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# Managing the Online Student Experience: an Ecological Model

**Bill Davey and Arthur Tatnall**

<sup>1</sup>School of Business Information Systems, RMIT University, Australia and <sup>2</sup>Graduate School of Business, Victoria University, Australia

[Bill.Davey@rmit.edu.au](mailto:Bill.Davey@rmit.edu.au), [Arthur.Tatnall@vu.edu.au](mailto:Arthur.Tatnall@vu.edu.au)

**Abstract:** The move towards providing fully online and blended courses for university students is becoming almost universal. To maximize the benefit to students and organisations we need to develop a robust model that allows us to identify the needs of students. We propose that an ecological model, already found to be useful in complex educational settings, can be used to make sense of data gathered regarding the behaviour of online students. Using an example involving three courses at a large Australian University we show this model yields useful pointers to investigating these issues.

**Keywords:** Online university education, blended courses, management of e-learning, ecological model.

## 1 Introduction

When university courses are taken online, or significant support is provided through the Web for blended learning, a difficult complication arises for the educational manager. In an asynchronous online environment feedback usually available through physical contact with students is replaced by parametric information available through the educational server. It is possible to interpret this information in many ways. If improvements are to be made in the content and delivery of online and blended courses then we need to have a model that allows us to measure the effects of changes we make and relate them to intended outcomes.

## 2 Modelling student use of the Internet

The literature contains a wide range of studies based upon models of student behaviour. When these models are studied in detail many of the assumptions we make about the way in which young people interact with the Internet are found to be unsupported by fact. For instance (Spennemann, 2007) looked at the assumption that students are choosing online courses because of the flexibility it gives them in study times. This study found that the overwhelming majority of students studied during normal working hours. Another study by (Kennedy, 2009), look for evidence of a generation gap between students and their teachers. This study found that there was no evidence of a generation gap in terms of using technology, that assumptions about

be preference by students for particular learning technologies were in error and it is critical that pedagogical technical and administrative issues be aligned. So much of our thinking on how to use the Internet to deliver education is based upon these poor models of students that studies often find no advantage to the student in having materials delivered online. For instance studies by found that there are many small numbers of students who felt that the Internet support provided helped them understand material being studied (Anagnostopoulou, 2009) (Franklin & Van Harmelen, 2007). A recent study (Wong and Tatnall 2009) found that the initial improvements in education supported by the Internet drop off quickly or students became less motivated by the novelty of a system that they used. This study hints at the possibility that it is not the materials, the way they are presented, or the technology used to present them, but the interaction between students and their environment that must be modelled if we are to effectively administer the use of the Internet to deliver educational services.

### 3 Ecological models

The world abounds with situations of great complexity. One of these situations that has been studied for a long period of time is the natural environment. The science of Ecology has developed many different ways of investigating nature. Ecology is concerned with interrelationships between different living things, and between living things and their environment (Tatnall and Davey 2004). In addition to dealing with the natural environment however, the principles of Ecology have been used to deal in many other areas to deal with the complexity of those areas (Star and Griessemer 1989; Richards and Sanford 1992; Podolny and Stuart 1995; Nagarajan and Mitchell 1998; Simon 1998; Barnett, Mischke et al. 2000; Grzywacz and Fuqua 2000; Havelka, Koh et al. 2001; Sutcliffe, Chang et al. 2003; Johnston 2006)

These techniques have also been used in education and curriculum development to produce worthwhile results (Tatnall 1997; Tatnall and Davey 2002; Tatnall and Davey 2002; Tatnall and Davey 2002; Tatnall and Davey 2003; Tatnall and Davey 2004; Tatnall and Davey 2005; Tatnall, Singh et al. 2008; Tatnall and Davey 2009)

Ecological models can be simple or complex and can incorporate some or most of the techniques used in ecology and environmental science. Two key biological principles exemplify the concepts of ecology (Townsend, Harper et al. 2000):

- Organisms behave in ways that optimise the balance between their energy expenditure and the satisfaction they obtain.
- Organisms operate within a competitive environment that ensures only the most efficient of them will survive.

A complete ecological model of educational change would consider the **Environment** in which the innovation under consideration was occurring; the **Organisms** (actors) involved; possible **Competition** or **Cooperation** between these organisms; maximisation of return for the **Least Expenditure of Energy**; and the possibility of finding a **Niche Environment** that is free from competition from other organisms (Tatnall and Davey 2004). In this study we have used a simplified model involving just Competition and Cooperation between entities and ecological concept

of greatest return for the organism for the Least Expenditure of Energy, in order to explain the complex datasets.

## **4 The ecology of online courses**

Ecological models require us to identify the Organisms which will interact with each other and the Environment they live in. The process of identifying organisms and environments is similar to that used in actor-network theory to identify actors. We see organisms as being those 'actors' who have the ability to respond to their environment independently. Those organisms that remain constant throughout a significant time, for instance a semester, are identified as being part of the environment. In an online course the principal actors who can respond are students, the resources and tools delivered through the Web, and the academics controlling the delivery of the course. The environment will include the facilities available to the student, including time, the software to be used in the course including the software that forms the University delivery system, and the details defining the course such as assessment and due dates. Our simplified ecological model asks us to look for potential competitive and cooperative behaviours between the organisms.

### **4.1 Least energy expenditure**

A principle often found in ecology is that organisms will behave in a way that maximises the amount of return they get from a small amount of energy expended. This principle will lead us to look for behaviours in the online experience where organisms (probably students or academics) are attempting to get maximum response for minimum energy expenditure. For instance, if there are two alternative methods available for an academic to communicate with students, we would look to find which of these this academic saw as requiring the least effort (energy expenditure). Similarly students might choose a path through the materials to return the greatest assessment results for the minimum effort on their part. Using this part of the model we would first of all look for communication facilities that enable students and teachers to communicate easily and efficiently. We would look for patterns of behaviour among students which improve their educational outcomes because communication was easy. We will also look for ways in which the student was missing out on educational experiences because they are attempting to minimize energy expenditure.

### **4.2 Co-operation**

In ecology we find successful organisms are often those that cooperate with other organisms to derive maximum benefit from their environment. This principle would let us look for behaviours in the online setting where organisms are attempting to cooperate. For instance an academic might find that cooperation with the tools available in the delivery system (even if they are not quite what they want) gave a better outcome than inventing a new tool. Another important aspect of cooperation is

the idea or of coordinating the structure of the course with the tools available on the Internet. Courses that give credit for students using tools seem to be important to the educational experience would be using the idea of cooperation to increase use of those tools.

### 4.3 Competition

In ecology scarce resources can lead to competition between organisms, with the most competitive organisms being successful. This would lead us to look for behaviours where the organisms compete with each other to obtain advantage. For instance a student might wish to communicate privately with the lecturer rather than using a bulletin board where all other students obtain the same information. Competition can be seen in more subtle interactions between the components of the environment. For instance use of Internet tools are require specific browser can lead to competition between those tools in the operating system favoured by the student.

## 5 The cases: Courses at RMIT

All courses at RMIT are supported by the Learning Hub. This is connected to the Student Records System and comes online one week before the commencement of semester. Semesters have twelve teaching weeks and a mid-semester break, before a week of exam preparation (that we call “swat week”) and two weeks of examinations. This is followed by the publication of results. We will now investigate three RMIT courses that we will call: Face-to-Face-1, Face-to-Face-2 and Online Course.

“**Face-to-Face-1**” is a compulsory subject for all business students and has no prerequisites. It has a very large student cohort for each of the three semesters in a year. All teaching materials are provided to the Learning Hub and students are required to communicate with the teaching team either at tutorials or using the discussion board within the Learning Hub. “**Face-to-Face-2**” is an elective course with no prerequisites and is open to all students in the University. In this course all the teaching materials are available both on the Learning Hub and on a network drive available to all students. The teaching team uses the Learning Hub mostly for dissemination of assessment results. “**Online Course**” was changed to a fully online course during 2008. It is an elective course with no prerequisites and is available to all students in the University. In the first of the three semesters studied the Learning Hub was used for all teaching materials and students were encouraged to communicate with the teaching team using individual academic e-mail addresses. Assignments were all uploaded to each student’s individual server account, and assessed by the team from that account. Results were then transferred to the Learning Hub and feedback provided by e-mail.

## 6 Results

It is often assumed that students will take advantage of online resources by studying at different times that suit them. Spennemann (2007) examined server traffic statistics over a number of Australian universities and found that the overwhelming majority of use of University servers took place Monday to Thursday and during office hours, principally before two o'clock in the afternoon. We looked at two aspects of the use of the Internet-based facility available to students in the three courses: firstly days and hours when students accessed educational materials. Table 1 below shows these results.

**Table 1: Percentage of hits during working hours**

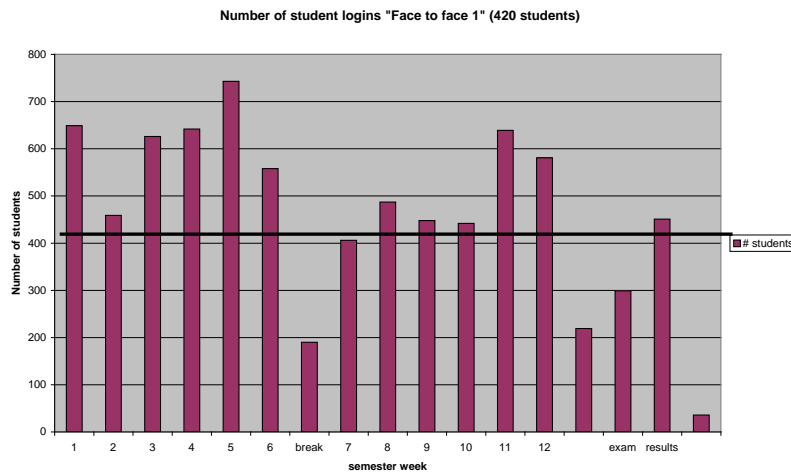
| Hit Times              | Courses        |                |               |
|------------------------|----------------|----------------|---------------|
|                        | Face to Face-1 | Face to Face-2 | Online Course |
| # hits                 | 25481          | 18377          | 3733          |
| % 9-5                  | 57.9%          | 76.19%         | 68.77%        |
| % outside office hours | 42.1%          | 23.8%          | 31.23%        |
| % 11-4                 | 43.82%         | 58.02%         | 55.16%        |
| Mon-Fri                | 84.82%         | 87.61%         | 89%           |

This table confirms the results from Spennemann (2007) and shows that regardless of the principal delivery method students mostly study during office hours. In our case this is surprising in that a significant proportion of the students undertaking these three courses are working full time and are studying part time.

Next we looked at each of the courses to see if there is any pattern in students logging into the Learning Hub. Logins are powerful in that they are direct evidence of student behaviour. They are also a broad measure as we only know that a student's computer is connected to a particular part of the learning hub and not what there are looking at there. We have only counted logins where the student navigated to some page other than the course homepage. These figures have been aggregated to give totals for each week. This means that a total of 600 logins may be one student logging in 600 times, or 600 students logging in once, or any combination of these scenarios. Careful study of the individual figures shows that students log in about three times a week. This means that the bars in the following graphs represent one student for each three logins. Figure 1 shows the pattern of logins for Face-to-Face-1. There were no logins for the week prior to semester when the Learning Hub was available because students generally are given instructions on how the course is delivered only during the first lecture. This chart is vaguely bimodal. There are two major assignments in the course due in week six and twelve. Students encountering a problem with their assignments are required to report that problem on the Learning Hub discussion board so that answers to problems are distributed to all students. This process was put in place mostly to make it possible for the teaching team to provide answers to a very

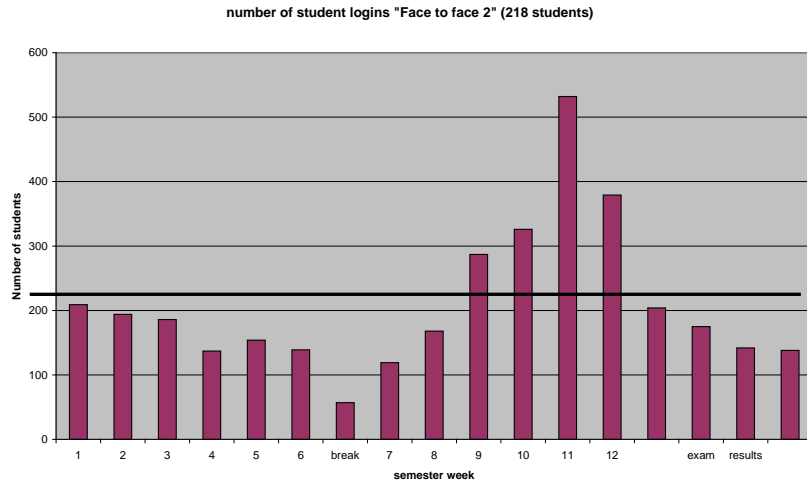
large cohort of students. Inspection of the detailed access in this course shows that 22% of all access was to the discussion board and 61% was to the announcements page (where summaries of answers were kept.) Inspection of access to the discussion board shows zero posting for the board by students for other students. All postings on the discussion board are intended for the lecture in charge of the subject or that lecturer making a reply.

**Figure 1: Large face-to-face subject showing number of students logging in each week**



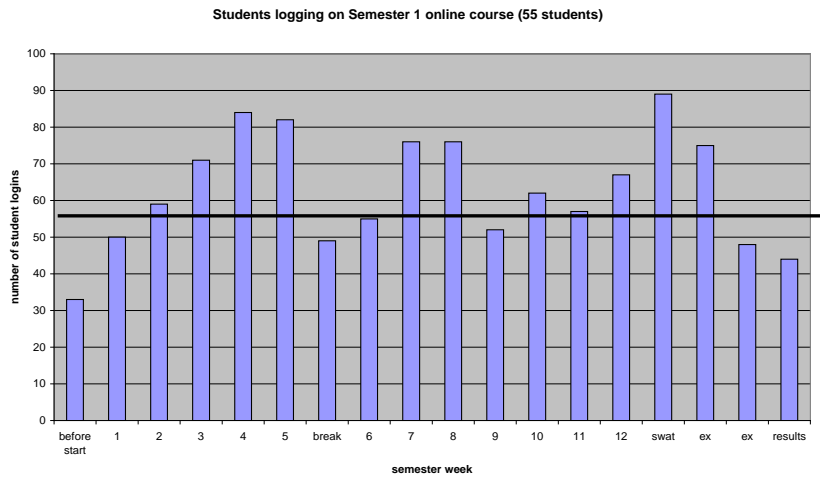
“Face-to-face-2” has assignments every few weeks, with the major assessment during week 12. The chart below should be interpreted in the context of this course making electronic copies of materials available in several forms. In this course 21% of accesses were to the page showing results of assessment, and 53% to the page showing announcements. The announcements page was mostly used to clarify any issues about assessment and the course. In this course, although a discussion board was provided, there were no postings to the discussion whatsoever.

**Figure 2: Face-to-Face-2 subject showing number of students logging in each week**



The third subject in a study was delivered completely online. In this case the figures show three peaks, again coinciding with the assessment task. This course requires all students to communicate directly by e-mail with an e-mail account separate from the learning hub. 80% of all hits on the learning hub were to the pages containing content, either lecture material or tutorials or assessment. Again the discussion board with provided in the subject was not used by the students.

**Figure 3: Students logging on Semester 1**





## 7 Conclusion

The courses presented in this case study cover some of the range that must be administered in the University. There are consistent outcomes across the three diverse courses that would indicate the need for action. Students appear to be only using the Internet materials at the last moment before assessments. They are also ignoring any of the richer facilities available to them that are not directly related to assessment. There is no evidence of student using social interaction within the courses, such as discussion boards and groups, unless they are forced.

The extensive use of office hours access the study materials by students is consistent with our model in that students are using the online subject and materials to avoid personal appearance rather than to gain flexibility. This choice is clearly a way of minimizing energy expenditure.

The evident rush of hits immediately prior to assessment task being due is both an indication of minimizing energy and cooperating with the structure of the course.

What we do about this consistency of student behaviour depends upon whether we see it as being positive or negative. The University was not concerned with students using the Internet facilities during office hours. It does, however, give us insights into the reason for students choosing to use the Internet facilities provided. These reasons have little to do with flexibility of study and more to do with the way in which students prefer to have their materials delivered. The lack of social interaction between students using the discussion boards and the apparent lack of interest in the course except immediately prior to assessment times is concerning.

The model would indicate that we can change student behaviour by looking for opportunities to give students least energy, cooperation with our course and competition with the other aspects of their life that interfere with maximizing the education. If we are concerned mostly with smoothing out student effort throughout the semester then our model suggests we did try some strategies:

- Smaller and more regular assessment spread through the semester.
- Use of push technologies with time release material.
- Covert monitoring of student interactions.

The ecological model was found to be useful in both predicting student behaviour and suggesting strategies for improving the outcomes of Internet delivered materials.

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