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The utilisation of web-based teaching resources in large diverse classes: An empirical study*

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Abstract

This paper describes a teaching research project which investigated the utilisation of web-based learning resources in a large undergraduate course taught by the Department of Politics and Public Policy in Griffith University's Business School. The study involved systematically tracking the manner in which specific student cohorts accessed and utilised various web-based resources across an entire semester. Having identified variations in the manner in which various students accessed these resources, students were surveyed in an attempt to explain some of the patterns of technology-rich learning (TRL) use identified. The paper concludes by discussing these findings for curriculum design in large diverse classes.

Introduction

Since its emergence over a decade ago, the Internet has transformed teaching and learning practices in universities. Its impact is clear in the proliferation of "flexible" courses where students engage with a learning environment which is radically different from the traditional lecture/tutorial formats, whereby knowledge is broken down into uniform weekly lessons. However, these so called technology-rich learning resources, are also reshaping traditional approaches to teaching. In these emerging mixed modes or hybrids, the Internet offers a range of new communication and resource tools. Tools such as email, bulletin boards and discussion forums are shaping interchanges with and between students, while systems such as Blackboard and WebCT allow us to make a large variety of material, from course outlines, lecture notes, supplementary readings, and self-assessment packages, available to students. Although we are becoming increasingly confident using these new tools, we still need to better understand how they impact on student learning. This paper, through systematically tracking and evaluating students' access of web-based resources in a large and diverse first-year class at Griffith University, makes a modest contribution to our understanding of how technology impacts on learning outcomes.

The following paper has five sections. It begins with a brief overview of the literature on the utilisation and impact of web-based resources on teaching and learning in contemporary higher education, before describing the specific teaching and learning issues confronting the authors in their large introductory courses. The third section outlines the methodology used to track the use made by different student cohorts of specific web-based course resources across a single semester. The fourth section presents the quantitative and qualitative data on web use gathered during the project. The paper concludes with a brief discussion of the implications of the analysis for curriculum design and teaching strategies.

Combining the new and the old

The impact of new technologies on teaching and learning has generated considerable research. While much of it focuses on more radical applications, some evaluates the potential for new technologies, in particular the Internet, to enhance traditional approaches to teaching and learning. The widespread take-up of the practice of posting lecture materials on course specific websites has been evaluated from both teacher and student perspectives. These evaluations suggest that it offers university teachers some

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practical advantages. For example, Bunker and Vardi (2001) asked university teachers about their use of the Internet to improve student access to course information, and enhance student participation and independence. In relation to the provision of course materials, their respondents reported that Internet posting reduced the administrative load associated with large courses and allowed them to use their face-to-face time with students more productively. Randolph et al. (2002) suggested that posting lectures also allowed for the more efficient use of other resources because it released staff from the tedious task of photocopying lecture materials that were often ultimately surplus to requirements. Hence, although the take-up of communication tools has the potential to confine academics in "virtual prisons" (Hart & Gilding, 1997), applications involving the dissemination of material offer considerable benefits. Realising these benefits, of course, depends on both technical reliability and ease of use (Bunker & Vardi, 2002; Stith, 2000).

More importantly, how do students respond? Much of the work in this area found that students responded positively to a hybrid of traditional and technology rich approaches. Riffell and Sibley (2003), for example, found that students liked the mix of face-to-face interactions and Internet-based activities. Signor (2003) also noted students' positive response to the availability of online materials, albeit as an adjunct to traditional delivery. Research in the area attributes this largely favourable attitude to the flexibility associated with online availability. This flexibility manifested in several ways. Posting lecture materials allowed students to use their time more effectively and was especially valuable for students balancing study with work and family commitments (Ritter & Lemke 2000; Randolph et al. 2002). In particular, access to lecture materials prior to the lecture allowed students to listen more carefully to lectures and organise their lecture notes more effectively (Bunker & Vardi, 2002; Arnold, 1997). Students also reported that online access allowed them to skim familiar material, freeing them up to concentrate on new, more challenging material (Diers, 2000; Ritter & Lemke, 2000). Diers (2000) also found that Internet posting provided students with an opportunity to reinforce concepts and also prompted them to ask the questions that they may have been self conscious asking in the lecture situation.

While there is evidence that students consider online access to lecture materials favourably, evidence of the impact of the availability of such materials on student outcomes is inconclusive. Stith (2000) found that while most students supported his course Web site, he was unable to make any connection between usage and student assessment performance. Ritter and Lemke (2000) argued that any attempt at correlation was fraught because student outcomes are a product of many factors and it would be difficult to isolate the impact of a particular delivery mode. Similarly, Signor (2003) concluded that extraneous variables made it impossible to draw any firm conclusions from data she had collected over a four year period.

One of the difficulties arises because there can be a considerable gap between what students say and what they do. In other words, while students will invariably welcome additional materials, they do not always use them. Hence, it is important to ascertain the extent to which students access online lecture materials and further, to identify barriers which may restrict their access. In their study of first-year biology enrolments, Peat et al. (2001) compared student expectations regarding their use of online materials and communication tools with their actual use. They found that, by and large, students used their computers less than they anticipated. Moreover, while many students recorded high levels of usage and satisfaction, a significant proportion did not. Students attributed some of this non-engagement to technical problems with both hardware and software. Other research has pointed to difficulties with external Internet connections including long download times and connection dropouts (Stith, 2000; Randolph et al. 2002). Peat et al. (2001) also argued that computer access could present difficulties both on and off campus in terms of availability and reliability. McGovern et al. (2001) suggested that poor past experiences can influence students' willingness to utilise web-

based materials. Therefore, if we want students to engage with these materials, it is crucial to build students' *trust* in the formats (Housego & Freeman, 2000). In sum, the literature argues that the utilisation and effectiveness of web-based learning technologies is very context dependent and varies according to course content, disciplinary context and student needs. Given this background and the specific teaching and learning issues we confronted, it became apparent that a systematic empirical study would be required in order to understand how students used web-based resources in our large introductory classes.

The teaching and learning environment

Given that an awareness of the political environment is essential to contemporary management practice, undergraduate Business and Commerce students at Griffith University are required to complete an introductory politics subject as part of their degree program. 2004PPP Government Business Relations (GBR) provides an introduction to the Australian political system with an emphasis on the policy issues confronting Australian business.

The course is organised according to a standard lecture/tutorial format. This involves a weekly two hour lecture for 13 weeks. The lecture is supported by a weekly one hour small group tutorial. The lecture generally focuses on providing an overview of key issues and debates, while the tutorials are devoted to exploring specific features in more depth. These activities are complemented by a purpose written textbook and additional readings.

In terms of using web-based resources, the course is formally "web supported". In practice, this means we make use of communication tools including the noticeboard facility to alert students to approaching deadlines, schedule variations, staff availability and so on. Higher level web-based resources include a self assessment quiz and an extensive glossary of useful terminology. Most significantly, the teaching team uses the web to post lecture outlines used in the course.

Enrolments in GBR average about 500 students per semester. Because of its status as a core component of the program, the majority of enrolments are business students. The most significant recent shift in our student base has been the dramatic increase in full fee paying overseas students. The majority of these students were from East Asia with significant numbers from Northern Europe, primarily Norway.

Research aims and objectives

The research described in this paper aimed to enhance our understanding of the way in which students accessed and used web-based materials. A particular goal was to establish whether different groups of students used the web materials in different ways. This aim helped inform the research design. The pedagogical rationale driving this research project was the fact (established through rigorous course evaluations and reviews) that the Government-Business Relations student cohort was extremely diverse in terms of their knowledge of Australian politics and society. Given the constraints on teaching resources, our initial hope was to design supplementary web-based resources to enable students to improve their foundational knowledge in relation to Australian politics. However, such a strategy was predicated on the assumption that this student group utilises web-based resources. This is the assumption we sought to test empirically in this research project.

The GBR cohort on the Griffith University's Gold Coast campus constituted the principal data set for the empirical analysis. The Gold Coast cohort offered several advantages. First, it offered the best mix of student types over the study period (Semester 2, 2003). GBR lectures were held in the early evening and students could opt for either day or

evening tutorials. This meant that we had both domestic full-time and domestic part-time enrolments. We also had two different sizeable groups of overseas students and this allowed us to more clearly isolate culturally specific influences. Second, during the semester in question, enrolments at the Gold Coast were at a manageable number (approximately 200). This was an important consideration, given each student had to be tracked individually. Finally, one of the researchers was the Gold Coast course convenor and hence was able to control some of the variables relating to the reliability of web postings.

Research methodology

The project involved collecting and analysing data from two distinct sources. The first phase of the project involved collecting quantitative data on patterns of web usage. Having established these patterns, the second phase of the project involved conducting a select qualitative survey of students in order to explain the patterns of web use observed.

Quantitative data

The quantitative data on web usage was sourced through the Blackboard platform which can be configured to track the number and timing of "hits" students make on specific web-based learning resources. In addition to global information, Blackboard also allowed us to systematically track the way in which individual students accessed web-based lecture outlines over the course of a semester. This approach was adopted in addition to the more common survey approach because it allowed us to detect differences between what students report, and what they do (see Peat et al. 2001). Unfortunately, while Blackboard is capable of generating a massive amount of data, its presentation makes it difficult to synthesise and this necessarily influenced the research design.

This information was used to answer three key questions:

- Did students access web based lecture material?
- which segments of the student population access them?
- When did they access this material?

The analysis focused on access patterns in relation to four specific lecture sets by four identified groups (outlined below). These lecture sets were posted for weeks three, six, 10 and 12. The sample weeks were chosen because they offered a good chronological range and each had particular characteristics. Specifically, we identified week three as a good starting point because it was immediately after the enrolment cut-off date, weeks six and 10 coincided with key assessment dates, and week 12 was the last week of new content. Lectures were held on Mondays and the lecture overheads were posted on the preceding Friday. We captured the data for the seven days from the Friday posting.

To detect differences in the way in which students accessed web-based materials, we identified four groups within the student population to track throughout the study. These were Scandinavian students, Asian students, domestic full-time students and domestic part-time students. Each of target group consisted of 17 students. In all, 68 students were tracked individually. This constituted almost 40% of the Gold Coast enrolment.

Qualitative research

The second phase of the research project involved conducting more detailed qualitative research, which aimed to explain the patterns of web use observed in the initial phase of the project. This involved sending a questionnaire to each of the students identified in the four sample groups. The questionnaire asked respondents to describe the manner in which they used web-based resources in Government-Business Relations, before asking open-ended questions inviting respondents to comment on why they use web-based

resources in the manner in which they did. The results of both data sets are summarised below.

How students accessed web-based resources

Overall, the data showed a relatively high take-up of web-based lecture materials. However, access patterns varied according to the group and week (Figure 1). Generally, access across all groups was high in the early part of the semester. In week three, 82% of students enrolled in the course accessed the lecture overheads. Although still high, access did drop off somewhat by week six (down to 74%). The most significant decline was in week 10 to just over half of the student body (53%). This was the week when a major piece of assessment was due. The figures recovered somewhat once the assessment deadline had passed. In week 12, 60% of students accessed the lecture material on the week.

Most significantly, we also discerned differences in access rates between the student groups. As Figure 1 shows, domestic part-time students were the most consistent users across the sample lectures. More than three-quarters of these students accessed the lecture materials electronically, and while there was some drop-off over the course of the semester, it was not nearly as significant as that experienced by other groups. This finding accords with existing research (Ritter & Lemke 2000; Randolph et al. 2002). It is suggestive of a much more routinised approach to study and also better time management in relation to inter semester assessment. These students maintained their commitment to lectures in the face of the looming deadline. Domestic full-time students displayed the second highest access patterns across the entire period. All but one of the group accessed the material in the first two sample weeks, but their usage fell away significantly in the latter part of the semester, especially in the assessment week. Access by both of these groups was consistently higher than that of the cohort as a whole. Of the two international student groups, a majority of those from Scandinavia accessed the material at the beginning of the semester, but numbers dropped away dramatically as the semester progressed. Access by the Asian student group was always below that of the other groups for each of the weeks. Only 12 of this group accessed the materials in the first two of the sample weeks, and this fell to eight in the assessment week, recovering only slightly in the last sample week. Access by this group was consistently below that of the cohort as a whole.

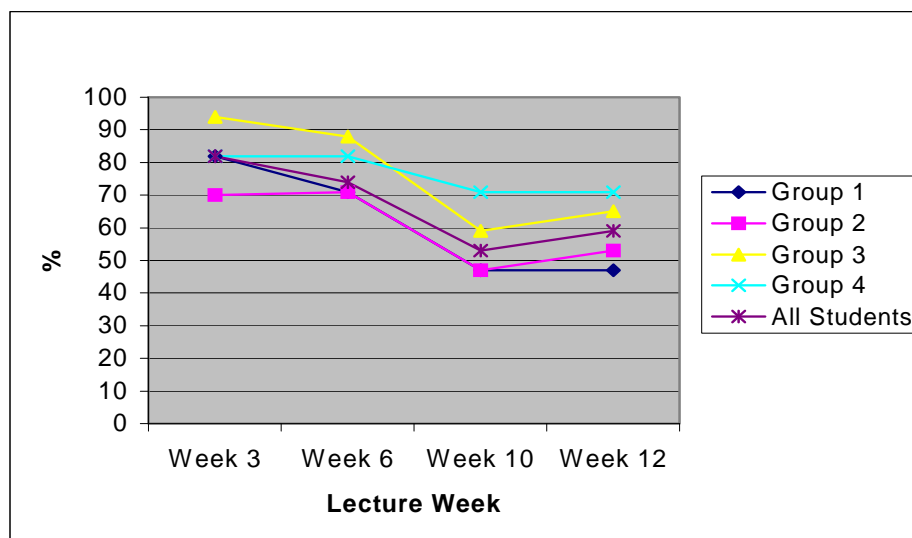


Figure 1: Weekly access by group Non-users

We also analysed the non-users over time and across groups to see if there were any discernible patterns. The figures revealed some interesting results (Table 1). The domestic part-time group had the highest share of users who accessed all four sample weeks; three students only missed one week, and only one student did not access any of the sample weeks during the semester. Domestic full time students also had a high share of users who accessed all four sample weeks and no students who did not access any of the sample weeks during the semester. Scandinavian students and Asian students, in contrast, had the smallest number of regular users and a correspondingly higher number of infrequent users. In the case of the former, only four students accessed every week, another three only missed one week. The latter had five regular users, four who accessed three out of the four weeks, and two who did not use the materials at all.

Table 1. Number of weeks accessed by group

Number of weeks accessed	Scand'n	Asian	Full time	Part time
<i>no weeks</i>	1	2	0	0
1	3	1	1	3
2	6	5	3	0
3	3	4	7	3
4	4	5	6	10

Qualitative data

The qualitative phase of the research project was conducted in late November 2003, immediately after the semester two examination period. A total of 22 students participated in a survey which focused on understanding how students perceived and used webbased resources in general and lecture materials in particular. Although conclusions drawn from the qualitative analysis described above are limited by modest response rates, especially among international students, the data revealed some interesting factors. First, students rated the quality of lecture materials above that of other web-based resources. Second, an overwhelming proportion of students in the sample reported that they accessed the lecture materials every week while only a minority (less than 20%) reported that they attended lectures every week. Moreover, some students reported that the availability of lecture outlines electronically meant that they were less likely to attend lectures. Based on our limited data this was particularly true in the case of Asian group.

The survey also provided some information on the way students used the materials. As Table 2 shows, all of the respondents printed them prior to the lectures and the majority believed that having them on hand enabled them to concentrate more on the material presented by the lecturer, a finding in line with that reported by Bunker and Vardi (2001). However, the data, while limited, did indicate that Asian and domestic part-time students were less likely to use lecture outlines to make extensive additional notes. This suggests that the availability of these resources may encourage a more passive approach to learning.

Table 2. Student use of down loaded lecture materials

Student Group	% print notes prior to lecture	% make extensive additional notes	% believe notes allow them to concentrate more
<i>Scandinavian (1)</i>	100 %	66 %	100 %
<i>Asian (2)</i>	100 %	0 %	100 %
<i>Full time</i>	100 %	50 %	87 %
<i>Part Time</i>	100 %	22 %	100 %
<i>Total</i>	100 %	41 %	96 %

Conclusions

This research project sought to investigate the manner in which students accessed and utilised web-based learning resources in a large undergraduate course taught by the Department of Politics and Public Policy in the Griffith University Business School. As teachers, we felt that such research would shed important light on a range of questions concerning the efficacy of web-based course resources in a large and diverse undergraduate course. More specifically, the project was designed to provide insights into the following questions:

- when they are accessed?
- how many students access them?
- which segments of the student population access them?

Beyond these questions relating to web access the project also employed a limited survey to which sought to provide preliminary insights into how these students used web-based resources.

Given these goal the research project had two distinctive components. Firstly, the data collection functions of Griffith University's Blackboard student interface platform were used to systematically track the way in which sample groups of students accessed web-based lecture outlines across an entire semester. The second phase of the research project was to use follow up questionnaires to help explain the patterns of web use initially identified via student tracking.

The quantitative phase of the research project yielded a number of significant findings. Firstly, in terms of research design and method, the student tracking functions within the Blackboard platform are capable of systematically tracking groups of students across an entire semester. However, it is important to note that this is a labour intensive process that could not be undertaken as part of the normal evaluation of teaching practises. Indeed, the resources required to capture this data were central in our decision to focus on the utilisation of lecture outlines (which students had identified as the most important resource) while limiting the analysis to four weeks of the course.

The data collected revealed a number of significant patterns. First, a majority of students accessed lecture outlines associated with the course, although this number declined as the semester progressed. Significantly, the vast majority accessed the notes prior to the lecture. The data also showed a significant drop-off in engagement when assessment items were due. This suggests that the impact of assessment dates should be taken into account when designing course schedules.

The most important findings of the project related to variations in the way in which different student groups accessed lecture outlines . The quantitative data found that domestic students were much more likely to use web-based resources, with time-poor part-time students being the most consistent users. This evidence suggests that flexible

delivery methods are an important teaching technique for this segment of the student population. Scandinavian students initially made use of the lecture outlines, but their usage declined across the semester more than any other student group. Finally, and of most concern from a teaching and learning perspective, was that students who identified as coming from an Asian background were least likely to access the web resources. Across the sample weeks, only between 50% and 70% of Asian students accessed this web-based teaching resource. Further research is necessary to determine the reasons for this. It may be that these students face access problems; it may be that the textual nature of these resources is not well suited to students with poor English language skills; or it may be attributable to a broader set of cultural issues.

The qualitative phase of the project shed light on many of the aggregate trends captured in the data described above, although the data set was relatively small. Certainly, students surveyed regarded the web-based resources on offer highly, with lecture outlines being the most useful. In terms of the manner in which lecture outlines were used, the majority conformed to our expectations in that they were printed prior to lectures, allowing students to concentrate on the lecturer and make supplementary notes. While the survey data were limited by the fact that there was a relatively poor response from international students, it did seem that Asian students in particular were less likely to make supplementary notes, implying that they tended to be more passive participants in lectures. Further research needs to be undertaken to shed more light on this important issue.

Overall the research project generated some useful results. Methodologically, it demonstrated that Blackboard could be used to systematically analyse the use of web-resources for a large course across an entire semester. It also confirmed some of our thinking about student attitudes to, and usage of, the materials. In general, we found that our resources were regarded as useful and used both frequently and actively, especially by part-time students. Students used them both to complement and substitute for lectures. However, this seems to be less true of students from Asia and this finding highlights the limits of providing web-based supplementary resources to specifically assist struggling ESL students.

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