resource. This subject

resource is designed for the module on the National Certificate in Information Technology course. At the design stage both, quantitative and qualitative methods of data capture and analysis was considered. It was felt that the qualitative approach might give an insight into the student's perceptions of WebCT, however, there was a danger that it would lack clear focus. The quantitative approach was seen to be adequate and appropriate, as it would yield actual numerical data. Therefore it was decided to use a quantitative approach in the main, with some qualitative feedback from each student. The entire class from years 2000 - 2001 and 2001 - 2002 was selected for the research. The years were broken into Class 2000 - 2001 control group (group2), and Class 2001 - 2002 as test group (group 1).

Profile of the College and Students

The students attended Dublin Business School, which has a full time student population of 2500 students, with approximately 2000 part time students. The college has successfully provided third level courses in the IT area for over five years. The college has 12 labs, totalling approximately 400 personal computers. All of the labs are connected to a Windows NT server. All labs are connected to the Internet via a T1 line. Three of the labs are open access areas to students, which allows students to enter the labs 8:00am to 10:30pm, Monday to Saturday, to work on projects etc.

All students have some experience with personal computers. Computer Applications is a compulsory subject where they receive three hours of basic IT lab experience. This includes Word Processing, File management, Database, Internet usage and Spreadsheets. As a result none of the students required instruction in basic Windows or Mouse skills. Therefore they had no learning curve to climb in using delivery tools. Also these students already had a computer culture with the use of personal computers being part of their daily lives. The class is time tabled for 26 hours per week, 12 of which are in the computer lab.

This class followed and HETAC National Certificate in Information Technology first year award. All subjects are mandatory in this course include:

- Principles of Information Technology
- Software Development
- Computer applications
- Computer aided accounting
- Relational database
- Communications

- Business Functions etc.

The Class

In all, 79 students provided data that could be analysed in the research.

The college operates a CAO entry requirement. For Irish candidates a minimum of five passes in the leaving certificate, which has to include maths and English. All international students have to achieve an equivalent with an appropriate level of spoken and written English. The points level or entry requirement did not change over the two year period, so in theory both groups of students should have same entry level of academic performance.

Description of the study

Each group of students received three, one-hour lecture, sessions for twenty five weeks of the academic calendar. The students were taught the material using traditional teaching techniques, chalk and talk, questions and answers and homework exercises.

Over the course the both groups of students carried out a 2000 word written report, a Christmas exam and finally a three hours end of year written paper exam. The program was based on an Information technology textbook corresponding to the online resource.

Analysis

- ✓ **The academic performance of the students who took part in the study;** – those with and without access to the subject resource WebCT. This academic performance was measured by comparison of the results of Group 2 (2000- 2001 traditional group of students without the resource) with Group1 (2001 –2002 students with the resource) overall exam results. Comparison of mean scores of the groups was carried out to determine whether the results of the two groups are significantly different.

  This involves testing of the null hypothesis Ho: $\mu1 = \mu2$ i.e. population means are equal and the tutorial has no effect on the scores achieved by the students against the alternative hypothesis H1 $\mu1 > \mu2$.

  $\mu1$ is the population mean for students who have access to WebCT as a resource. $\mu2$ is the population mean for the student who have been taught by traditional methods only.

- **The use of the subject resource WebCT by the students** as measured by the identification and analysis of how many hits students accessed and used the WebCT course directly affected the results. This would involve correlation to access the hypothesis that the more a students accessed the online course, the more likely that student is to receive a higher grade.

- **The usability factor** as measured by the results of the questionnaire . Identifying and analysis of performance of WebCT, how it could be improved for future study. Qualitative analysis will be carried out via means of a questionnaire to analysis how the students felt about the tutorial. In order to gain an insight into what the students thought of the system. It was felt that the qualitative approach might give an insight into how the students were interacting with the tutorial and the nature of the interaction. This was believed to be an important aspect of the study as greater student interaction is claimed as one of the major benefits of on-line educational packages. Assigning values to the responses would be a concern- but was not seen as a major problem.

The class of 2001 – 2002, group 1, received usernames to WebCT on the 19th of March, where the course was fully online with quizzes, lecture material, and external links. From that date all logins and accesses was logged. Each student received a full tutorial of all facilities. No problems were reported from that date. The course remained online until exam date, 16th May 2002.

Analysis and Results

Areas of Interest

In a study such as this there are several variables that can be measured and analysed. In this study the areas of interest were:

1. The usage of the system
2. The performance of Group1 (Webct) V's Group 2 (Traditional group)
3. Regression analysis of students and attendance to lectures

6.1 Usage of the Virtual system

From the log files it is possible to analyse the date, time and user identification for each login during the pilot study. This information can be compared to exam performance. The pilot

study/experiment lasted a total of 59 days. Several different variables were measured during the study

AHIT: The first date that the student logged into the system

ZHIT: The last date that the student logged into the system

HIT30: The total number of hits made by that student up to an including day 30 of the pilot study (the half way mark).

TOTHIT: The total number of hits logged into the system for that student

The figures for the AHIT, ZHIT and HIT30 were chosen to collectively indicate study patterns. A low AHIT, high HIT30 and TOTHIT figures combined with a high ZHIT would indicate a student who started the virtual class early on in the pilot study, covered the material throughout the duration of the pilot study and was taking classes right up to the end of the pilot study.

Graph of Exam mark V's AHIT - Day of first hit

Show that over 50% of the students starting using the online resource within the first ten days of the study, however some of the remaining group did not use the study or did not use the course until quite late in the study. Figure 6.2 shows that all but 4 had logged on by the halfway point of the study. Figure 6.3 shows that 43% of the group logged on within the last 10 days of the exam. Figure 6.4 depicts the total number of hits and the exam marks for the entire study – a good spread of usage with some students taking up to 150 logons and others logging on very rarely.

6.1.1 Correlations

Descriptive Statistics

	Mean	Std. Deviation	N
Exam mark	35.8333	15.24373	36
No of hits	39.39	38.102	36

Table 6.1

Correlations

		Exam mark	No of hits
Exam mark	Pearson Correlation	1	.553**
	Sig. (2-tailed)	.	.000
	N	36	36
No of hits	Pearson Correlation	.553**	1
	Sig. (2-tailed)	.000	.
	N	36	36

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6.2

The scatter plot depicted by figure 6.4 shows that there is a correlation between usage levels of Webct and exam mark. Correlation table 6.2 shows there is a significant positive correlation between no of hits and percentage grade for end of year exam marks, at 0.01 level of significance. Thus higher login numbers are associated with higher end of year exam grades. Although this could be linked with more motivated students are more likely to login to the system more often.

R^2 co-efficient of determination .3, means that of all the variation in score only 30% can be accounted by variation in the amount of logins onto the system i.e. 70% of the variation is accounted for by other factors e.g. white noise.

Analysis of TOTHIT graph indicates that the students that did not take part in the logins got the lowest scores within the class.

6.2 The performance of Group 1 and Group 2; T- test

To measure the effectiveness of WebCT it is important to compare the performance of both groups in the examination. This provides a measure of how well the test group learned from WebCT versus the traditional mode of class delivery as experienced by the group 2.

The hypothesis explored here Ho: $\mu1 = \mu2$ i.e. population means are equal and the tutorial has no effect on the scores achieved by the students. ($\mu1$ = group 1 and $\mu2$ = group 2). One would hope that the students using WebCT would perform better in the exams than their counterparts using traditional methods.

A graphical analysis of the performance of both groups can be seen in figure 6.5.

Descriptive Statistics Group2 (Traditional method)

	N	Range	Minimum	Maximum	Mean	Std. Deviation
exam mark	43	73	13	86	43.44	18.403
Valid N (listwise)	43					

Table 6.3

Descriptive Statistics of Group 1 (WebCT)

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Exam mark	36	57.00	5.00	62.00	35.8333	15.24373
Valid N (listwise)	36					

Table 6.4

The table 6.4 show that the mean score of the traditional group is higher that that of Group1, therefore this does not concur with the hypothesis outlines above i.e. that the students in the test group performed better in the exams than those in-group 2. This data is represented in graphical format in figure 6.4.
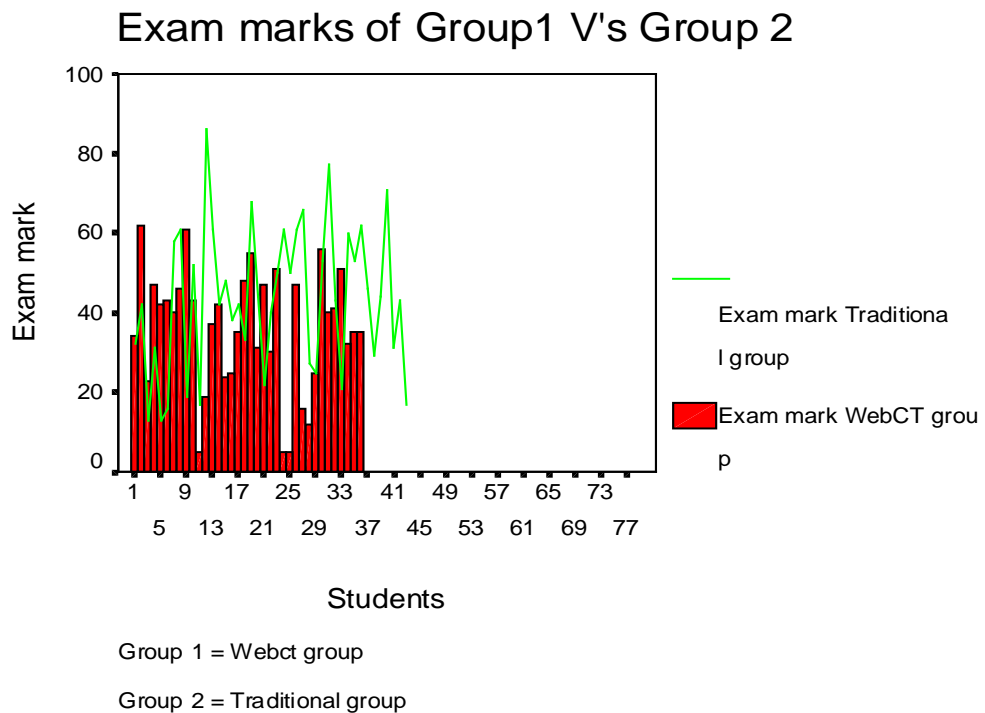

Figure 6.5

As the participants are unrelated an independent sample t-test was carried out. Given that the Levene's test has a probability greater than .05, and assumption has been made that the population variances are relatively equal, reference α .223 in table 6.5.

T-Test

Group Statistics

	Type of student	N	Mean	Std. Deviation	Std. Error Mean
Exam mark	Using Webct	36	35.8333	15.24373	2.54062
	Traditiohnal method	43	43.4419	18.40329	2.80648

Table 6.4

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Exam mark	Equal variances assumed	1.510	.223	-1.977	77	.052	-7.6085	3.84942	-15.27370	.05665
	Equal variances not assumed			-2.010	76.995	.048	-7.6085	3.78564	-15.14671	-.07035

2-tailed significance for exam mark shows p at 0.05, which implies not significant difference between groups. But it is noted that T of – 1.98 is close to the cut of point to the critical region. This clarified what was graphically shown in Figure 6.5 line chart. The students in Group 2 using traditional methods achieved on average better grades than the student's in-group 1 using Webct.

T of – 1.977 is outside the critical region of 95% confidence interval but from analysis of the statistical table just barely as $\alpha = 2.000$.

$\mu 1$ = group 1 using WebCT

$\mu 2$ = group 2 using the traditional method

Null hypothesis Ho = $\mu 1 = \mu 2$

Alternative hypothesis is $\mu 1 \neq \mu 2$

Do not reject the null hypothesis. Cannot state a significance difference.

Summary and conclusions

The null hypothesis Ho was proposed which stated that there is no difference in the test scores achieved by both groups of students. After analysis of the T test we cannot reject the null hypothesis. The hypothesis was tested at a 0.01 significance level i.e. there is a 1% chance of rejecting the Ho.

However a correlation does exist to correspond that with the fact if a student is more likely to log onto the system there is a higher probability of a higher grade.

Some factors that may have affected the research

1. The entry requirement to the course of both groups of students. Unfortunately this data is not available to me for analysis, thus could be one of the residing factors.

2. Also as the downturn in the IT sector is affecting us economically, the knock on effect could be a lower standard of student academically.

3. It has to be noted that the attendance record of Group 1 had dropped considerably in lecture hall, once the lecture notes were placed online. As can be seen from figure 6.6 and figure 6.7 a considerable difference occurred during the time scale in the academic calendar over the two years. This may have a caused a negative effect on performance hence resulting examination marks.

Findings, Conclusions and Recommendations

The primary aim of this research was to determine if WebCT is a successful educational tool that enhances students learning. A combination of both quantitative and qualitative statistical methods was used for this research.

Findings

a) The lack of significant difference in grades received by the both Group 1 (using WebCT) and Group 2 (using traditional method) indicated that the provision of an online learning environment such as Webct as a resource had neither a positive or negative effect on the academic performance of either group of students. The students in Group 2 do not seem to have been disadvantaged by not having access to the WebCT and the students in the pilot study do not seem to have had an advantage over Group 2 by having access to an online learning environment.

It might have been expected that the pilot study group, having access to a specially designed resource would perform better than Group1. However, the provision of such a resource does not guarantee worthwhile use of the resource by the students.

b) Based on the results of the post questionnaire, the students found the online course management system, interesting, well organised and stimulating. However they also show that if asked to choose between the virtual classes and the traditional classes, they

would not choose the Webct courses on their own if either were available. These students learning environment would consist of small class sizes and they would never have experienced a large lecture with its problems of anonymity and reduced personal contact. There fore these students did not fully appreciate the benefits of the one to one approach of the Webct and this explains why they found the Webct solo experience and why they preferred the traditional style class if asked to choose between them.

c) Link between mixture of response in questionnaire and level of attainment with exam scores, has been noted. This could be associated that WebCT didn't meet the needs of the students. It could be further consolidated with the fact that 15% of the students stopped logging into the system after 10 hits.

Limitations of the study

While this study achieved its objectives, it revealed a number of flaws that would require adjustment for future research.

a) The study was conducted in the final term of the academic year. Traditionally this is the busiest period of the year for students in the college. If the study had been carried out earlier in the year there may have been higher usage levels; this limitation is supported by the fact that the findings show that the online management course was postponed, as the students got busier.

b) The aim of WebCT was to create "any time any where " learning environment where the students could work through the material in a mainly self-directed manner. In this study the students had access to open labs for restricted access. As many of our students commute large distances they could not avail of the open access labs for after college use.

c) All of the students in the group had completed an office applications course prior to the pilot study. As a direct result, all of the students in the test group had abundant experience of the WWW acquired prior to the study. This would not always be the case with other third level students.

d) Although the entry requirements did not change during the two year entry to the course. One cannot be guaranteed that group 1 and group 2 have the same academic ability.

Possibilities for further study

This study was carried out over a relatively short period of time, 56 days, and was based on one subject within a National Certificate in Information Technology. Further study could include more than one subject over a longer period of time, perhaps for a full academic year. Thus allowing a more extensive analysis of usage patterns and performance within the third level sector.

a) Both groups used in this study were very small, totalling 79 students. Further studies could include using WebCT with larger groups, using more than one third level college and different student profile. Further studies could also involve student's variation in age and abilities of students.

b) In this study the online course were used in a full time student environment. A study in the possible use of this mode of course delivery in part-time or distance education could be useful.

c) Examination of alternative interactive learning systems such as Blackboard. This could help on the analysis of how different interfaces effect performance and learning outcomes of the student.

The overriding conclusion of the research is that the provision of an online management course didn't affect academic performance may have affected the information sourcing behaviour of the students.

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