A CONSTRUCTIVIST APPROACH TO ONLINE LEARNING:

Encouraging Pedagogical Re-engineering

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Statement of Authentication

I hereby declare that the work herein, now submitted as a thesis for the degree of Doctor of Teaching of the Northern Territory University, is the result of my own investigations, and all references to ideas and work of other researchers have been specifically acknowledged. I herby certify that the work embodied in this thesis has not already been accepted in substance for any degree, and is not being currently submitted in candidature for any other degree.

Signed _____

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To God be the Glory.

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Abstract

Teaching online is becoming more pervasive in higher education. This move towards online teaching gives staff an opportunity to reflect on the ways they currently teach and perhaps adopt improved techniques or 'pedagogical re-engineering'. However, without appropriate staff development there is a danger that educationally ineffective or inadequate patterns of teaching may become habits embedded in online teaching practice.

Staff development is critical for both improving pedagogical practice and ensuring the successful adoption of technology in teaching. Given limited resources and time restrictions on staff it can be difficult to provide 'traditional' staff development activities. In order to reach more staff, particularly those who would not or could not make time for traditional workshops, a voluntary, web-based staff development module 'Introduction to Online Teaching' was developed following a constructivist perspective. The module and the sample modifications resulting from the research form the practical thesis. The study examines the degree of use, pattern of use and impact of this module. Using a case study approach, data was gathered using log files, Stages of Concern Questionnaire, Level of Use survey, interviews and transcripts of email and discussion groups.

The degree of use and patterns of use of the site varied depending on participant role, staff type, staff level and concerns profile. Usage patterns clearly exhibited the phenomenon of churn. That is, many users viewed the site very briefly and did not subsequently return. There was a correlation between the concerns of the developer and those of the high-level users. Lack of time was cited as the major barrier to use. Lack of time is also a factor involved in limiting development.

The study concludes with a case for an expanded multi-theoretical and multi-disciplinary approach, suggestions for improvements and a modified model for developing online staff development.

Chapter 1 Introduction

1.1 Background to the study

1.1.1 Mainstreaming of online teaching - the PlatformWeb project

Teaching online is becoming more pervasive in higher education. Some teachers are experimenting with online techniques simply as a supplement to more traditional methods. For others it is integral to their teaching, while a few conduct whole courses entirely online. An increasing number of commercial teaching delivery packages, such as WebCT, BlackBoard and Lotus Notes, are available to assist teachers moving to the online environment. In addition, educational institutions are also starting to make use of the web as a convenient medium for conducting various administrative tasks such as enrolment and tutorial registration. Traditionally, the areas of educational delivery and university administration have been treated as mutually exclusive, 'with separate staff, buildings and computer information systems' (Hansen & Salter, 2001, p282). However, this situation is changing with a blurring between teaching, support and administration.

The 'PlatformWeb' project at the University of Western Sydney (UWS) began in 1998 on the premise that the web can allow a seamless integration of both an institution's teaching and administration functions. The aim of the project is to provide an integrated environment that supports the mass movement of staff in the use of the web for effective online teaching. To date, the project's success in mainstreaming online teaching is in part reflected by the number of subjects registered with PlatformWeb growing from 50 in semester one, 1999 to 471 in semester one, 2001.

A move to online teaching gives staff an opportunity to reflect on the ways they currently teach and perhaps adopt improved techniques. However, there is a danger that traditional forms of staff development may not be able to keep pace with the rate

of change. Educationally ineffective or inadequate patterns of teaching may become habits embedded in online teaching practice (Fowler & Dickie, 1997).

> 'Internet technology is at risk of being misused. If its glitz, popularity and apparent ease of use are allowed to pre-empt careful planning, or if teachers and students do not receive proper training in its use, its integration as an information and learning resource, as well as a communication tool will likely be subverted' (Carr Jr, 1999)

In my role as staff development coordinator for the PlatformWeb project, I presented over 25 well-attended workshops aimed at helping staff use the system as well as introducing them to some of the issues involved with teaching online. However, the secondment to the project was fractional and for a limited 12-month period. It was difficult to keep up with the demand for places at the workshops and impossible to continue them after the secondment. In addition, an increasing amount of time was spent answering phone and email queries from staff who were using PlatformWeb without previously attending any workshops. These problems led to the question - was there a way to reach more staff, particularly those who would not or could not make time for traditional workshops? This initiated a search of the literature to examine if the Web itself would be appropriate to teach about teaching on the Web. The result was the development of a web-based staff development module, 'Introduction to Online Teaching', which forms the practical thesis associated with this study.

1.2 Significance of the Study

1.2.1 Investments in the use of technology in teaching

Most universities are making, or at least considering making, substantial investments in the use of technology in teaching. For example, the cost of the licence for TopClass, a teaching delivery package, at UTS in 1999 was US$40,000 (Sawers & Alexander, 1998). This does not include the substantial costs of hardware, infrastructure, support, resource and professional development. To give some idea of this cost, the Information Technology Alignment Project adopted at RMIT, which covers infrastructure, Distributed Learning System, integrated Student Management System and staff development is being funded at $50 million (McNaught, Kenny, Kennedy, & Lord,

1999). Even this fairly realistic figure does not include many hidden costs, such as the time spent by staff in training and getting familiar with the new 'Learning System'.

It has been estimated that in the 15 years leading up to 1994, US$20 billion was spent in the United States on the support of computer-related teaching and learning in higher education (Spotts, 1999). This money has not always been well spent. Bondaryk (1998) warns that many recent projects in this area, funded at an average cost of US$100,000-US$1 million, have never been 'used outside of the university at which they were conceived and sometimes not even within that'. After spending millions of dollars and developing hundreds of online courses the launch of the much-publicised Western Governors' Virtual University attracted only 10 students and 75 inquiries (Noble, 1998).

On the other hand, the potential gains are also significant. One source suggests that the e-learning market will grow from US$4 billion to US$15 billion worldwide between 1998 and 2002 (Cooper, 2001). Dyrli (2000) gives a more optimistic estimate of hundreds of billions of dollars. Whatever the true figure, a focus on financial gain alone is risky.

> 'just because income beckons and innovation is technically possible doesn't mean that new methods will be accepted enthusiastically, will be adopted quickly, or will be implemented well' (Farrington & Yoshida, 2000, p14)

Despite institutions making significant investments, the adoption rate by teachers is often surprisingly low. For example, a study into a staff development program at Western Michigan University focusing on the use of the Web in teaching found that after 2 years only 13 out of 49 who attended had put Web pages up (Rups, 1999). This is despite the fact that the program involved a weeklong intensive commitment. Typically, usage rates tend to plateau when most of the innovators and early-adopters, those keen to implement innovations, have been brought on board. Many find themselves 'grappling with a question common these days to those in faculty support roles - how to reach beyond the early adopters?' (Donovan & Macklin, 1999).

Even when an innovation has been adopted widely it does not guarantee that it will be used well. A classic example is the classroom film, which was (and may still be) often used in schools as a 'Friday afternoon filler' rather than as a planned learning experience (Carr Jr, 1999).

To make responsible decisions, educational administrators 'must distinguish which of the educational innovations of today are pure hype and which point to common future practice' (Freeman & Capper, 1999). To achieve this, more research needs to be done to determine if the large investments in educational technology are worthwhile and lead to significant enhancements in teaching and learning. There is also a need to ensure that the effectiveness of the existing technology is maximized so that the 'multibillion dollar investment in computers and technology is not wasted' (Jackson, 1999, p28). One of the critical factors in this process is staff development.

1.2.2 The need for staff development in online teaching

With the mainstreaming of online learning, an increasing number of academics will be expected to take on the role of online teacher, but most have little or no formal education in this area (Naidu, 1997). Without systematic, high priority professional development, some teachers may 'make the necessary transition, more or less effectively, on their own, but many will not. Neither should they be expected to do so' (Fowler & Dickie, 1997, p29).

Most staff require training before moving to online teaching. Simply becoming familiar with the available tools may take some time (Freeman, 1997). The teacher needs a higher degree of skill and level of comfort using the system than is required by the students. The teacher will be the first person students turn to for help in using online systems. They expect the teacher to know as much about online tools as they know about the tools of the ordinary classroom (Harasim, Hiltz, Teles, & Turoff, 1998). After ramping up the learning curve, the teacher needs to develop material and design the online experience (Schoenfeld-Tacher & Persichitte, 2000).

However, initial training alone is not sufficient as most staff need on-going support (Marjanovic, 1999). Many innovations have failed to reach wide acceptance because adequate post adoption support was not provided (Hansen, Deshpande, & Murugesan, 1999; Surry & Farquhar, 1997). Apart from the innovators and early-adopters, many academics are understandably reluctant to move to technologically-based teaching innovations which they perceive as complex, untried and lacking in support (Sawers & Alexander, 1998). It is important to note that even just the perception that the technology is difficult to learn or use can result in it not being adopted. Once this happens, it can be difficult for top-down or administrative incentives to reverse the negative trend (Carr Jr, 1999).

Even though staff development is widely recognised as being crucial in the successful introduction of technological innovations in teaching, this is rarely reflected in budgets. This falsely suggests that given the appropriate hardware and software, academics will quickly and easily change their teaching methods and course materials to take advantage of it.

After previous failed, often expensive, attempts to use technology in education some actively scorn new attempts to use technology at all (McKenzie, 1999a). Those who think they can easily transfer successful face-to-face teaching strategies and materials to an online environment may find disappointment and be similarly antagonistic in the future.

We cannot assume that traditional teaching skills will necessarily transfer successfully or easily to online environments (Chester & Gwynne, 1998; Naidu, 1997). Indeed, many authors comment on the need for new teaching skills (Boddy, 1997; Collis, 1998; Naidu, 1997; Mann, 1999; McNaught et al., 1999). For example, teachers need to foster learning interactions, moderate discussions and design and implement online group learning experiences (Harasim et al., 1998). Unfortunately, most teachers have little or no experience of online education either as learners or as teachers (Bennett, Priest, & Macpherson, 1999). This could be a significant problem given that teachers have a tendency to teach in the ways they themselves were taught

(Dooley, 1999) or at least fall back on familiar pedagogical practices when dealing with new technologies (Pettit, 1998; Porter & Foster, 1998).

1.2.3 The need for pedagogical re-engineering

Arguably the greatest benefit brought by the push for online education is the reviewing of pedagogical practices, sometimes referred to as pedagogical re-engineering (Collis, 1998). Teachers who would not normally reflect on their teaching to any real extent are now seriously considering the ways in which they teach. Such reflection is likely to permeate into other areas and lift the overall quality of teaching, not just teaching online. Teachers are 'being challenged to think of powerful, non-conventional ways to construct learning environments' (Porter & Foster, 1998, p69). The extent of this will, of course, vary from individual to individual. Some teachers are 'already making deep changes in their instructional beliefs and course objectives, while others are less imaginative' (Collis, 1998, pp 390-391).

Most of the studies related to pedagogical re-engineering involve small numbers of staff, usually with teachers who would be considered as innovators or early-adopters. With the move to mainstream online teaching at UWS it is not clear to what extent reflection on teaching practices is occurring. Correspondence from staff wishing to use PlatformWeb suggests that most simply want to use the environment to electronically post lecture notes. This has been observed at other universities. Many of the online subjects currently promoted as 'flexible' often do little more than place lecture notes on the web (McNaught et al., 1999).

> 'there remain few true attempts to see the Web as a means of breaking out of the traditional paradigm of professor-centered university instruction. If we do not take advantage of the opportunity provided by Web technologies to re-examine university teaching and learning then the Web will simply remain and be more universally perceived as just a nice way to publish teaching notes and make them available to students inexpensively – a modern-age photocopy machine of sorts' (Duchastel, 1997, p222)

The prevailing philosophy at UWS has been to get staff using the system and to consider pedagogical issues later. This also seems to be a common occurrence. In

relation to online teaching, the majority of topics on offer to staff at Australian universities relate to the mechanics, rather than the pedagogy, of online teaching (Ellis, O'Reilly, & Debreceny, 1998). For example, staff development programs frequently list workshops on assorted software programs such as 'Introduction to FrontPage 98' or techniques such as 'Designing Web Pages'. While this has been a popular strategy over the last 20 years most reports 'indicate that the majority of teachers have still not integrated new technologies into their classrooms' (McKenzie, 1999c). This is not surprising given that even relatively computer literate academics find difficulty in producing HTML (HyperText Markup Language) and saving it to a web server (Slay, 1999) and that 'most faculty members simply do not have the expertise, time, or inclination to use HTML' (Dyrli, 2000, p23).

While teachers clearly cannot make effective use of the technology until they gain technical competence, it may be a mistake to leave the educational issues to a second stage (Grant, 1996). This can falsely signal that they are of lower priority. More importantly, teachers will often use the technology immediately after they have attained a degree of competence. If this is done without adequate consideration of the educational issues, it may lead to the perpetuation of inappropriate teaching styles in the online environment. Pedagogical issues need to be 'brought up-front as a professional development priority from the beginning and, in the initial stages, developed in teachers concurrently with the development of technical competence' (Fowler & Dickie, 1997, p36). The central goal of staff development related to educational technology should be for teachers to be able to integrate the technology into their ongoing practice and use it in meaningful ways (Dooley, Metcalf, & Martinez, 1999; Goral, 2001a; Grant, 1996)

1.2.4 The need for new models of staff development

Traditional staff development activities in higher education are an essential element in any systematic professional development program. However, there are problems associated with these types of activities. For example, the often-used practice of an 'education developer' sitting down one-to-one, is only suitable for small numbers of staff and depends on the availability of a skilled specialist (Grant, 1996). This

methodology also suffers from the amount of time and resources needed in educational environments with limited, and often, diminishing resources (Slay, 1999).

Activities that can deal with larger numbers, such as workshops, but require 'synchronous' attendance for a period of time also have limitations. For example, they tend to attract the same participants (Zuber-Skerritt, 1992). When an event is voluntary, attendance usually reflects a willingness to improve one's own practice. Because of this, many who attend are already good teachers and not necessarily the most in need of such development. This does not mean that those who fail to attend are not good teachers. There are many barriers to attendance – the most commonly cited usually that of time pressure.

Activities that are scheduled require that the staff member is available at that particular time and for that amount of time. Staff are often reluctant to give up large amounts of time, particularly if they have concerns over the relevance of an activity (Cook, 1997). It is difficult to design a one-off activity that is relevant to all, given the wide diversity of needs and levels of competence that participants bring. Many staff have experienced giving up a day only to find that few of their needs were met. Negative experiences like this make it more difficult to attract participants in the future.

When staff do make the effort it is often to a single event rather than being a part of a coordinated staff development plan. While short-term training sessions have value in imparting certain skills, they are frequently used beyond their effective domains and in some institutions become the dominant method of staff development (Grant, 1996). The ability of such short term training to promote lasting change is often questioned (Fowler & Dickie, 1997; Hall & Hord, 1987; Loucks-Horsley, Hewson, Love, & Stiles, 1998). Rather than 'inoculating' teachers with one-shot injections of information, many suggest that effective professional development should be a systematic and continuing process (Apple K-12 Education, 2000; Butler, 1992; Goral, 2001a; Grant, 1996).

1.3 Potential benefits of online staff development

> 'Learning takes place in our minds, not in classrooms, and our minds can perform this work in many different locations…whether it be alongside a stream, in a museum, or online' (McKenzie, 1998)

Providing staff development online may be able to overcome some of the problems noted previously. There are a range of potential benefits developing online staff development activities.

Self-paced

In face-to-face activities students inevitably progress at different rates (McKinnon & Nolan, 1989). Even if a large percentage of the class is already familiar with part of the material, the teacher must still go through all of it for those who aren't (LGuide, 1999b). Online environments can allow students to select and spend more time on material they find relevant. Adult learners tend to find this highly motivating (North, Strain, & Abott, 2000).

Reduced travel

Learning can take place in more convenient locations, such as the office or home. A Gallup survey of 1012 workers in the United States found that 'workers strongly preferred informal on-the-job training and self-paced training to formal classroom training' (Horton, 2000, p7). The Center for Teaching, Learning, and Technology at the University of Washington found that it was primarily early adopters who physically went to the centre. Pragmatic staff, 'while interested in using technology, were not interested in straying too far from their office to learn' (Donovan & Macklin, 1999).

Travel can account for up to 40% of costs in corporate training (Horton, 2000). This figure is likely to be less for academic staff development. However, given the multi-campus nature of many institutions this could still be a significant cost as well as inconvenience. One group of teachers noted their appreciation at not being required to travel to the training centre – particularly in winter! (North et al., 2000).

Just-in-time and just-enough learning

Online resources can be covered in a just-in-time fashion targeting the exact need. A major attraction for staff is that they can engage at a time that suits them and doesn't interrupt other important work (LGuide, 1999a; North et al., 2000). Barring technical mishaps, such as server 'crashes' and network outages, web-based resources are available 24 hours a day, 7 days a week. Rather than having to work through material that may or may not be relevant in order to get to the reason for being involved in the learning activity, online learning can be provided in small, 'bite size' modules, which can be selected as needed (McKenzie, 1998). This can also have the effect of lowering opportunity costs as staff do not need to spend as long away from the job (Horton, 2000).

Systematic

While information may be 'chunked' into smaller modules, these modules can be developed to connect and interlock to form 'a comprehensive and coherent whole' (McKenzie, 1998). However, other factors, such as certification or need, are probably more important determinants of how much material a staff member will cover. Nevertheless, online discussion areas provide a means for on-going interaction with the learning materials and, more importantly, other people.

Collaboration

Given teaching, research, committee and other commitments 'the seemingly simple task of getting people together can be logistically difficult' (Cifuentes, Beller, & Portela, 1999, p81). Using technology, there is the potential for greater collaboration than more traditional situations, which can be limited by the difficulty of arranging face-to-face meetings (Harasim et al., 1998). This collaboration is not restricted by classroom or even national boundaries.

It can also lead to more rather than less interaction with the teacher. After completing an online course at the University of Dallas, one student reported, 'Believe it or not, I

actually felt that my asynchronous instructor was easier to approach with questions than my classroom teacher' (Kroder, Suess, & Sachs, 1998, p68).

Reflection

Staff can re-visit the material as often as they want or need (North et al., 2000). Participants in asynchronous, online discussions can reflect on what is being discussed, organise their own thinking within this context and spend considerable time devising thoughtful responses (Althaus, 1997; Klemm, 1998; Witmer, 1998). This usually results in a contribution that is much better than would be said off the top of the head in a face-to-face class (Harasim et al., 1998). Because the typical online discussion is always open it can go into much greater detail (Harasim et al., 1998). Participants from a non-English speaking background or slow learners are put on a more equal footing as they can read items as many times as they wish, consult dictionaries and take as long as they need to draft responses (Harasim et al., 1998). The fact that there is a permanent record of the discussion tends to promote the likelihood of critical reflection. Answers tend to be more well thought out and better articulated when typed rather than spoken (Klemm, 1998; Shneiderman, Borkowski, Alavi, & Norman, 1998) and the intellectual effort required can aid comprehension and retention (Harasim et al., 1998).

Privacy

While time and location are probably the greatest barriers for staff to attend face-to-face staff development activities (Grant, 1996), some reluctance may also be due to the fear of professional embarrassment.

> 'Many teachers want to stumble privately. They don't want to appear foolish or incompetent in front of their peers' (McKenzie, 1998)

As well as not wanting to demonstrate ignorance or slowness in learning, some content areas and techniques, such as role-play, create discomfort and are often avoided. For example, dealing with training in sexual harassment online means that 'no one has to go to the front of the room and play-act being a harasser, and no one is sniggering in the back of the class' (LGuide, 1999a).

Some staff are also more likely to talk honestly online. It is an interesting paradox that some people open up more to a stranger on the other side of the world via the Internet than they do with a colleague down the hall (McKenzie, 1998).

Modelling

In order to incorporate online skills into their own teaching, academics are likely to benefit by actively experiencing them as a learner (Wills, Nouwens, Dixon, & Lefoe, 1997). Teachers who have positive experiences with technology and have adequate support are more likely to integrate technology into their own teaching (Freeman, 1997). It also gives teachers some idea of how their students might fare in such environments (Creanor & LittleJohn, 2000; Lasseter & Flanagan, 1998). The frustrations that the potential online teacher may encounter due to technical problems, for example, can be a valuable learning experience (Bennett et al., 1999).

Online staff development can model the new teaching strategies and skills required, particularly for those with little experience in online teaching environments.

> 'one of the things I was skeptical about as a prospective teacher of an online course was that there is no model to learn to teach online' (a teacher's comment in Mather, 2000b, p21)

Lower need for facilities and supplies

As the learning can be done from any suitable place, such as an office, there is no extra strain on, what are often already stretched, facilities. For example, Kent State University was able to increase student enrolment by 30% without the need for any extra buildings (Horton, 2000). Other expenses, such as printing costs, may also be reduced (or at least transferred).

Ability to reach large numbers of staff

The aim of the PlatformWeb project is to encourage the 'mass-migration' of academic staff to online teaching. An evaluation of a similar project at the University

of South Australia, UniSAnet, found that older models of professional development, which allowed for one-to-one professional support, were not feasible (Slay, 1999). Other institutions, such as the Open University, are graduating 'from pilots and trials to large scale take-up' (Mason & Bacsich, 1998, p249). Technology gives the potential to significantly 'scale-up' the number of staff who can participate (Loucks-Horsley et al., 1998).

1.4 The need for research

There are many untested assumptions in the previous section. For example, do staff really prefer just-in-time learning from their office? For people who spend a large part of their day at a computer keyboard, 'classroom training might sound much more appealing than another three hours spent clicking from one bland slide to the next' (LGuide, 1999b). The convenience of online learning may be easily negated by technical problems, which can generate 'extremely strong feelings of frustration and anger' (North et al., 2000, p32).

In addition, the potential benefits listed are neither automatic or exclusive. Many of these are shared with various forms of traditional staff development. For example, action learning is highly collaborative. On the other hand, online teaching has the 'potential to be just as inflexible and inappropriate as any other form of poor instruction' (Bennett et al., 1999, p208). There is no guarantee that tools, which have the potential to enhance learning, such as computer-conferencing, will be used effectively. As the field of online teaching is relatively new, what constitutes 'effective' use needs further research. It is recognised that best practise will only develop over time (Morris, Mitchell, & Bell, 1999).

> 'Because we do not know which aspects of current educational innovation will be heretical and which will be proved right in the light of research, we need to continue testing a wide variety of methods and technologies in different contexts' (Freeman & Capper, 1999)

As well as the recent emergence of the Web, Clarke (2000) gives the following reasons for research into the field of e-commerce, which apply equally well to e-learning –

- the rapid change of technology and methodologies
- substantial variation of behaviour in apparently similar contexts and
- the distortion of terminology and data due to the high levels of interest from the populist media and marketing interests.

The rapid change associated with technology not only affects adoption by teachers who have to try to keep up with constantly new innovations (Slough, 1999), but it may limit research because in some cases, 'publication is impossible before the results are outdated' (Clarke, 2000). Ellis & Phelps (1999) note that while the literature on online teaching and learning is emerging at a rapid rate, it is likely to remain one step behind.

There is criticism of some of the research that has been published. Hara & Kling (1999) state that research on the use of the Web in education 'lacks disciplined scholarly articles' and that studies are 'more anecdotal than systematically empirical or critical'. Another group complains about the lack, and quality of, quantitative studies in the related field of hypermedia. They report on a study that analysed over 400 studies of hypermedia, which found that 'only 30 actually examined quantitative effects of hypermedia usage on learning outcome' (Lu, Zhu, & Stokes, 2000, p199) and that these suffered from a number of methodological flaws. Reeves (1993) also criticises the methodology of quantitative studies in another related field, computer-based learning, referring to much of it as 'pseudoscience'. However, in contrast to Lu and her colleagues, he sees a need for qualitative, in-depth studies related to meaningful learning theory that may be susceptible to quantitative inquiry at a later time (Reeves, 1993).

The author's literature search concurs with Hara & Kling (1999) who found that 'the vast majority of published work is description of technology implementation in classrooms or reflection of what has been done in distance education'. What is needed, no matter what type of research paradigm is applied, is research that is both well-conceived and rigorous (Reeves, 1993).

The need for such rigorous research is pressing, as there is an element of large-scale experimentation with our current education system. Many Web-based educational trials are taking place on the assumption that the claimed benefits of online education are real. However, many of these claims are yet to be tested. As Kleiner (2001) puts it 'students run the risk of being guinea pigs'.

Another reason for more research is a phenomenon that Horton (2000) terms 'the horseless carriage syndrome'. That is, whenever a new technology is introduced people tend to use it exactly the same way as the previous technology for a decade or more. Horton gives a number of examples –

- For over 10 years, buggy-whip holders were standard on the first cars or horseless carriages as they were then called.
- The first few hundred movie pictures were films of stage plays shot from a fixed position in the fourth row.
- Early television newsreaders acted no differently to radio reporters reading from scripts without looking to camera.

Moves towards the 'virtual university' show a similar nostalgic link to previous technology. For example, Harasim, Hiltz et al. suggest that 'metaphors of campus, a school house, the classroom, or a community can provide a familiar concept or link to help new users become comfortable with the online space (Harasim et al., 1998, p140). Similarly, Warren & Rada say we should duplicate 'the conditions that encourage productive interchanges such as occur when people regularly, over time, meet physically and converse in a classroom or at a conference table' (Warren & Rada, 1998, p71). These suggestions may very well be valid, but they cannot be

assumed or we risk limiting the potential of the new tools by trying to get them to fit an existing paradigm.

In addition, there is a need to link what has been learned about staff development and online teaching 'and use these understandings to bring about rich and effective models of professional growth and support for all teachers' (Grant, 1996). There is also a need to relate educational theories and adoption theories as 'most instructional technologists do not understand why their products are, or are not, adopted' (Surry & Farquhar, 1997). In particular, by examining user profiles, with respect to usage patterns and attitudes, 'it could be possible to develop plans of action that can encourage the non-users to become more active users' (Mitra, Hazen, LaFrance, & Rogan, 1999).

1.5 Research Questions

1.5.1 Operational definitions and theoretical framework

Definitional problems are one area in which previous research has been criticised (Reeves, 1993). As noted previously, the involvement of media and marketing hype has lead to a distortion of terminology in this area (Clarke, 2000). Thus, it is important to give precise operational definitions. The term 'staff development' is one that has an imprecise definition.

> 'staff development comes in many forms. It can take place in the workplace or in some other environment, it can be required or voluntary, it can be offered by an organization or sought independently by an individual. Two-hour lectures, three-day conferences and year-long courses can all be considered staff development.' (Butler, 1992)

For the purpose of this study, the staff development module consists of a web site developed -

- on the topic 'Introduction to Online Teaching'
- following a constructivist approach
- to be used on a strictly voluntary basis.

The voluntary aspect of the site was chosen to reflect a methodology consistent with the aim of assisting the mass migration of staff to online teaching.

A constructivist approach to learning and a concerns-based approach to technology adoption form the theoretical framework for this research. The definitions, rationale and discussion of these choices are given in Chapter Two.

1.5.2 Primary Research Questions

As there are very few examples of research analysing the use of this type of site, the primary questions are - Will it be used? How is it used? Does it make a difference?

Put more formally -

> **What is the degree of use, pattern of use and impact of a voluntary, online staff development module, aimed at improving online teaching, developed following constructivist principles?**

1.5.3 Related Research Questions

In line with a concerns-based view of technology adoption -

> **Do user concerns or current levels of online teaching influence the degree of use, pattern of use and impact of the module?**

While this study focuses on a particular case, the aim is not just to evaluate the product, but also to add to the body of theoretical knowledge and inform future developments. Important questions in this respect include -

> **Are the findings consistent with current theories or do they point to possible modifications or new understandings?**
>
> **What factors or strategies might lead to increased participation and effectiveness of online staff development?**

1.6 Overview of Chapters

This chapter has presented an overview of the background and significance of the study. The research questions have also been defined. Chapter Two presents a review of the literature pertinent to the current study. The themes include the degree and effectiveness of online professional development as well as an examination of the factors affecting its adoption. Chapter Three presents a case for the research paradigm chosen and describes the methodology followed in order to answer the research questions. Chapter Four presents the results of the research and discusses the themes found from the data. Chapter Five examines the implications the results have for both theory and practice, including a case for an expanded multi-theoretical and multi-disciplinary approach as well as a modified model for the development of online staff development.

Chapter 2 Literature Review

2.1 Online staff development

Providing staff development online is not new. Many programs are already available and their number is growing (Jackson, 1999). An examination of published directories of staff development available online in education point to this trend.

Table 2-1 Increase in listings of online staff development

Year	Number reported	Reference
1999	16	Online Professional Development (Huntley & Mather, 1999)
2000	32	A Directory of Online Professional Development Options (Mather, 2000a)
2001	38	Teaching Old Dogs New Tricks (Goral, 2001b)

While we often think of school-based and undergraduate courses in relation to distance education, 'the majority of all distance education courses today involve adults. And a growing number of these adults are educators involved in online workshops, degree programs and idea exchanges that supplement or take the place of the sorts of professional development traditionally conducted' (Mather, 2000b, p18).

Online staff development is not restricted to education. In the corporate world, online adult education, while still a relatively small component of the entire adult education market, is growing rapidly (Massey, 1999). International Data Corporation reports that the growth in Web-based training is currently greater than one hundred percent per year (Horton, 2000). In 1998, the market was worth around US$550 million (Massey, 1999). Estimates for 2002 put this figure close to US$10 billion (Horton, 2000; Massey, 1999). The major focus of online training has been in the development of skills in IT, particularly the use of standard desktop applications (Massey, 1999; Pastore, 2001). This is not surprising given that IT training vendors

have been at the forefront of the development of online training and that IT training tends to be ubiquitous. However, there is now a shift towards non-IT content from twenty-eight percent of the market in 2000 to an estimated fifty-four percent by 2004 (Pastore, 2001).

Although IT training comprises a large part of online training, a survey in 1998 found that online training accounted for less than five percent of courses available and concluded that 'IT training is still predominately offered in classroom-based, instructor-led environments' (Massey, 1999). In a separate survey of two hundred managers, all of them said that they would use online training for their work force (Massey, 1999). However, actual use does not necessarily match intentions. While ninety-two percent of large organisations in the United States planned to implement some form of online training, only forty-one percent had actually done so by 1999 (Horton, 2000).

A similar picture can be seen in higher education. There is interest in online education, but there is still much work to be done in implementation. In a survey of over fifteen hundred academics at the University of Washington eighty-four percent responded that 'the Web was very important for their work', but only thirty-one percent reported that they had put anything more than a simple syllabus on the Web (Donovan & Macklin, 1999).

Although there is increasing interest in online teaching, traditional teaching continues to be used far more widely (Boddy, 1997). This is also the case for staff development efforts. A survey sent to the Staff Development Units (or equivalents) in Australian universities found that most staff development activities, even in the use of online teaching, are still taught by traditional means such as classroom presentations, demonstrations and half-day tutorials (Ellis et al., 1998).

At this stage many online staff development programs are in development or are prototypes being revised based on small-scale user-testing. Reports are often descriptive and often include reference to results of evaluations without giving details of the methodology used. For example, a report from the Academic

Innovation Unit of the University System of Georgia gives recommendations on how to effectively engage adult learners online, but the research evidence is limited to one line which states 'feedback and evaluation about the programs indicate a high level of satisfaction among the participants' (Lasseter & Flanagan, 1998). This is not a criticism of their report, but indicates the relative immaturity of the field. There are few rigorous research reports into the use of online staff development systems.

A team from the Division of Distance and Continuing Education at Central Queensland University did conduct a formal study into the use of an online staff development model (Bennett et al., 1999). This was the most comparable report to the present study in that all of the staff development was provided online using volunteers. Rather than focus on online teaching, they chose the Irish Potato Famine as the topic to study. This was done deliberately so that few, if any, staff would have in-depth knowledge of the topic allowing them to start at the same level. Data collection consisted of an evaluation survey, feedback provided to tutors during the course and a follow-up survey one year after the course.

The positive outcomes reported included –

- Overall response by participants was overwhelmingly positive
- Participants gained greater familiarity with the Web
- Generated ideas for their own use of the Internet as a teaching resource
- Promoted discussions with other colleagues about online teaching and learning
- Most participants in the follow-up indicated that they had been involved in some form of online teaching during the year
- Course designers and tutors gained valuable experience

The negative outcomes included –

- Frustrations experienced with trying to connect via a modem
- Searching for information from the Web for assignments was found to be time consuming and frustrating
- Use of multimedia components was quite low

However, these negative outcomes also had the positive side effect of alerting staff to the problems their students may face. One participant noted that it was useful to learn 'what it is like to be a student suffering through an online course' (Bennett et al., 1999, p214).

Other research studies involving online staff development varied from the present study in that they include, sometimes significant, face-to-face contact. While it is useful to review such studies, it is difficult to compare to this study given that the models and formats followed vary widely. For example, a group from Southern Cross University used an online collaborative team-based action-learning model to assist in the transition to online teaching (Ellis & Phelps, 1999). Five small teams, consisting of between two to four academic staff and an instructional designer, developed a unit of work for online delivery. These small teams formed part of a larger development group, which included members with other expertise such as desktop publishing and project management. Staff development included two weekly face-to-face workshops of two hours duration as well as online contact. Data collection consisted of pre and post development interviews, documentation of staff development opportunities and regular personal reflections of participants. Rather than drawing firm conclusions, the authors listed a number of key issues that require further investigation. Those that relate to the current study include issues of –

- the level of involvement of academic staff
- work release for staff
- the benefits of integrating teaching and research
- the value of cross-fertilisation of ideas and experience
- the time consuming nature of developing online materials
- the important role of the instructional designer in fostering staff development and promoting innovative design developments
- managing the timeliness of learning opportunities

Another staff development course that mixed online and face-to-face components was the FADxPMI project run by the Institute for Educational Technology of the Italian National Research Council (Ferraris, Manca, Persico, & Sarti, 2000). This project was aimed at assisting the movement of training for small and medium enterprises from face-to-face to distance mode in order to reach more staff at the workplace. Data collection included personal reflections, logging of online discussions and surveys carried out at the beginning, midway and end of the course. The majority of students rated a number of aspects highly. These included degree of interest, suitability of method, usefulness of distance activity, website usefulness and structure of the online discussion.

Negative aspects included the difficulty in fostering participation in the online discussion and distance group work. They found that thirty percent of the students accounted for more than sixty percent of the discussion postings and more than seventy percent of the web accessed. This pattern, which they termed 'the passivity of the many and superactivism of the few', became more evident towards the end of the course. Based on participant's comments, the main cause of this appeared to be the difficulty they had in devoting regular blocks of time to the course, especially given work commitments. However, the importance of the design of the staff development is highlighted in that another cause was the inclusion of face-to-face sessions. As one participant noted, 'sometimes I gave up writing to the forum because I knew that I was going to meet up with the others in a few days'.

They concluded that the design of future courses would take into consideration –

- the use of a training contract to make the commitment explicit
- finding a balance between guidance and student autonomy
- choosing teaching strategies based not only on course objectives and content, but also on the work habits and time/space constraints of the audience
- integrating various strategies and tools including 'old-fashioned' modes such as print and face-to-face

Apart from significant procedural and contextual differences to the present research, these studies tend to identify issues using self-reported opinions rather than look at the actual effectiveness of online staff development. The use of self-reporting can introduce bias and may be 'inaccurate or intended to please the researchers' (Lu et al., 2000, p199). Given these limitations, it is useful to look at the results of research into the effectiveness of online teaching more generally.

2.2 Effectiveness of online teaching

> 'online learning tends to be a lot more about online than learning' (Foreshaw, 2000, p39)

There is some suspicion that more effort has been put into promotion and advertising than quality assurance in many online offerings (Carr-Cheilman & Duchastel, 2000). When this study was first proposed, the examples of online professional development that the author had seen demonstrated at conferences or found on the Web were primarily linear, text-based, 'turn the page' type presentations. One study that reviewed online staff development programs at this time 'found them to consist of less than compelling content re-purposed for the Web' (Jackson, 1999, p28). Horton suggests that 'a lot of the courses on the Web today would have to improve just to achieve mediocrity' (Horton, 2000, p27). Merrill has evaluated hundreds of instructional products over the years, including web-based offerings, and found that 'an amazing number of these are surprisingly ineffective and some do not teach at all' (Merrill, 2000, p8). Some suggest that online courses are more 'shimmer than substance' and that they may follow the fate of the many unsuccessful dot.com businesses (Farrington & Yoshida, 2000). One critic even suggests that the relational aspects of learning are only available face-to-face and that it is impossible to get any education online (Noble in Kleiner, 2001). Nevertheless, it is important to look beyond anecdotal evidence regarding a suspected lack of quality and examine the research evidence.

2.2.1 Comparative studies

A common method for researching technology-based teaching innovations is to experimentally compare the 'traditional method' with the innovation. (Shneiderman et al., 1998). The generalisability of the results from such studies is often quite

limited due to the context-specific nature of teaching and methodological problems associated with such comparative studies. For example, Reeves (1993) notes that treatments are often too brief and infrequent using sample sizes that are too small. Researchers may also possess an unintentional 'technicist bias' (Hara & Kling, 1999; Witmer, 1998).

Definitional problems also occur. Many of the terms used, such as multimedia and computer-mediated communication, are ill defined and often misleading (Boddy, 1997). Perhaps the greatest criticism is in the use of the term 'traditional'.

> 'The term "traditional methods" is used to represent some widely practiced method that presumably has predictable acceptable results. "If technology performs better than traditional methods", such questions imply, "everyone should use it". A neat picture, but "traditional methods" doesn't define the higher education I know and love, nor the higher education revealed by research' (Ehrmann, 1995, p20)

Even given that there may be some questions regarding this type of study – what does this research reveal about the effectiveness of online learning?

2.2.2 No significant difference phenomenon

In some cases, online teaching has been found to be better than classroom teaching. In the use of an 'electronic classroom' at the University of Maryland, students rated their learning significantly higher than in the traditional classroom (Shneiderman et al., 1998). The finding that the final grades of the students using the electronic classroom were also statistically significantly higher backed this up.

In a study of pre-service science teachers using a computer courseware module to learn about lesson planning, Hacker & Sova (1998) found that achievement gains of fifteen percent in pre/post tests were significantly higher compared to traditional delivery methods. However, when the courseware delivery was online with e-mail tutorial support the achievement gains rose significantly to thirty-six percent.

However, the vast majority of studies return a finding of no significant difference. Some examples include –

- a comparative study of a pre-service teacher education course in education technology at the University of Idaho found no significant differences and concluded that 'the online course was equally effective as the traditional and integrated course' (Davis, Odell, Abbitt, & Amos, 1999, p126).
- The majority of students participating in the 'Virtual Classroom' project at New Jersey Institute of Technology reported many benefits including that it was overall a better learning experience than traditional formats. 'However, there was no significant improvement in grades' (Harasim et al., 1998, p89).
- At Western Michigan University, students in a Web-based geography course 'achieved the same results as those in traditional classroom courses' (Horton, 2000, p25).

This trend has been so pronounced that it prompted Thomas Russell to produce a listing of studies in this field that report no significant differences. This listing began in 1992 and culminated in a 1999 report entitled 'The No Significant Difference Phenomenon' which reviewed more than three hundred and fifty such comparative studies and argues that the different forms of instruction are equivalent (Kleiner, 2001).

> 'Does the technology used to deliver instruction improve it? Clearly, it does not; however, it does not diminish it either. As far as learning is concerned, there is just no significant difference' (Russell, 1997)

Russell (1997) relays a story from a posting to a listserv, which stated that one major university had informed doctoral candidates that comparative educational studies of this type would no longer be allowed. The message also added that the department chair felt 'such studies amounted to beating a dead horse'. While few details are supplied and this is an unverified account it does sound plausible. Others have also commented on this phenomenon. For example, one group concluded after reviewing the literature, that there is still a 'lack of concrete evidence' as to the effectiveness of web-based instruction (Muppala & Ha in Lu et al., 2000, p198). Horton (2000) suggests that studies, which show no significant improvement, may actually be a victory for online teaching given that it is often a first effort for both teachers and

students. However, this may also indicate the opposite as novelty may increase motivation and interest.

More detailed studies may find that there are students who do benefit greatly from online teaching but get washed out with the 'no significant difference' majority (Martinez, 2001). Significant differences may also be found in measures of factors other than test results such as the degree and quality of collaboration and communication (Jones, Valdez, Nowakowski, & Rasmussen, 2001). One factor that is often measured in evaluations is that of student satisfaction.

2.2.3 Student satisfaction

Student satisfaction is not a reliable measurement of learning, but it is certainly preferable to student dissatisfaction (Horton, 2000). After reviewing the literature, Chin (1999) concluded that 'the use of the Internet/WWW in teaching is well received by the students in general'. For example, the study into the geography course reported above which showed no significant differences in learning also found that 'ninety percent expressed satisfaction with the course' (Horton, 2000, p25). After completing a Web-based course in exercise physiology eighty-eight percent of students said they would 'take another Internet-based course given the opportunity' (Horton, 2000, p25). The study by Chin concluded that a majority of students found web-based teaching a positive and successful experience. In particular, students appreciated control over the reading sequence; control over the pace and sequence of the presentation of subject material; the ability to review material. The use of the Web for the trial subject also provided incentive to seek information on the Web for other subjects.

However, the same study also found that many students felt isolated and described a lack of motivation, support and feedback, which in some cases lead to withdrawal from the subject. Gillham and Hall (2000) also found mixed results. While the students viewed online learning positively, the study demonstrated that they also highly valued face-to-face contact with their teachers and peers and that convenience of access to online resources was critical. Results concerning the use of the Web for online training in the corporate world are also mixed. A survey of fifty seven training

managers from Australian blue-chip companies found that forty-four percent 'rated online learning as completely unsuccessful in developing staff participation and enthusiasm' (Foreshaw, 2000, p39). As well as the difficulties simply using a new medium for learning, students may suffer a range of technical problems such as 'viruses, unstable software, incompatibility problems and slow access times' (Bennett et al., 1999, p209).

While many studies into online learning report student frustrations, they rarely investigate them (Hara & Kling, 1999). Hara & Kling offer a number of reasons for this omission. Researchers in this area are often associated with technology-oriented departments and may be biased towards technology. The literature is dominated by descriptive studies and there is a low number of rigorous, fine-grained qualitative studies. Evaluations are typically conducted close to the end of a subject where students may simply be relieved to have made it through. With opportunity to report during the subject, more frustrations may be revealed.

The level of frustrations reported is likely to decrease as access to technology increases, technical reliability improves and both students and teachers gain greater experience with online learning. However, it is important to keep in mind that technology is not a panacea or 'silver bullet'. It cannot provide the solutions for all educational problems. Not all students will necessarily prefer the online delivery of education.

Given a choice will students choose to study online? Even going back several years there have been reports of online subjects attracting significant numbers of students who live within commuting distance of the delivering campus (Harasim et al., 1998; Kies, 1998). Typically these involve students continuing to enroll in most subjects on-campus, but selecting one or two online subjects for added convenience. Increasingly the distinction between on-campus and off-campus offerings is becoming blurred as online materials and tools are made available to attending students (Stapleton, 1998).

Online learning can provide flexibility in time, pace and location. Many studies report that students appreciate this added convenience (Chin, 1999; Cooper, 2001; Davis et al., 1999; Harasim et al., 1998). In particular, adults often find that online learning suits a busy lifestyle and allows them to combine formal study with other commitments such as work and raising a family (Naidu, 1997; Nisan-Nelson, 1999). A telephone survey of six hundred and sixty seven working adults found that nearly two-thirds were interested in continuing their education, but forty-eight percent cited busy schedules as the biggest barrier (Pastore, 2000). Over half responded that the biggest advantage of online education was the ability to work from home. In the survey of corporate training managers mentioned previously, fifty percent rated 'the convenience of online learning either extremely or very successful' (Foreshaw, 2000, p 39). It is likely that an increasing number of overseas students, who have access to the Internet, will seriously consider obtaining their qualification online from home due to the added convenience and savings in transportation and living costs (Harasim et al., 1998; Hosie & Mazzarol, 1999).

2.2.4 Reduced costs

As well as potential savings for students, there is the possibility of reduced costs to the institution. Many educational administrators view the use of technology in education as an opportunity to lower delivery costs (Porter & Foster, 1998; Sawers & Alexander, 1998). Some reduction of delivery costs may be realised by shifting costs, such as hardware, connection and printing, from the university to the student (Bennett et al., 1999). Studies also show that when the target population reaches a sufficiently large size, distance education does actually become cheaper (Ferraris et al., 2000). A majority of training managers regard online training successful in reducing the cost of IT training (Foreshaw, 2000). However, these savings are often exaggerated and the time and costs for design and development underestimated (Ferraris et al., 2000). Many online courses do not attract anywhere near the number of students required to ensure cost benefits. In addition, in order to provide equity of access, they often duplicate existing modes of delivery thereby creating extra costs (Bennett et al., 1999). Probably the major potential cost saving is seen in replacing some, if not all, of the human teaching with technology. This issue will be discussed in more detail later in this chapter.

2.2.5 Other factors

Even where no significant differences in grades are found, many reports highlight other potential benefits. For example, in the study of the Virtual Classroom project cited earlier a majority of the students reported (Harasim et al., 1998) –

- Taking online courses was more convenient
- They had better access to professors
- Spending more time and working harder
- Friendlier and more egalitarian interaction
- Improved attitudes toward the use of computers
- Increased computer skills

In a study of computer-mediated communications all respondents agreed that 'meeting with distant others facilitates learning, communication, and cultural understanding'(Cifuentes et al., 1999, p86).

A study of seven Apple Classroom of Tomorrow (ACOT) classrooms conducted over four years found that the use of technology in teaching 'encourages fundamentally different forms of interactions among students and between students and teachers; engages students systematically in higher-order cognitive tasks: prompts teachers to question old assumptions about instruction and learning' (Rakes, Flowers, Casey, & Santana, 1999). The researchers also found that 'teachers started talking about their students more as individuals with varied goals and less as a collective' (Apple K-12 Education, 2000).

It is beyond the scope of this study to examine the effectiveness of online learning over multiple variables. However, it is probably safe to say that online teaching may have positive and/or negative effects on a wide range of factors. The degree and direction of these effects will be influenced in turn by numerous other factors. Thus, given the complexity and contextual nature of teaching, simple 'horse race comparisons among different systems are not likely to be productive' (Marx, Blumenfield, Krajcik, & Soloway, 1998, p41). Rather than attempt to measure the

effectiveness of online teaching by comparing to some non-existent traditional method it may be better to determine the conditions that promote learning and examine if they can be provided in an online environment.

> 'what makes any course good or poor is a consequence of how well it is designed, delivered and conducted, not whether the students are face-to-face or at a distance' (Moore & Kearsley in Horton, 2000, p25)

2.3 A constructivist approach

It would be relatively simple to replicate one of the typical linear staff development sites already available. However, this was avoided as a constructivist approach was chosen as the theoretical basis for the design of the module.

2.3.1 What is constructivism?

In the constructivist model, learning is viewed as the result of mental construction. Students learn by fitting new information, gained from interacting with objects and events, with what they already know. Learner autonomy and initiative is accepted and encouraged.

Constructivism is often seen incorrectly as a single theory of learning (Woolfolk, 1995). However, there are many different approaches to constructivism and it might be more accurately viewed as a 'metatheory' (Wild & Quinn, 1998). Different researchers place differing emphasis on the importance of social negotiation and also on whether there is an external reality and, if so, whether it can be known. Based on these differences, constructivism is often divided into three broad categories: Cognitive Constructivism, Social Constructivism, and Radical Constructivism.

Cognitive constructivism is associated with information processing models. It differs from the other forms by asserting that knowledge is the 'result of the accurate internalization and (re)construction of external reality' (Doolittle, 1999). It has led to theoretical advances in areas such as schema theory and working memory models and associated instructional applications such as the use of concept maps. However, some authors prefer to classify cognitive-based theories separately, making a distinction between constructivism and 'cognitivism' (George Mason University,

2003). Even when considered a form of constructivism, it is often termed a 'weak' form. While this is related to the lack of adherence to certain tenets and is not meant to be a value statement, the term does carry some connotations. It is even referred to as 'the "black sheep" of the constructivist community since its focus does not include the subjective nature of knowledge' (Doolittle, 1999).

Radical constructivism, on the other hand, asserts that knowledge is an internal model of experience constructed by the individual which does not match any external reality or objective 'truth'. Those with a post-modern inclination may suggest there is no external reality while other radical constructivists are comfortable with the notion of an external reality, but feel that knowledge cannot be an accurate representation of it.

Social constructivists tend to lie somewhere between these positions. Truth is 'neither the objective reality of the cognitive constructivists nor the experiential reality of the radical constructivist, but rather is a socially constructed and agreed upon truth' (Doolittle, 1999). As well as a physical reality there is also an assumption of a social reality. The development of knowledge is viewed as a shared rather than individual experience.

Each of these forms have merits and disadvantages. Being from a scientific background I tend towards, and I am comfortable with, the idea that a physical reality exists. Nevertheless, there are problems with a totally cognitive approach. Laws that were once thought to be universal and immutable have turned out not to be so. For example, the law that the interior angles of a triangle always add up to 180 degrees is true, but only in the gravitational field of the earth. As a spaceship moves through space the total becomes more than 180 due to the curvature of space (Williams, 1995). However, these differences are often not of significance at a mundane or practical level. Most people can live with Newtonian laws rather than quantum physics when driving a car (although admittedly the behaviour of some drivers does resemble chaos theory). Even if truths are specific rather than universal, as long as the necessary conditions are known, then an external reality can be mapped.

However, even if we accept that there are certain 'facts' which can be known, most real-world problems have a multitude of possible solutions. Complex systems tend not to provide problems that fit neatly with known laws or problems that can be solved with simple one-line answers. Science deals well with linear models and Euclidean geometry, but has greater difficulty with nonlinear turbulence and living systems.

> 'The smooth and frictionless surfaces, the empty space, the perfect spheres, cones, and right angles of Euclidean geometry are aesthetically appealing, even soothing. They are not, however, descriptive of the rough, jagged world in which we live' (Williams, 1995)

As the complexity of problems increase the ability to find a single, 'correct' answer decreases. Some answers may be incorrect, in that they don't lead to the intended result. However, there may also be a range of correct answers, some better than others. Of course, the questions of what is incorrect or which answer is better and by how much can be quite subjective. Some degree of subjectivity is an essential part of constructivism. There is recognition that our own personal reality is influenced by our own mental schema established by previous experiences. New information is filtered by our personal reality and assumptions. 'We do not think about these assumptions, we think *from* them' (Williams, 1995). The personal nature of knowledge is recognised within cognitive constructivism. However, by seeking to be an accurate representation of reality it may place artificial limits on the type of content that can be covered. At the extreme it could result in an emphasis on recall of factual material and surface learning.

Dissonance and cognitive conflict play a key role in the accommodation of schemas and growth in personal knowledge (Ernest, 2003). A social constructivist approach promotes a greater likelihood of such conflict and growth. Nevertheless, it is possible for learning to occur without social interaction. For example, learning can take place from reading a book or an article. For some forms of content this may be all that is needed. In other cases, however, it may lead to a highly biased view. This could still be addressed without social interaction by reading diverse material from a range of authors. It could be argued that this is a social constructivist approach as it is based

on language and information sharing. However, while language is being used in reading, the information is only being transmitted in one direction without any interaction. There are many examples of experiential learning, such as practicing a musical instrument or sport, which take place without necessarily involving the direct use of language or interaction. Based on these examples, social interaction would not be considered a necessary condition for learning.

However, there are many reasons why interaction is desirable. Most meaningful activity is not done in isolation. Jonassen and Rohrer-Murphy (1999) note that the ability to perform is predicated on collaboration and a system of social relations. They cite the example of the solo concert pianist who relies on teachers, the piano manufacturer, the concert hall designers and the accompanying orchestra.

In a learning context, if activities are done purely in isolation the outcomes are also likely to be restricted. Interactions between teachers and students as well as peer interactions 'are requisite to facilitating critical thinking and promoting enriched learning' (Brahler, Peterson, & Johnson, 1999). By articulating our own position in front of others we have the opportunity to test the validity of our personal knowledge. Just as peer review is one of the hallmarks of academic scholarship, social interaction improves the quality of learning. Collaboration as well as critiquing is important. For example, interaction is an essential criterion in Vygotsky's concept of the zone of proximal development. The assumption is that learners are 'constantly on the verge of acquiring new learning' (McInerney & McInerney, 1994). The zone of proximal development is the area where a learner can 'achieve a goal with the support and guidance of a more knowledgeable other' (Wang, 2003). Over time the assistance is gradually removed until the learner can perform the task independently (McInerney & McInerney, 1994). The person providing the assistance may be a parent, teacher, coach, mentor or even a peer who possesses a slightly higher cognitive level (Applefield, Huber, & Moallem, 2001).

The danger inherent in a social constructivist approach is that the 'correctness' of answers may be judged solely by popular opinion. Advances in many areas have only been made where courageous individuals have dared to go against the

prevailing opinion or conventional wisdom. Copernicus, for example, 'argued against the conventional wisdom, promulgated by Claudius Ptolemy in Alexandria around A.D. 150, that the earth was fixed at the middle of the universe' (Reed, 2003). A related phenomenon which may result is 'group-think' where extreme decisions (either more conservative or riskier) tend to be made when the need for consensus overrides a realistic assessment of alternative actions (Borchers, 1999). Thus, while social interaction can enhance learning it is often wise to validate the opinion of the group in other ways as well.

Radical constructivism clearly articulates the subjective nature of personal knowledge. However, if taken to extreme it may become solipsistic (viewing the self as the only reality). If all knowledge is subjective and relative then all opinions are equally valid. Apart from leaving little to assess in education, there are areas where objective answers, such as 'administering too much of a certain drug causes death', are readily observable and lead to undesired outcomes if not adhered to.

It has been argued that each of the forms of constructivism have relative merits and disadvantages. Based on this, the form of constructivism used in this study is an amalgam of all three positions. The assumptions made are –

- There are certain 'facts' which can be known, but that for most real-world problems there are a multitude of possible solutions.
- Factual material often provides a fundamental base from which deeper learning can take place through reflection and social interaction.
- Dissonance and cognitive conflict play a key role in the accommodation of schemas and growth in personal knowledge.
- Social interaction is a desirable, but not a necessary condition for learning.
- All knowledge is subjective, but is not totally relative. Knowledge is a personal creation that 'will vary in its degree of validity as an accurate representation of reality' (Doolittle, 1999).

While the degree of emphasis may vary for the different forms, there tend to be common elements to most constructivist views of teaching. These elements, which are not exclusive to constructivism, include -

- Authentic problems

Students should be given authentic, real-world, complex and, if possible, personal problems rather than simplified problems (Alexander, 1999; Doolittle, 1999; Merrill, 2001; Rakes et al., 1999). Students may need support or 'scaffolding' initially when dealing with high degrees of complexity (Collis, 1998; McKenzie, 1999b; van Merrienboer, 2000). Over time, the amount of support can be gradually reduced.

- Multiple representations of content and complex learning environments

Content should be re-visited in different contexts (Alexander, 1999; Bridges, 2000; Doolittle, 1999; Tam, 2000). Students often oversimplify if they encounter only one representation and may attempt to inappropriately apply this knowledge to other situations. The learning environment should provide a wide variety of learning resources (Rakes et al., 1999).

- Social negotiation and collaboration

While social constructivists place particular emphasis on this aspect, it tends to be a common element in all forms of constructivism.

> 'Students will learn from one another because in the discussions of the content, cognitive conflicts will arise, inadequate reasoning will be exposed, disequilibration will occur, and high-quality understandings will emerge… In this view, the opportunity for students to discuss, to argue, to present and hear one anothers viewpoints is the critical element of co-operative learning with respect to student achievement' (Slavin, 1996, p49)

Learning in collaboration with others can be more engaging than learning alone (Harasim et al., 1998). Even self-directed learning requires collaboration among students, teachers and others to be successful (Lasseter & Flanagan, 1998). Collaborative learning tends to encourage knowledge building and deeper understanding (Marjanovic, 1999). Collaborative learning can also result in other positive outcomes such as greater self-assurance (Marjanovic, 1999). It affords the opportunity to compare different and often refreshing perspectives (Cifuentes, Murphy, Segur, & Kodali, 1997; Lander, 1999; Naidu, 1997). Chester and Gwynne

(1998) note that the internet is rich with opportunities for the experience of re-seeing or 'depaysement', which literally means to decountrify oneself.

> 'One leaves one's own culture to face something unfamiliar and upon returning home it has become strange – and can be seen with fresh eyes' (Turkle, 1995)

However, it is important to recognise that depaysement does not necessarily result in an appreciation of other points of view (Noddings, 1992). Not only should students be exposed to multiple points of view, they should be encouraged to construct multiple perspectives of their own and understand issues from alternate viewpoints (Merrill, 2001; Tam, 2000).

- Understanding the knowledge construction process – metacognition

Metacognition consists of knowledge of cognition (eg. knowing what you are capable of doing) and also the regulation of cognition (eg. planning and evaluating your own learning and cognition) (Doolittle, 1999). Students should be assisted in understanding their own metacognitive processes (Basiel, Jones, & Dudman, 1999). Again this assists in developing and defending self-critical and reflective positions.

- Student-centred instruction

The previous experience and the needs of the students are valued rather than ignored.

> 'We must never merely discourse on the present situation, must never provide the people with programs which have little or nothing to do with their own preoccupations, doubts, hopes, and fears' (Freire, 2002, p96)

Students may be given the opportunity to share and negotiate planning so that they can pursue personally meaningful problems (Alexander, 1999). The teacher should not expect or desire to be the 'fount of all wisdom' and not be afraid to be challenged. If the teacher-learner hierarchy is diminished, there is opportunity for teachers to become learners, and learners to become teachers. Experience and research suggest that one of the most effective ways to learn is to be given the opportunity and responsibility to teach others (Harasim et al., 1998).

- Active engagement.

Some forms of teaching, such as the lecture and video, place the student in a passive role. Students often fall into an 'entertain me' mode in these types of presentations (Klemm, 1998). The resemblance of the computer screen to a television may promote a similar response to online material.

One of the central tenets of constructivism is that learning is an active process in which the learner attempts to make sense of the world (Doolittle, 1999; Squires, 1996; Tam, 2000). Knowledge is not viewed as a well defined finished product. Rather than passive knowledge absorption, learners are encouraged to have ownership and responsibility for their own learning.

2.3.2 Why choose a constructivist approach?

There are many theories of learning. Many articles incorrectly depict learning theory as an imaginary continuum from behaviourism to constructivism. The former is usually depicted as grossly deficient and the latter 'as the only credible explanation of student learning' (Wild & Quinn, 1998, p78). While many of the components of behaviourism have been discredited, a number of important concepts, such as contiguity, repetition and reinforcement are still regarded as important in the learning process (Wild & Quinn, 1998). On the other hand, there are valid criticisms of constructivism. For example, student resistance can be a problem in constructivist learning environments due to the desire by students for 'banking education' where they can remain passive while the teacher 'deposits' knowledge (Pettit, 1998). Successful constructivist approaches often depend on the student being well motivated and well prepared. One study using a constructivist approach to computer-mediated communication, found that students who didn't have the self-discipline to set up a regular pattern of participation 'tended to do less work and learn less than they would have in the traditional classroom' (Harasim et al., 1998, p 89). Larger student attrition rates are often associated with self-paced learning due to the 'huge motivational investment required on the part of the student' (Mann, 1999, p16). In addition, it is impossible to prescribe an approach to learning that 'can describe the necessary conditions of learning, for all learners, and for all learning situations' (Wild & Quinn, 1998, p79).

Thus, it would be inappropriate to see constructivism as an educational panacea. Nevertheless, many of the learning theories that current research links with good teaching practice, such as situated cognition theory, adult learning theory, cooperative learning theory fit within, or strongly articulate to, a constructivist

framework. In practical terms, numerous approaches to learning such as problem based learning, anchored instruction, collaborative learning, interactive multimedia, cognitive apprenticeships can be viewed as constructivist in nature. However, as with online teaching, there is difficulty in judging the effectiveness of constructivism given the breadth of its theoretical underpinnings (Doolittle, 1999). Nevertheless, while there is still debate over the value of constructivism, it has forced 'a level of theoretical questioning that is extremely valuable in itself' (Carr-Cheilman & Duchastel, 2000, p240). This in turn should lead to the emergence of refined models of teaching and learning.

Rather than compare to a single theory of learning, such as behaviourism, a clearer distinction may be between a learner-centred, constructivist approach and a teacher-centred, information-transmission approach to teaching. Knowledge is often equated with having the right information, such as the correct answers to exam questions. Using this limited conception of knowledge a teacher can easily become content-oriented. The student is sometimes viewed as an 'empty vessel' waiting to be filled with little or no account given to the prior experiences of the student. In an information-transmission model of teaching the flow of information is primarily one-way, from teacher to student.

While few academics would claim to follow this model, the reality may not match the rhetoric. There is often a discrepancy between espoused theory and theory in use (Apple K-12 Education, 2000; Zuber-Skerritt, 1992). The traditional lecture, which is neither interactive nor adaptive, (Pettit, 1998) is still widely used. Some would argue that lectures are imposed by the system and that the 'real' teaching takes place in tutorials. However, research comparing the amount of teacher talk to student talk in tutorials suggests that we may be deluding ourselves about the extent of our student-centredness (Cryer, 1992).

In addition, assessment is often heavily weighted towards lower-order thinking skills such as the memorisation of facts. This may become even more of a problem given the ease with which online tests can be delivered and marked. Most of the current online assessment tools have facilities for delivering multiple-choice, true-false and

short answer style questions. These generally deal with lower order cognitive skills, such as recall of facts, rather than higher order skills, such as analysis, synthesis and evaluation. Many educators take it as a matter of faith that standardised testing procedures are true indicators of learning (Herrington & Herrington, 1998). A hasty implementation of online assessment may not only promote surface learning (Littlejohn & Sclater, 1998), but give a distorted and inaccurate picture of student performance (Bocij & Greasley, 1999).

The way in which technology is used may also betray an adherence to a transmission model of teaching. For example, videoconferencing is often used to replicate face-to-face lectures using 'talking head' presentations that can be done much more cheaply using video or audiotape (Schiller & Mitchell, 1993). The extent of the marvelous interaction brought about by videoconferencing technology 'is the same occasional question, except that we now need a series of monitors and expensive equipment to enable a student to ask it' (Mason in Tennant, 1999, p83).

Unfortunately, there may be more inappropriate uses of technology in education than examples that clearly demonstrate enhanced student learning (McNaught, 1995). Many of the online subjects currently promoted as 'flexible' often do little more than place lecture notes on the web (McNaught et al., 1999). This approach may lead to an impoverished form of education due to the reduced level of interaction. Even with a lecturer following an information-transmission model there is still a 'possibility of some human interaction and interest' (Stapleton, 1998,p 33).

One of the largest problems in equating the quantity of knowledge to successful learning is that knowledge is increasing at an exponential rate. If teaching concentrates purely on content and opportunities to develop metacognitive strategies are limited, graduates will have considerable difficulty remaining up-to-date in their respective disciplines. It is likely that they will also face problems applying the knowledge they do have.

> ‘For so long teaching has been about teaching knowledge. It is no longer that. It is teaching children how to research things, how to find answers, what is relevant to the search, and what do they do with it after they've gotten it’ (Porter & Foster, 1998, p71)

Student-centred, constructivist approaches to teaching attempt to help students develop the metacognitive strategies needed for life-long learning. Content is not ignored, but linked to rich learning environments with authentic problems in order to increase engagement and the ability to transfer learning.

2.3.3 The importance of dialogue

Education can either be an instrument to bring about conformity to the present system or ‘the “practice of freedom”, the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of the world.’ (Shaull in Freire, 2002, p34).

The information transmission model of teaching not only emphasizes learning as knowledge, but also learning as conformity. If we espouse the view that education should allow people to ‘deal critically and creatively’ with the world then communication needs to flow in many different directions (eg. teacher - student, student - teacher, student - student, student - community). We need to recognise that there are neither utter ignoramuses nor perfect sages and encourage dialogue rather than a teacher-student monologue (Freire, 2002).

2.3.4 How are constructivist principles applied in the module?

> ‘It is surprising, however, how often the principle of constructivism is conveyed to teachers in the context of how they should help their students learn, without its being the basis for how the teachers are helped to learn themselves (eg. there are still many lectures on constructivism). Experiencing learning in ways that hold to constructivist principles is the only way for teachers to understand why it is important for their students to learn in this way and for them to break their old models of teaching’ (Loucks-Horsley et al., 1998, p39)

Many recent studies using technology in teaching proudly boast that the delivery of the subject was based on a constructivist approach. However, they often provide little evidence as to why their particular teaching approach should be classified this way. As the ‘Introduction to Online Teaching’ module attempts to model a constructivist

approach it is important to distinguish the practical ways in which it can be termed constructivist.

- Authentic problem

The content is authentic and related to the real-world problem of becoming an effective teacher in an online environment. The module includes a mix of theoretical and practical concepts. Mechanical issues are not emphasised, but also not ignored for those who need to develop technical competence in an area.

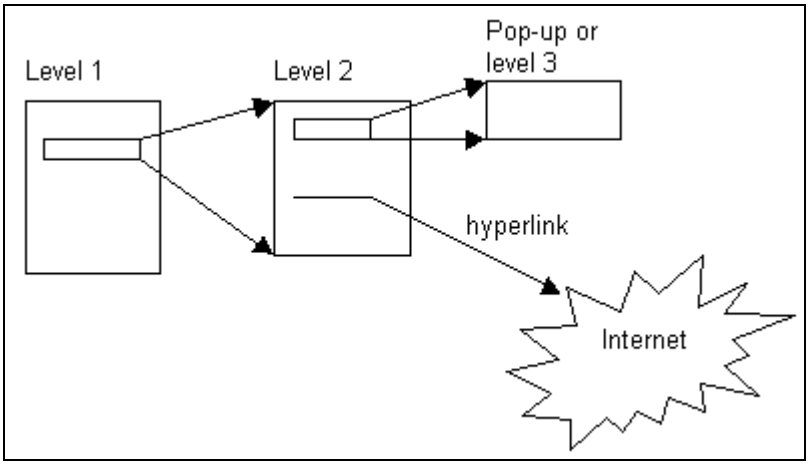
- Multiple representations of content and complex learning environment

The Web is a hypermedia environment and content can be presented in a variety of ways including text, hypertext, audio, animation, video. Hypermedia lends itself to a constructivist perspective for organising information. Rather than a linear sequence leading to certain conclusions set by the author, the information can be fragmented and presented in discreet units. Providing information in 'chunks' is well suited for time-squeezed teachers 'because they offer the busy adult an opportunity to pick up new ideas and competencies in "bite size" pieces' (McKenzie, 1998). The learner can select the information in the quantity and order they choose and in ways that make sense for them (Fowler & Dickie, 1997; Schoenfeld-Tacher & Persichitte, 2000). A consistent navigation system and site map help prevent the learners from getting lost in a 'sea of content'.

Assuming that time is one of the greatest constraints, teachers will want the quickest access to the information they want. In order to facilitate this the top level of the site contains summary, 'need to know' information, but allows users to 'drill down' to further layers or link to the Internet if they want more information on a specific topic. This also allows learners to start at an appropriate level and develop concepts over time.

This was done using hypertext links, Javascript pop-up windows which allow multi-modal representations of content (Basiel et al., 1999) and the use of Portable Document Format (pdf) for full-length documents.

Figure 2-1 Layered information



Links to the real world not only provide access to expertise and resources beyond the classroom, but also help students see themselves as members of a larger community (Harasim et al., 1998). They are also often more current than other resources such as textbooks. As one student commented, Internet resources are 'varied, up-to-date, comprehensive and immediately available when I am working on a project in the middle of the night rather than having to go to the library' (Naidu, 1997, p271).

The computer monitor is not the best interface for reading (Carr-Cheilman & Duchastel, 2000). While there are some who are happy to read from the screen others have a distinct preference for reading from printed material (Gillham & Hall, 2000). Where text went beyond one screen it was provided in the form of a PDF document to eliminate scrolling and to give an alternative to reading from the screen. Having screen information in smaller chunks, which do not require scrolling, also lowers the probability of user cognitive overload (Rees, White, & White, 2001).

- Social Negotiation and Collaboration

Computer-mediated communication techniques, such as discussion groups and e-mail open up communication (Basiel et al., 1999). Rather than being primarily teacher-centred, information can flow in many directions. The discussion area, in which participants are invited to contribute, affords the opportunity to compare different and often refreshing perspectives (Cifuentes et al., 1997; Lander, 1999; Naidu, 1997). It also provides a forum for exchange across departments and increases awareness of what others may be doing in the area (Edmonds, 1999). Suggestions for contribution included –

- reflection on current practice
- sharing a good idea
- peer review of other comments
- providing a link to an appropriate external resource

For those interested, opportunity for face-to-face interaction and collaboration on topics of interest, such as desktop video conferencing or digitising video was available.

- Understanding the Knowledge Construction Process

Many authors recommend that the skills required for online teaching should be modeled in staff development (Bennett et al., 1999; Collis, 1998; Dooley, 1999; Lasseter & Flanagan, 1998; Littlejohn & Sclater, 1998; Wills et al., 1997). By experiencing online education as learners themselves, teachers may have a much greater understanding of what will be required by the students. In particular, the teachers may experience some of the same frustrations typical in online environments, such as technical problems, which interfere with the learning process. Rather than resulting in a poorer learning experience, staff actually prefer the opportunity to experience and resolve potential problems before going 'live' with students (Creanor & LittleJohn, 2000).

The use of text-based messages in the discussion area calls for organised thinking and coherence which ‘not only brings cognitive skills into play but also develops metacognitive skills’ (Benigno & Trentin, 2000). Increasing learner control also increases metacognitive demands (Wild & Quinn, 1998). Metacognition is more likely to be developed when the student is in control - making decisions, reflecting on these decisions and their consequences.

- Student-Centred Instruction

Research suggests that staff development is more effective when it is centered around the choices made by the learners rather than imposed by administrators or external consultants (Cifuentes et al., 1999). As well as having the freedom to use the module as they wish, contributions from participants were welcomed. Responses to the online discussion, participants were encourages to provide suggestions for activities and links which could be incorporated into the site.

- Active Engagement

Each online teaching component in the module consisted of the following sections - Introduction, Benefits, Problems, Resources, Strategies and How do I do it?
The first three sections were largely theoretical and text-based. The ‘Resource’ sections contained links to free or trial versions of software, such as NetMeeting, that the user could download and trial, links to external online tutorials and an email link for users to email suggestions for additional material to add to the site. There were a range of demonstrations such as streaming video, flash animations and an interactive quiz. Each ‘Strategies’ sections gave a range of ideas for the users to trial in their own online teaching. The ‘How do I do it’ sections contained links to university contacts to set up discussion groups or desktop video-conferencing, help documents for using the PlatformWeb environment and demonstration presentations using Javascript rollovers, video and streaming video. A guestbook, written in Flash, was also provided for users to leave comments. Nevertheless, none of these sections were

particularly interactive. The main expectation for engagement was through the discussion area.

2.4 Promoting effective educational change

There are many in education who appear to think that it is sufficient to purchase and install technology for it to be successfully used (Boddy, 1997). Another common belief is that teachers will 'automatically seek to learn about new technology and instructional methods' (Dooley, 1999, p38). However, while the investment in technology is there, surveys have consistently found that very few teachers integrate technology into the classroom (Newhouse, 1999; Spotts, 1999). One research study found that even when the technology is readily available and staff accept the functionality of it, they 'might not anticipate their personal use of it' (Mitra et al., 1999).

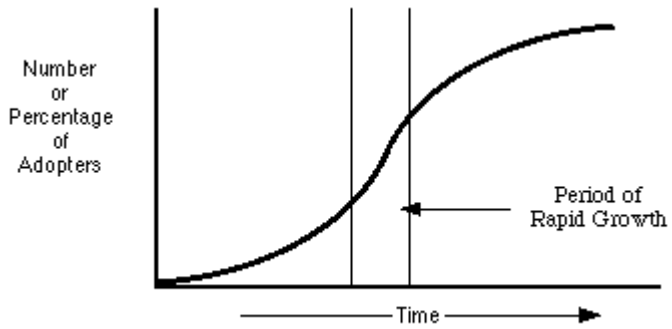
However, even with intensive staff development, results may be disappointing. Staff developers with Apple Computer tried a range of staff development approaches with teachers involved in the Apple Classrooms of Tomorrow (ACOT) project. They held workshops after school, over a day and even over a week during the vacation. As one said they used the 'spray and pray' approach. The most successful of these was a week-long workshop introducing constructivist learning strategies. They hoped that after returning to their classrooms the teachers would modify their teaching practices. However, on follow-up visits to their classrooms, they 'did not see that teaching strategies had changed much or that teachers were implementing the units they had designed during the workshop' (Apple K-12 Education, 2000).

Thus, there is a need to look beyond pedagogical theories alone. While constructivism provides the theoretical framework for the pedagogy of the module, the promotion of effective educational change also needs to be considered. There is a significant body of knowledge concerned with the diffusion or adoption of innovations that can provide such a theoretical base. An increasing number of instructional technologists are turning to these theories after realising that innovative products and practices are under-utilised (Surry, 1997).

2.4.1 Diffusion of innovations

There is no unified theory of diffusion. Among the most widely cited theories are those of Rogers from his book Diffusion of Innovations originally published in 1960 and now in its fourth edition (Surry, 1997). These theories include the Rate of Adoption theory, which 'states that innovations are diffused over time in a pattern that resembles an s-shaped curve' (Surry & Farquhar, 1997).

Figure 2-2 Rate of adoption (Surry, 1997)



The rate of adoption rises slowly at first. When around twenty percent of the population have joined the adoption 'takes off'. The rate increases to a maximum when adoption reaches about fifty percent of the population. After this period of rapid growth the rate of adoption gradually stabilises and may even decline. This theory is related to the Individual Innovativeness theory which states that 'individuals who are predisposed to being innovative will adopt an innovation earlier than those who are less predisposed' (Surry & Farquhar, 1997). Individuals can be placed into adopter categories based on specific characteristics in relation to a proposed innovation. These categories are: innovators, early adopters, early majority, late majority, and laggards. The s-shape curve relates to the timing of adoption by the various categories. These are, of course, 'ideal' types and in reality there are no pronounced breaks between the categories. Nevertheless, they are useful for guiding research efforts, planning professional development strategies and anticipating reactions to change (Dooley et al., 1999; Edmonds, 1999; Rogers, 1983). These theories highlight that change is a process and that characteristics of individuals will affect when or if they will adopt a change during this process.

As well as general diffusion theory, there are theories specifically related to the diffusion of instructional technology. These can be divided into two categories based on their underlying philosophies regarding technological change: technological determinism and technological intrumentalism (Surry & Farquhar, 1997).

2.4.2 Technological determinism

> 'Must society be shaped by the available technology, or may society shape technology?' (Jones, 1982, p211)

Many theories of diffusion are based on a deterministic view of technology. Technology is seen as an inevitable, autonomous force. Utopian determinists, such as Alvin Toffler, feel that it will lead to prosperity and be the salvation of humanity. On the other hand, dystopian determinists, such as George Orwell, view technology as morally corrupt and that it will eventually lead to the destruction of humanity (Surry & Farquhar, 1997).

Determinist or developer-based models of diffusion focus on the technical characteristics in order to promote change. They assume that technological superiority is all that is required to bring about the adoption of innovative products and practices (Hansen et al., 1999). However, successful adoption entails continued use. There are classic examples, such as the results of the contests between Beta/VHS video or the Dvorak/QWERTY keyboard, which demonstrate that technical superiority alone is not sufficient to ensure change. Clearly other factors influence change.

Instrumentalist or adopter-based theories of diffusion emphasise the importance of the social context of change and the need to address the knowledge, beliefs, feelings and concerns of the users (Crawford, Chamblee, & Rowlett, 1998). Successful change is seen in relation to meeting the real and perceived needs of the bulk of the users not just the innovators. Technology is viewed as being under human control and its use can lead to beneficial or disastrous consequences. Jones (1982) notes that technologically determined decisions do not just happen. They are 'contrived, pushed and promoted by conscious human agencies – specialists in particular fields, many bureaucrats, advertising agencies, manufacturers, newspapers and television – people

who argue a position and, in default of any effective alternative view being put, win the debate' (Jones, 1982, p210).

However, care needs to be taken as a totally instrumentalist approach that turns out 'technically inferior and pedagogically weak products that people want to use is not the answer' (Surry & Farquhar, 1997). Nevertheless, the history of the adoption of innovations is littered with failure due to the lack of attention to the concerns of the people ultimately responsible for the change – the end users. For example, in the 1960s a number of 'teacher proof' curricula were developed in the United States, partly in response to the fear of being left behind raised by the launch of Sputnik. A study of a number of high school teachers using one of the supposedly teacher proof curricula found that in the classroom teachers still had strikingly different patterns of practice (Hall & Hord, 1987).

Many authors comment on the importance of addressing the concerns of the teachers who will actually implement the change in the classroom (Bondaryk, 1998; Dooley, 1999; Harasim et al., 1998; Marx et al., 1998). Concerns theory and research reveals 'that concerns change over time in a fairly predictable, developmental manner' (Dooley et al., 1999, p109). Individuals go through stages during the change process with differing needs through these stages. Change strategies that meet these needs are more likely to be effective (Crawford et al., 1998; Schiller & Mitchell, 1993).

Viewing change in this way fits well with a constructivist framework. Teachers must develop their own meaning of an innovation rather than being expected to apply new ideas and methods after just passively receiving knowledge about it (Crawford et al., 1998). An adopter-based theory that has been specifically designed to assist in promoting systemic change in education based on the concerns of teachers is the Concerns-Based Adoption Model (CBAM).

2.5 Concerns-Based Adoption Model (CBAM)

This model has been used extensively to examine the adoption of technological innovations or curriculum reform efforts in education across a wide range of disciplines (Crawford et al., 1998). It is based on five assumptions (Kember & Mezger, 1990) –

1. Change is a process, which takes time to unfold, rather than an event.
2. Change is result of the actions taken by individuals.
3. To the individuals involved it is a personal experience.
4. The feelings of an individual about an innovation go through a series of developmental levels as the skill in using the innovation develops.
5. The change itself will almost certainly be adapted or mutated over a period of time.

CBAM data provides information on how teachers are reacting to and using educational innovations. There are three key tools to collect this data - Stages of Concern, Levels of Use and Innovation Configurations (Gallagher, 1999). This study makes use of the first two of these tools.

2.5.1 Stages of Concern

Research by the Center for Research and Development in Teaching at the University of Texas-Austin and the Southwest Educational Development Laboratory identified seven stages of concern (SoC) grouped into four dimensions about the adoption of an educational innovation (see Table 2-2 over page).

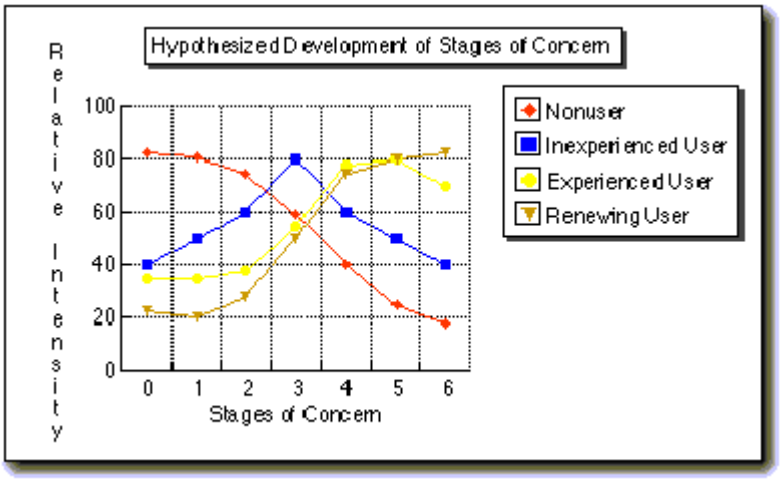
Data about stages of concern can be used to plan unique professional development opportunities that meet the concerns of the participants and provide them with methodologies appropriate for their particular needs (Maney & Brooks, 1998).
The data can also be used to measure the progress of teachers in their adoption of the technology.

Table 2-2 Stages of Concern

Dimension	Stage	Expression of Concern
Impact	6. Refocusing	I have some ideas about something that would work even better
	5. Collaboration	How can I relate what I am doing to what others are doing?
	4. Consequence	How is my use affecting learners? How can I refine it to have more impact?
Task	3. Management	I seem to be spending all my time getting resources ready?
Self	2. Personal	How will using it affect me?
	1. Informational	I would like to know more about it.
Unrelated	0. Awareness	I am not concerned about it.

The Stages of Concern Questionnaire (SoCQ – see Appendix B) is a statistically valid and reliable instrument for quantitatively measuring concerns about the adoption of an innovation(Hall, George, & Rutherford, 1986). The results can also be used to construct individual 'concerns profiles' for use in qualitative interpretation. The following figure represents four 'ideal' profiles –

Figure 2-3 Ideal SoC profiles (Maney, 2000)



When self and task concerns are largely resolved, the individual can focus on impact concerns. A movement toward Stage 4 Consequence and Stage 5 Collaboration

concerns indicates that teachers are ‘beginning to focus more on effective uses of technology and how technology will impact their students and less on the mechanics of using technology’ (Maney & Brooks, 1998).

The SoCQ can be used to demonstrate changes in concerns over time. However, these changes are generally not rapid. For example, after an extensive, systematic approach to staff development over a school term, one study found that ‘some change in the type and level of the teachers’ concern had occurred. Although not significant in the statistical sense, these changes provided some evidence that the intervention strategies were beginning to work’ (McKinnon & Nolan, 1989). Another study using a pre and post SoCQ combination, concluded that after six workshop days teacher attitudes were changed in ‘subtle and emerging ways’ (Norton & Sprague, 1998, p214). A similar study did find significant differences in concerns, but in this case the treatment time was a year (Crawford et al., 1998). Thus, it is not expected that there would be any major movement in concerns in this study except perhaps for staff who interact extensively with the site. Nevertheless, the SoCQ data may indicate relationships between concerns and patterns of use of the module.

Stages of concern measures how people feel about an innovation. How people feel and their perceptions of a situation can be different from what they actually do (Hall & Hord, 1987). Levels of Use (LoU) assesses how people are actually using an innovation. The LoU measures behaviours which are fairly congruent with the SoCs (Gallagher, 1999).

CBAM is not explicitly constructivist. Nevertheless, one study has specifically linked the model to a constructivist approach (Crawford et al., 1998). As teachers move through the change process they may exhibit more constructivist behaviors. Teachers at higher levels of use or stages of concern tend to exhibit greater concern for their students, increased reflection on their teaching practices and more willingness to collaborate with colleagues.

2.6 Factors affecting adoption

> ‘Good teaching is never easy. Changing one's way of teaching is never easy. Handling new technologies is never easy. Finding the time to do new things is never easy. Doing things differently than the traditional ways of the university is never easy. Being rewarded and appropriately supported (in terms of human and financial support) for putting effort into one's teaching in higher education is unfortunately often not easy’ (Collis, 1998, p391)

There are a number of potential barriers to online teaching and learning, many of which, relate directly to if and how staff will voluntarily make use of staff development provided online. If the barriers are seen to outweigh benefits, adoption is unlikely. The potential user must see a clear advantage in order to change his or her way of teaching (Collis, 1998; Mitra et al., 1999).

2.6.1 Perceptions

Staff perceptions of the difficulties in using a technological innovation may be quite different to the reality. Nevertheless, it is the perceptions rather than the reality, which will influence their decision to adopt. This is one of the reasons why a concerns-based model is particularly useful. Staff with positive perceptions about the use of technology tend to use it more (Lu et al., 2000; Mitra et al., 1999), particularly those who perceive a valuable benefit (Collis, 1998; Spotts, 1999). Higher-level users tend to be more forgiving of frustrations encountered (Spotts, 1999). While some staff find technology intriguing, others find it intimidating and frightening (Bondaryk, 1998; Tennant, 1999).

Of course, negative perceptions may indeed match the reality. Online teaching can represent a significant departure from traditional teaching styles (Bondaryk, 1998). Academics who are already doing a good job using traditional delivery may ask ‘why change?’, especially given the real possibility that they may not do as well online (Hagner, 2000). There may also be healthy scepticism of the motives behind the change. Is it change for change sake? Is it change because of technology push? Is the development of a ‘virtual university’ simply a way for politicians to reduce funding? (Collis, 1998). Will this change result in educated students or an ‘entire class of victims’ (Hagner, 2000, p31)? Of particular concern to some staff is whether technology may eventually replace them (Boddy, 1997; Bondaryk, 1998).

> ‘Any teacher who **can** be replaced by a computer **deserves** to be’ (Cooley in McInerney & McInerney, 1994, p279)

Administrators may consider that lower-level staff can 'playback' material after initial development (Harasim et al., 1998). Some may even be ‘lured into the fantasy’ that online delivery can supplant the need for teachers (Shneiderman et al., 1998). These views appear to be predicated on the role of the teacher as information transmitter, which, as shown earlier, is 'a limited conception of what it means to be a teacher’ (Freeman, 1997). Educators need to be aware that some managers hold this view and that they may need to promote a better understanding of what it means to be a good teacher.

It is important to recognise that information technology is not just a way of accessing a vast, impersonal data bank, but ‘represents a human information network, developed and maintained by humans’ (Fowler & Dickie, 1997, p13). Some people mistakenly speak of ‘computer communication’ when they really mean ‘computer-mediated communication’ – the object of communication is another person not a computer.

In particular, the significance of relationship in the process of learning cannot be underestimated. (Pettit, 1998; Shneiderman et al., 1998). Even if it is interactive, computer-based subject matter cannot guarantee learning any more than the presence of a library on campus (Reeves, 1993). Content cannot carry itself. Noddings goes so far as to claim that, apart from some rare exceptions, relation precedes engagement with subject matter (Noddings, 1992).

It is unlikely in the near future that this aspect of teaching will be successfully simulated. Incorporating human elements into courses run entirely online will be one of the main challenges for distance educators. While it is doubtful that technology will replace teachers, it has the potential to significantly influence approaches to teaching and it may become increasingly important for teachers to be technology literate (Barritt, Ashhurst, & Pearson, 1995; Porter & Foster, 1998).

> ‘Computers will never replace teachers, but teachers who can use computers will replace teachers who can’t’ (Barritt et al., 1995, p33)

Whether the threat of being made obsolete is real or perceived it should be remembered that it will affect teacher attitudes and the rate of adoption of technology in education (Bondaryk, 1998).

2.6.2 Experience

Experience with technology can influence use. Teachers who have had positive experiences with technology are more likely to use technology in their own teaching (Freeman, 1997). A study into patterns of use of email at Wake Forest University found that users differed significantly from non-users on a number of demographic characteristics (Mitra et al., 1999). Users tended to be relatively new to the university, hold junior ranks, report first use of computers earlier in their academic career and have higher self-evaluation of their computer skills. Non-users of email tended to be non-users of other computer applications as well. Gender or discipline did not show any significant differences.

In a study where all participants had above-average computer skills, Schoenfeld-Tacher & Persichitte (2000) found that teachers had a wide variation of knowledge about distance education theories. This in turn influenced their satisfaction with teaching online.

2.6.3 Increased workload

Staff workload is a critical issue in the successful adoption of technology in education (Bondaryk, 1998; Leigh, 2000; McNaught et al., 1999). Innovators often put in large numbers of unpaid hours (Mason & Bacsich, 1998). This is clearly unsustainable. While good teaching is important it should not be overwhelming (Collis, 1998). Teachers need to carefully manage their online commitment (Harasim et al., 1998). Mainstream users are much less likely than innovators to devote a large amount of extra time and will resist change if there is even a perception of increased workload without corresponding benefits.

Developing online material and learning how to use online teaching tools is time-consuming. Most staff guard their time and are reluctant to give it up, particularly when the amount of extra time required or the steepness of learning curves are

largely unknown (Hagner, 2000; Spotts, 1999). There are also legitimate concerns that materials and skills developed may have only a short shelf life given the rapid changes in technology (Slough, 1999).

Once an online subject is underway, extra time may be needed to respond to large numbers of student messages and postings. A student question that might be answered in 30 seconds in the office may require a much longer response in electronic form when visual cues are not present. Encouraging electronic communication with students can also result in increased administration (Littlejohn & Sclater, 1998). Time and date stamping on messages creates greater accountability to provide prompt feedback. In some cases, students tend to expect almost instant responses to questions (Freeman, 1997).

For some teachers, the move to online teaching may also correspond with a move to a more facilitative form of teaching which, whether face-to-face or online, requires an inordinate amount of time for it to be successful (Pettit, 1998).

2.6.4 Institutional barriers

Even where staff are fully trained and eager to proceed, attempts to integrate technology in teaching may still fail due to a range of institutional barriers (Edmonds, 1999). For example, some institutions seem to operate on the assumption that time in front of the class is the only valid use of a teacher's time (Grant, 1996). A number of researchers highlight the importance of providing release time to allow for activities such as planning, collaborating with colleagues, developing new skills, developing online materials and evaluating new practices (Edmonds, 1999; Grant, 1996; McKinnon & Nolan, 1989). On the other hand, some question the value of release time, particularly for individuals, given that most academic staff do not have the technical skills 'required to develop educationally stimulating, digital learning materials that involve students actively in the learning process, and accommodate diverse learner needs' (Brahler et al., 1999, p46). However, even if the teaching role is kept distinct from that of resource development, there are still many demands on time relating to changing teaching practices.

Apart from the difficulty in obtaining release time there may actually be disincentives to change given that reward structures often give little, if any, weight to this work (Hagner, 2000). Many authors argue that there is little reason for academics to invest time in teaching innovations when this is not recognised in tenure or promotion decisions (Carr Jr, 1999; Donovan & Macklin, 1999; Edmonds, 1999; Spotts, 1999). Similarly, there may be some reluctance if there are questions regarding intellectual property (Donovan & Macklin, 1999).

The success of online teaching is strongly correlated with the 'timely provision of equipment and support' (Mason & Bacsich, 1998, p256). Without such support technology can actually interfere with learning (Cifuentes et al., 1997; Hara & Kling, 1999). Both students and staff may have problems with connection to the Internet, lack of training, incompatibility problems, software and hardware difficulties and network outages. With attempts to mainstream online teaching, problems may magnify as the use of technology increases if adequate attention has not been paid to problems of scaling-up (Mason & Bacsich, 1998).

While innovators are prepared to be relatively understanding of technical problems, the bulk of users are not likely to be as forgiving (Freeman, 1997). Their have been many failures in attempting to introduce technology in education because of the 'lack of equipment, time and training' (Hara & Kling, 1999).

As well as the level of technological support, lack of access to technology is a major barrier (Apple K-12 Education, 2000; Boddy, 1997; Dooley et al., 1999; Leigh, 2000). Even where technology is available, having to transport it for use in the classroom is often considered too much effort (Spotts, 1999). These were not important issues in the current study given that all academic staff members have Internet access from their office and adequate IT support including a phone hotline.

There is wide agreement that one of the most critical factors influencing adoption, particularly beyond the innovators, is the type and level of staff development provided (Bennett et al., 1999; Dickinson, Agnew, & Gorman, 1999; Ellis et al., 1998; McNaught, 1995; Sawers & Alexander, 1998; Stapleton, 1998). This highlights again the relevance of the current study.

2.7 Summary

The rate of online staff development is increasing in both higher education and the corporate sector. Nevertheless, traditional teaching is still the dominant paradigm. Previous studies have found a number of benefits for providing staff development online, particularly in relation to student measures of satisfaction and convenience. Nevertheless, disadvantages such as frustrations due to technical problems and difficulty in fostering participation are also reported. Given the relatively small number of evaluation studies of online staff development, the literature on the effectiveness of online teaching generally was examined. Again, measures related to improved student satisfaction such as convenience and access to teachers are often reported. However, in research into the effectiveness of online learning, as measured by improved grades, the majority of studies return a finding of no significant difference. Given this, it is perhaps more important to determine the conditions that promote learning that might be replicated in an online environment rather than attempt to measure the effectiveness of online teaching through comparative studies.

In respect to these conditions, the value of a constructivist approach is highlighted noting that many of the learning theories current research links with good teaching practice fit within such an approach. A learner-centred, constructivist approach is contrasted with a teacher-centred, information transmission model of teaching. In particular, the importance of dialogue and the need for rich learning environments linked to authentic problems is noted. The reasons for claiming a constructivist approach to the development of the 'Introduction to Online Teaching' module is provided in relation to the elements most common to constructivist views of teaching. These elements include dealing with authentic problems, having multiple representations of content and complex learning environments, encouraging social

negotiation and collaboration, promoting an understanding of meta-cognition, providing student-centred instruction and encouraging active engagement.

Given that the results of staff development are often disappointing there is a need to also examine theories of diffusion or adoption of innovations. The factors affecting adoption of technology in teaching include staff perceptions, computer literacy, workload and institutional barriers. The type and level of staff development is one of the factors that are critical in successful adoption. Instrumentalist theories of adoption are contrasted with deterministic theories. One of the instrumentalist models, the Concerns-Based Adoption Model, has been specifically designed to assist in promoting systemic change in education and has been previously linked to constructivist approaches. This study uses two of the tools from this model – stages of concern and levels of use.

The next chapter describes the use of these tools as well as the other methods of data collection and analysis chosen to fit within a case study approach based on a descriptive/interpretive methodology. The rationale for choosing this approach is also detailed.

Chapter 3 Method

3.1 Introduction

Given the nature of the sample, the positivist paradigm was not necessarily the most appropriate for this study. As participation is voluntary, and the number of participants impossible to ascertain in advance, there are difficulties in obtaining a representative and random sample. In addition, the complexity of educational change means that the identification, let alone control, of relevant variables is virtually impossible. Typically the causes or manifestations of educational change are not simple (Stake, 1995). In this study, the principal research question invites interpretation rather than an investigation for cause and effect. Indeed, 'human actions are seldom simply caused and usually not caused in ways that can be discovered' (Stake, 1995, p39).

While a variety of non-experimental approaches could be chosen, Burns suggests that the case study is 'the preferred strategy when the investigator has little control over events, or when the focus is on a contemporary phenomenon within a real life context' (Burns, 2000, p313). Given this context, the previously mentioned constraints and the bounded nature of the research problem a case study approach, based on a descriptive/interpretive framework, was chosen. This chapter details the methods, within this framework, that were used in order to answer the research questions.

3.2 Selection of subjects

In line with the research problem, subjects were all self-selecting volunteers. The problem this introduces to external validity is discussed in section 3.5. The site was open to staff at UWS who access PlatformWeb, although provision was made for participants who do not or cannot access PlatformWeb to enter. In order to keep the case as close to a natural setting as possible, colleagues external to the university, who heard about the site from other participants or from the researcher via conference presentations, were welcome to join the study on condition that they were identifiable in user tracking logs. Data concerning staff who did not participate, but

who had either expressed interest in the module or who did not proceed past the initial survey were analysed separately. This form of sample introduces considerable bias into the study and severely limits generalisablity. One report highlights the problems of collecting data over the Internet -

> 'That is where the awkwardness of e-survey arises. Investigators generally cannot determine, - even guess the size of the population they are interested in; cannot guess the number of subscribers sitting at keyboards exploring the Internet. The awkwardness is also compounded by lack of representativeness' (Hill, 1998)

This limitation of sampling is discussed along with other methodological problems in section 3.5. Nevertheless, Hill states that small sample sizes are justifiable when 'the research involves in-depth case study' where 'enormous amounts of qualitative data are forthcoming from each, individual respondent' (Hill, 1998). As well as large amounts of qualitative data this study includes large amounts of individual quantitative data from log files.

3.3 Methods of data collection

> 'Any research method chosen will have inherent flaws, and the choice of that method will limit the conclusions that can be drawn. It is therefore essential to obtain corroborating evidence from using a variety of methods' (Scandura & Williams, 2000, p1249)

One of the characteristics of case study research is the collection of considerable detail, from multiple sources, about the case in question (Clarke, 2000). In addition, given the low degree of external validity based on a volunteer sample, it was important in this study to apply triangulation from multiple data sources.

The case study approach is often associated with the qualitative research paradigm. However, it does not necessitate a purely qualitative approach. Some researchers have concerns about mixing methodologies from different philosophical traditions, but mixed-mode approaches are not uncommon in education research.

> 'Purists argue that qualitative and quantitative approaches derive from different, mutually exclusive .. assumptions…, pragmatists argue for the integration of methods that can be used fruitfully for corroboration, elaboration or initiation' (Rossman & Wilson, 1984, p1)

Shotsberg & Crawford (1999) recommend collecting qualitative data in addition to SoCQ data in order to identify teacher concerns more precisely. Similarly, McMahan, Gardener, Gray & Mulhern (1999) note that qualitative data can enrich the interpretation of quantitative data.

In order to enhance internal validation, data collection involved a range of qualitative and quantitative measures. The possible quantitative characteristics that could be collected were extensive. However, a common complaint about case study research is that it may produce 'a massive deluge of information which is impossible to adequately analyse' (Burns, 2000, p327). Apart from the issue of overload it was important to restrict data collection based on the theoretical framework, relationship to the research problem and ethical considerations. The characteristics chosen for collection based on these criteria are shown in the following table.

Table 3-1 Data collection

Data Collection Technique	Characteristics Selected
User tracking in log files	Staff (or external) ID
	Staff type
	Staff level
	Gender
	Pages accessed
	Time and date of access
	Calculated length of access
SoCQ survey (online)	SoC profile
Open ended questions (online)	
Interviews	
Workshop invitation (online)	Staff ID
	email address
Email and discussion transcripts	

Server log files automatically collected additional data, such as browser type and IP address, which were not used in the current study.

3.4 Time frame

Hill notes the problem of determining an appropriate time frame in this type of study -

> 'If in a naturalistic setting, or a single-subject case study, how many independent observation sessions are required? For example, if observing a listserv group, and measuring the number of times people from different countries log in or contribute to the discussion, then how many hours of observation are required; on how many days do I need to observe this?' (Hill, 1998)

This was the first time a site like this had been implemented at UWS so there was no historical data to base a decision on. However, in order to compare patterns of use during teaching and non-teaching periods the site had to remain active until at least the conclusion of one vacation period. Final development and testing of the site concluded on 20 June 2000. The site was launched the day after, 21 June 2000. The next inter-semester break did not end until 10 October 2000 and it was thought that this would allow time for sufficient data collection so this became the closing date for the site. Interviews took place after this.

When the site was opened, staff were told that the site would close after ten weeks on 14 September 2000. This was done to prompt staff to use the site from the beginning. On 7 September 2000 an 'extension of time' until the end of the inter-semester break was announced via 'm-general' - an email list sent to all staff at both campuses of UWS, Macarthur.

3.5 Limitations

3.5.1 External Validity

The use of case study research ranges from clinical examination of a single atypical case through to pilot studies preceding major investigations. For this research, the aim was to examine in detail a case that was typical of many others in order to 'provide insights into the class of events from which the case has been drawn' (Burns, 2000, p314). However, Burns goes on to warn that there is no way to know how 'typical' a case is and that it is 'therefore hazardous to draw any general conclusions' (Burns, 2000, p314). This study proceeded at a time when two

important atypical events were occurring– the Olympic games and a major restructuring of the university (although some may argue that restructuring in higher education is the norm). Nevertheless, the case is typical in the sense that many other higher education institutions are developing online staff development modules to be undertaken on a voluntary basis. However, the fact that the results were obtained from a non-random volunteer sample also poses a threat to external validity and generalisations must be made with caution.

On the other hand, Stake notes the importance of naturalistic generalisations – 'conclusions arrived at through personal engagement in life's affairs or by vicarious experience so well constructed that the person feels as if it happened to themselves' (Stake, 1995, p85). Thus, while the hope of generalising from a single case is small, others may be able to learn much that is general from a single case.

> 'They do that partly because they are familiar with other cases and they add this one in, thus making a slightly new group from which to generalize, a new opportunity to modify old generalizations' (Stake, 1995, p85)

Atkinson & Delamont (1985) criticise this as it appears to give the consumers of research the power to define what counts as knowledge. This seems antithetical to the constructivist viewpoint where knowledge is regarded as being constructed by the individual. Thus, the reader is encouraged to make connections that are relevant to their own situation.

3.5.2 Internal Validity

How well do the results represent reality? Threats to internal validity in this study include history, instrumentation, researcher bias and non-random sampling.

From some constructivist perspectives this is not an issue. For instance, Miles & Huberman (1994) claim that there is no objective or unambiguous social reality 'out there' to be found. Similarly, Clark (2000) notes that 'interpretivists question whether objectivity is attainable, or even meaningful'. Even if an objective reality is assumed, perception can often be more important than what is true, particularly with the adoption of innovations.

Steinbeck gives a good illustration that knowledge is dependent on context and perspective. Consider a scientist, who takes a fish from a jar in a laboratory, examines it and writes down correctly D.XVII-15-IX as the number of spines in the dorsal fin.

> 'The man with his pickled fish has set down one truth and has recorded in his experience many lies. The fish is not that colour, that texture, that dead, nor does it smell that way' (Steinbeck in Reeves, 1993, p16)

Nevertheless, without efforts to minimise threats to internal validity questions about rigour and credibility may arise. In this study, these efforts included unobtrusive collection of log data, triangulation of data, a member check of preliminary findings, the use of a validated instrument (SoCQ) and efforts to identify and explain negative results.

3.5.3 Determining causal relationships

Lu et al. (2000) claim that Web logs enable us to explore the plausibility of a causal relationship by comparing user behaviour with outcomes such as exam scores. However, in this study, only one participant met the level required for administering the post-SoCQ survey (see section 3.7.5) so there was little data available from outcomes measured in this way. In addition, the findings stem from a descriptive/interpretive research design without the use of statistical inference, so it is beyond the scope of this research to determine whether any of the relationships discussed represent causal ones. This is a limitation, not a fault.

> 'There will be times when all researchers are going to be interpretive, holistic, naturalistic, and uninterested in cause' (Stake, 1995, p46)

Nevertheless, while causal relationships cannot be proven, analysis of the data may suggest such relationships, which could be examined experimentally in future research.

3.6 Ethical Considerations

All aspects of data gathering and reporting were explained clearly in plain language either via the web-based (Figure 3-4) or paper-based (Appendix A) research consent forms in which participants were asked for free and informed consent. Participants were free to withdraw consent at any time. Confidentiality and data storage

conformed to guidelines. Names on transcripts were replaced by codes. Ethics approval was obtained from the Northern Territory University.

3.7 Procedure

3.7.1 Registration of Interest

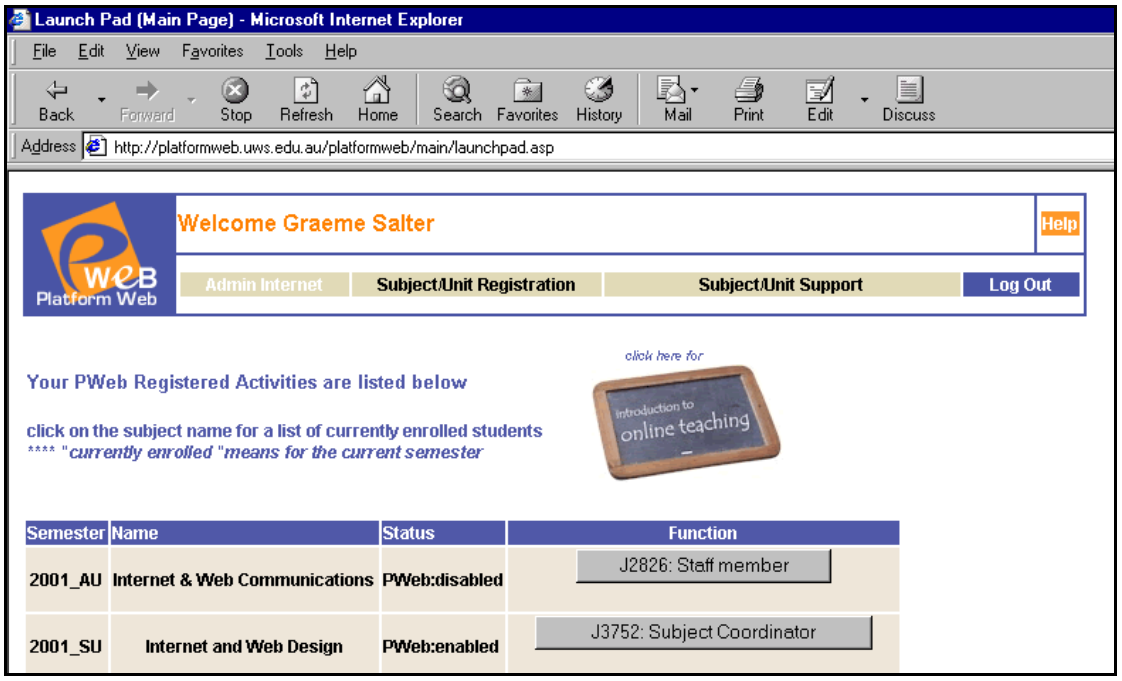
On 31 May 2000 an invitation to register interest in the online staff development program was issued via 'm-general' (see Appendix C1). This invitation elicited seventy seven positive responses from staff.

3.7.2 Launch of Site

The site was developed during Semester 1, 2000 and went live on 21 June 2000. All staff who had expressed interest were notified of this via email (see Appendix C2).

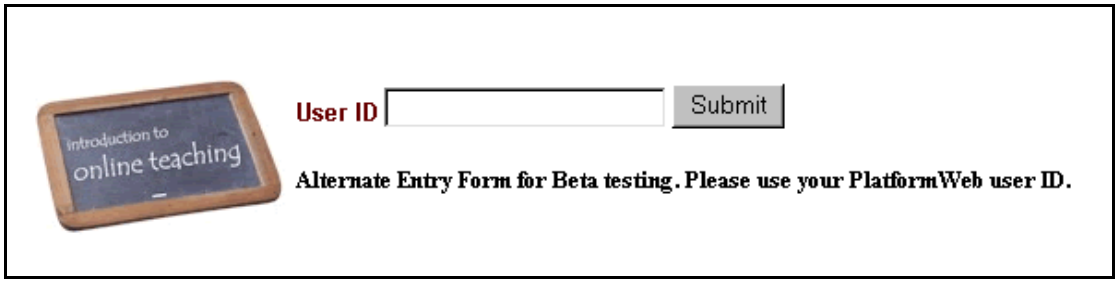
For staff, entry into the site was via a button shaped like a blackboard (the logo of the site). In order to have the entry point easily accessible and repeatedly seen, it was deliberately located inside the LaunchPad of PlatformWeb as shown in Figure 3-1.

Figure 3-1 Entry to the site via PlatformWeb



As some participants did not have access to PlatformWeb an alternative access point via another web page was provided.

Figure 3-2 Alternative entry point

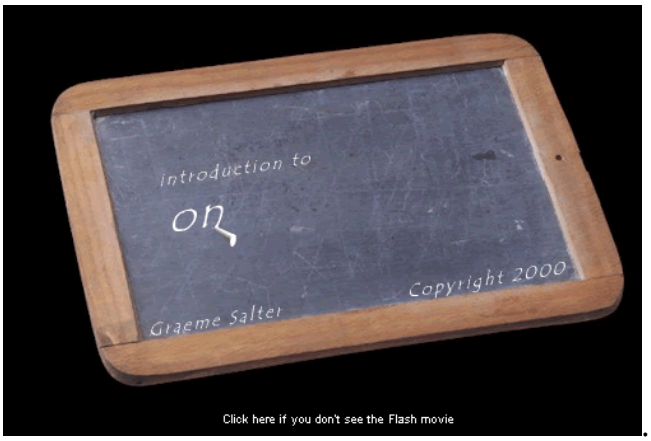


In order to control access and correctly identify external users from logs, use of the alternative entry point could only be done using a unique ID provided by the researcher.

3.7.3 New Users

The ID of users entering the site was checked against the log to see if they were a new or returning user. If the user was new their browser was 'sniffed' to see if it could handle Flash animations. If it could, they were presented with an animated logo. This was done as an example of what could be done, but more importantly, to generate interest in further examining the site. The animation consisted of a piece of chalk writing out the last part of the title 'online teaching'. If their browser could not open the animation they moved straight to the Research Consent page.

Figure 3-3 Opening animation for new users

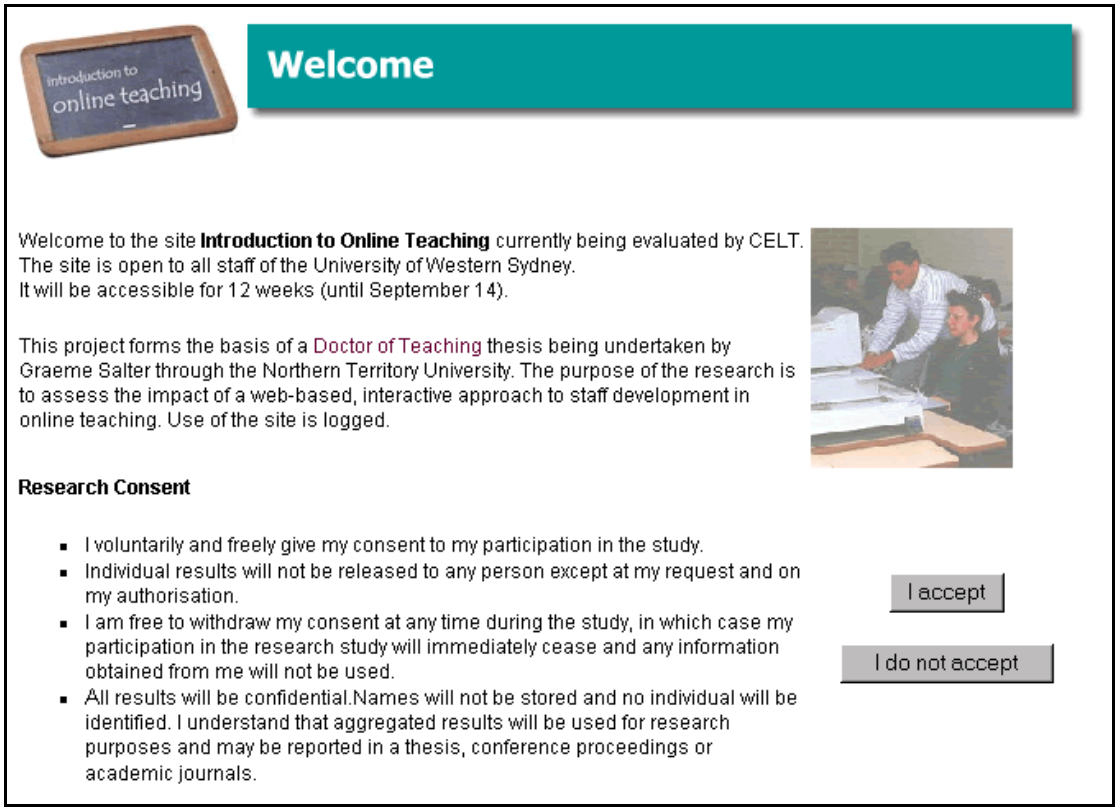


Returning users by-passed the opening animation and survey and moved straight to the home page of the site.

3.7.4 Research Consent

The Research Consent form was placed on the Web so that any member with access to PlatformWeb (nearly all academics and many general staff members across UWS) could gain immediate entry to the site by accepting the conditions on the page. Staff who clicked on the 'I do not accept' button were returned to PlatformWeb.

Figure 3-4 Web-based research consent form

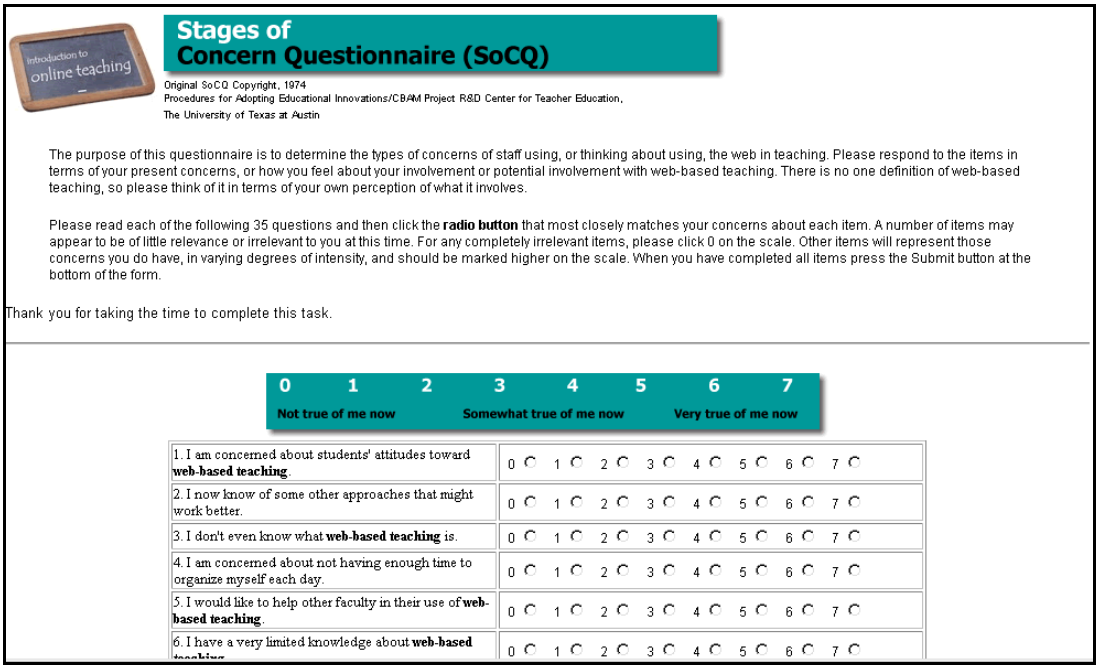


Initially, staff who clicked on the 'I accept' button were directed to the Stages of Concern Questionnaire.

3.7.5 Stages of Concern Questionnaire

The SoCQ as described in Chapter Two was delivered online and the results stored directly into a Microsoft Access database. Figure 3-5 (over page) shows the top of the online SoCQ form. The full text can be found in Appendix B.

Figure 3-5 Online SoCQ survey



Stages of Concern Questionnaire (SoCQ)

Original SoCQ Copyright, 1974
Procedures for Adopting Educational Innovations/CBAM Project R&D Center for Teacher Education,
The University of Texas at Austin

The purpose of this questionnaire is to determine the types of concerns of staff using, or thinking about using, the web in teaching. Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with web-based teaching. There is no one definition of web-based teaching, so please think of it in terms of your own perception of what it involves.

Please read each of the following 35 questions and then click the **radio button** that most closely matches your concerns about each item. A number of items may appear to be of little relevance or irrelevant to you at this time. For any completely irrelevant items, please click 0 on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale. When you have completed all items press the Submit button at the bottom of the form.

Thank you for taking the time to complete this task.

0	1	2	3	4	5	6	7
Not true of me now			Somewhat true of me now			Very true of me now	

1. I am concerned about students' attitudes toward **web-based teaching**.	0 1 2 3 4 5 6 7
2. I now know of some other approaches that might work better.	0 1 2 3 4 5 6 7
3. I don't even know what **web-based teaching** is.	0 1 2 3 4 5 6 7
4. I am concerned about not having enough time to organize myself each day.	0 1 2 3 4 5 6 7
5. I would like to help other faculty in their use of **web-based teaching**.	0 1 2 3 4 5 6 7
6. I have a very limited knowledge about **web-based**	0 1 2 3 4 5 6 7

The questions were grouped into 5 groups of seven and the rating scale repeated before each group so that it would remain visible even as the user scrolled down the screen. After pressing submit, the form was validated to check that each question had been answered otherwise the user would be prompted to complete all the questions.

The SoCQ was primarily administered to see if there were any relationships between concerns and patterns of use. However, after closing the site the SoCQ was re-administered to participants who interacted significantly with the site to see if use of the site had caused a shift in concerns. The level of interaction was arbitrarily defined as ten sessions and/or two hours (the time of a short workshop). Even at this level of use significant changes were not necessarily expected as these changes usually occur after long-term interventions (Crawford et al., 1998; McKinnon & Nolan, 1989; Norton & Sprague, 1998).

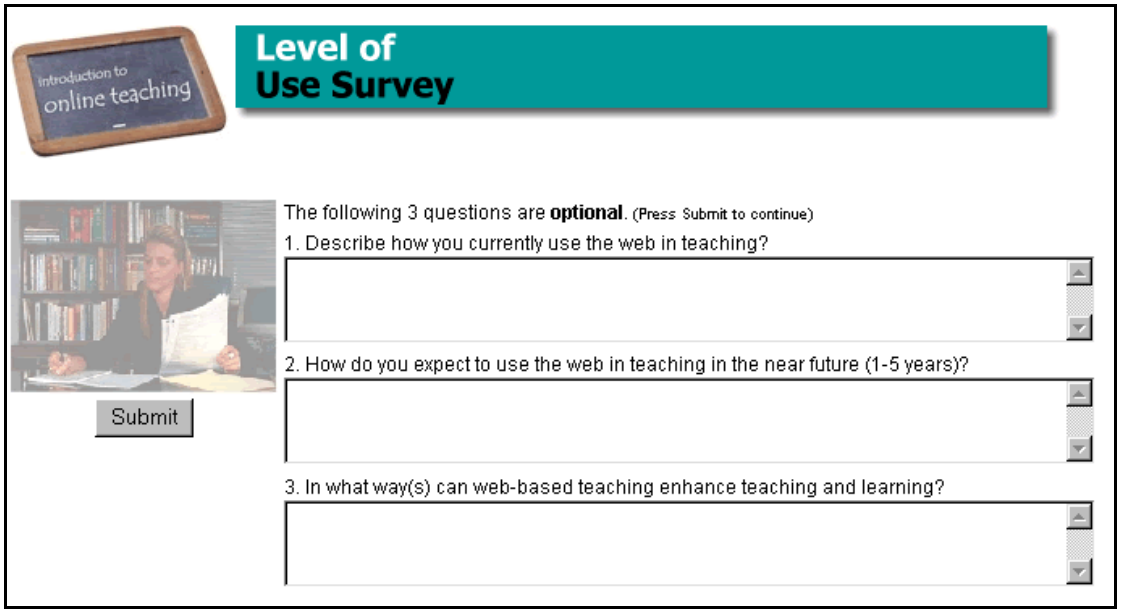
3.7.6 Level of Use (LoU) Survey

Three open-ended questions were asked –

1. Describe how you currently use the web in teaching?
2. How do you expect to use the web in teaching in the near future (1-5 years)?
3. In what way(s) can web-based teaching enhance teaching and learning?

The questions were optional and could be left blank.

Figure 3-6 Level of Use survey

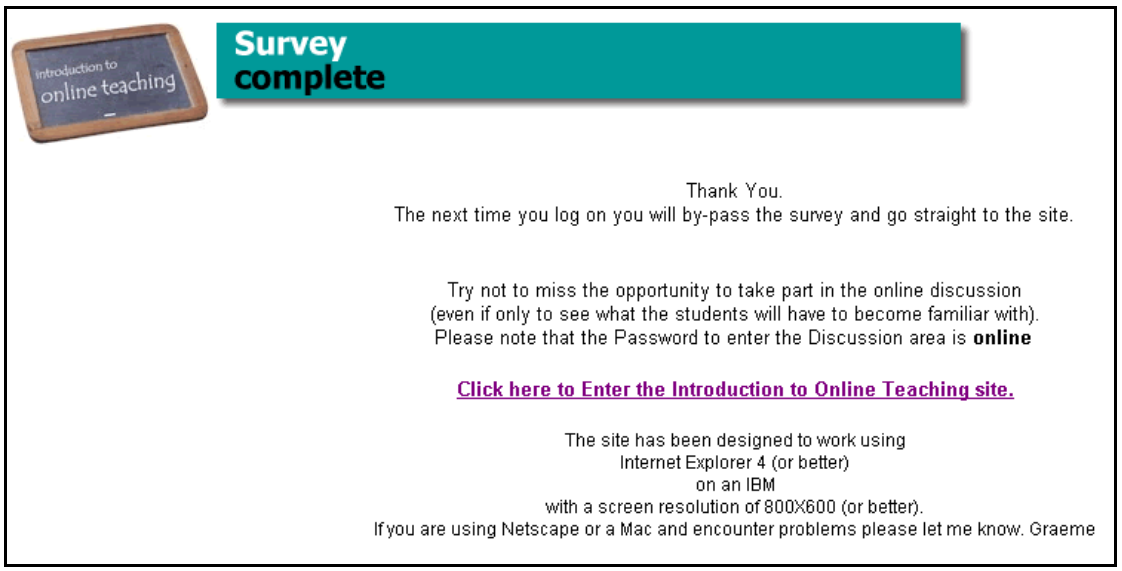


On completion of the LoU survey the users went to a screen expressing thanks, encouraging participation in the discussion area and giving some technical details such as the discussion area password and the best browser and resolution to use (see Figure 3-7).

3.7.7 Log Files

Maintaining an audit trail of user interaction with the system in log files has several advantages. Data collection is unobtrusive - collected in a naturalistic rather than contrived setting (Salter, 1995), and longitudinal - based on continuous monitoring rather than post-test only (Lu et al., 2000). Observer bias is reduced as the logs are recorded automatically by computer.

Figure 3-7 Information when survey completed



All activity of the site was recorded in log files. The Research Consent form noted that use of the site was logged. Automatic log files generated by the server were stored as text files on the server. These files record all activity of the server, but it is difficult to calculate the time spent on individual pages. In addition, the site required a basic form of security so that the user ID would be available to match with use. Therefore, the pages in the site were converted from HTML (.htm) files to Active Server Pages (.asp) to allow code to be included that used session variables to –

1. check if the user was valid
2. log off invalid users
3. calculate and record the time spent on each page
4. keep user and researcher data in separate log tables

The code written in Visual Basic (see Appendix D) was saved as a text file and inserted at the top of every web page as an include file. The time spent on the final page viewed could not be recorded using this technique so this was later calculated from the server log files.

The ASP generated log file was stored in a Microsoft Access database with the following fields –

Table 3-2 Log file fields

Field Name	Description
Session number	A unique session ID
User ID	Unique ID – staff or student ID or ID given to external participant
Timeon	The number of seconds the user had the page open
Pagename	The title of the page
currdate	The date and time of access

Both text logs and Access logs were copied every few days to another machine for back-up purposes. The Access logs were viewed at least once a week to monitor how participants were using the site.

3.7.8 Workshop Invitation

A form allowing participants to express interest in a face-to-face workshop on aspects of real-time communication such as chat and desktop video conferencing was placed on the 'How do I do it?' page under the topic 'Real-time communication'. The form was linked to an Access database to store responses. The database was checked for entries when backups of logs were made.

3.7.9 Reminders

As well as the reminder to staff who had expressed interest, a number of other reminders were made.

An email message (see Appendix C3) was sent on 27 July 2000 to all participants who completed the SoCQ to stimulate continued interest in the site and encourage online discussion

Another email message (see Appendix C4) was sent to make entry as easy as possible by providing a direct hyperlink and noting that the survey had been removed (see Section 3.9 noting changes to the planned procedure).

On approximately three occasions, participants were given a verbal reminder to participate in the online discussion during 'corridor encounters'.

3.7.10 Email and discussion area transcripts

All email correspondence and entries into the discussion areas were stored for later analysis. Search and replace functions were used to change names to codes.

3.7.11 Interviews

The sampling strategy follows the maximum variation typology as noted by Miles & Huberman (1994). Fifteen participants representing a range of users who varied considerably in their level of use of the site were invited via email (See Appendix C5) to participate in an interview.

Of these, ten were willing to participate. Two of these were unable to arrange a suitable time given other commitments and one left the university leaving seven participants in total. The available number still represented the full range of users - from a participant viewing a total of 6 pages over 1 session through to a participant viewing 184 pages over 16 sessions. Because of this and the fact that the data was to compliment significant amounts of other data, this number of interviews was considered to be sufficient.

The interviews took place at all participants' convenience, usually in their offices. All interviews were audio-taped, and tapes from the interviews were transcribed and coded throughout the data collection process.

Participants were asked to read and sign the consent form (see Appendix A) if they agreed and to note whether they also agreed to a) the interview being audio-taped and/or b) providing access to their online subjects.

Table 3-3 Profiles of participants interviewed

	Name (fictional)	Gender	Concerns profile	Pages accessed	Sessions	Minutes online
I-1	Sandra	Female	Personal	30	8	8
I-2	Maheesha	Female	Personal	6	1	2
I-3	Sahed	Male	Unknown	41	2	4
I-4	Kay	Female	Collaboration	16	2	17
I-5	John	Male	Management	20	1	7
I-6	Tim	Male	Personal	31	2	27
I-7	Susan	Female	Collaboration	184	16	486

3.7.12 Interview Guide

The interviews were semi-structured. The following questions were used as a guide, but did not restrict the scope of the interview.

- What would you classify your computer literacy level as?
- How do you use technology in teaching now?
  How do you think you will use technology in teaching in the near future?
- What factors did you like about the Introduction to Online Teaching module?
- What factors didn't you like about the Introduction to Online Teaching module?
- What improvements would you suggest for the module?
- List 3 points you remember from the module.
- Did you like the fact that you could roam around the module freely or would you prefer more structure?
- Do you think it will impact on the way you teach? If so, in what way(s)?
- How have you undertaken staff development in the past?
- What role do you see for the Web in staff development?

- What are the three greatest barriers preventing you from
    - undertaking staff development
    - using technology in teaching
- In what way(s) has your use of technology in teaching enhanced teaching and learning?

3.8 Changes to Planned Procedure

> 'Few case studies ever proceed exactly as planned. Inevitably, changes are made as new evidence comes to light and the focus can even change' (Burns, 2000)

It became apparent early on that the SoCQ was a major disincentive to enter the site. After a little over one month from the site opening, monitoring of the log files revealed that, two-thirds (48) of the seventy-two consenting to the research did not proceed any further. In addition, the addition of an up-front survey reduced the generalisability of the findings by making the site a research-oriented rather than staff development oriented site. As enough responses had been received to examine patterns it was decided to remove the SoCQ survey requirement. The open-ended questions were retained at this time as they could be left blank.

Before August 2000, only one response to the open-ended questions had been left blank. During August this number increased rapidly to six, so after collecting thirty responses it was decided to remove the open-ended questions as well in order to maximise participation and reflect on online staff development site more realistically. This survey was removed on 6 September 2000 and the email reminder described previously offering 'Free entry to online teaching web site' sent to all UWS Macarthur staff the next day.

Those who did consent to the research, but didn't return to the site subsequent to the 'free entry' were followed-up with an email message (see Appendix C6).

3.9 Data Analysis and Presentation

Due to the research design, the numeric results are necessarily descriptive. Qualitative data was coded in an iterative process until a logical structure and themes emerged. Where possible results were triangulated with special attention given to negative or contradictory findings.

The results of the study are presented in the next chapter. A small number of students, conducting research into e-learning with access to the teaching section of PlatformWeb, entered the site. Given their low number (4) and the fact that the focus was on staff development, no conclusions were drawn from their participation. Where appropriate, quotes from the interview transcripts are included in the discussion using the fictional names listed in table 3-3. Other participants are listed by their coded ID number (eg. participant 8). Email responses came from both participants and non-participants and are not identified in any way unless relevant to the discussion (eg. email reply from lecturer).

Chapter 4 Results & Discussion

4.1 Introduction

In Chapter One the following research questions were posed.

> **What is the degree of use, pattern of use and impact of a voluntary, online staff development module, aimed at improving online teaching, developed following constructivist principles?**
>
> **Do user concerns or current levels of online teaching influence the degree of use, pattern of use and impact of the module?**
>
> **Are the findings consistent with current theories or do they point to possible modifications or new understandings?**
>
> **What factors or strategies might lead to increased participation and effectiveness of online staff development?**

This chapter examines the findings of the research in relation to the first two of these questions. In particular, was the site used, how was it used, what factors influenced patterns of use and did use of the site make a difference? Chapter Three pre-empted one of the results of the study. The use of up-front surveys is a major disincentive to entry. This result was not entirely unexpected. Similarly, the analysis of use of the site uncovered results that could well have been predicted. Nevertheless, not all of the results were as anticipated. Overall, the findings led to a considerable revision of the model of online staff development originally presented. These revisions, along with the theoretical and practical implications concerned with the remaining research questions above, will be examined in greater detail in the final chapter.

4.2 The use of online staff development

4.2.1 Degree of Use

The number of records in the automatically generated log files suggested that a great deal of activity had taken place. Log file statistics are often used to highlight the success of a web site. However, they can be misleading as they record all activity not just 'hits'. For example, if a page with two pictures is loaded this will record three entries in the log, one for the page and one for each picture file loaded. Nevertheless, even after correcting for this, a lot of activity did occur. The custom log file maintained separately, which did record hits, showed that a total of 1443 pages were accessed during the research period.

Sixty-three people accessed the site during this time while the SoCQ survey received 27 responses and the LoU survey 31 responses. The list of staff names included some that were 'regulars' at staff development activities, but also others who I did not recognise from these activities. Not all of those involved were staff members. All of the external participants were academic developers. The following table shows the breakdown of participants -

Table 4-1 Breakdown of participants

Type	Number of Participants	Completed SoCQ	Completed LoU survey
Staff	51	23	26
External	8	4	5
Students	4	0	0
TOTAL	63	27	31

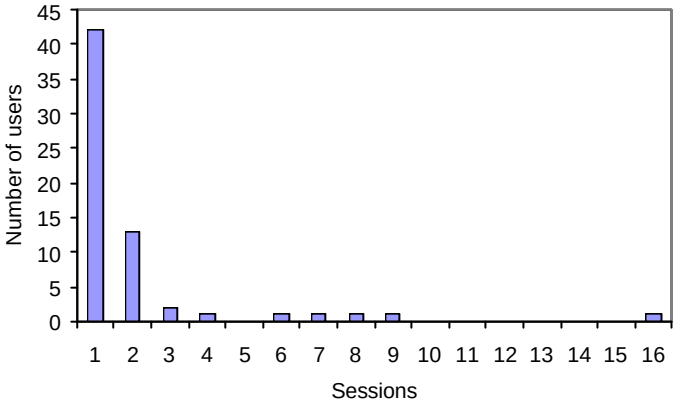
The number of participants (63), the completion of surveys and the number of pages viewed (1443) would seem to indicate that the site was successful. This assumes that accessing a site is a valid measure of success. However, these figures do not tell the whole story. A closer examination of the log files revealed deficiencies with the site.

4.2.2 You can lead a horse to water…

The site was developed with the expectation that staff would use it as a resource and return often. However, as Figure 4-1 shows, the vast majority of users went to the site only once or twice. While this activity, referred to as 'churn', is rarely referred to in educational literature it is quite well known in other disciplines such as e-commerce and marketing.

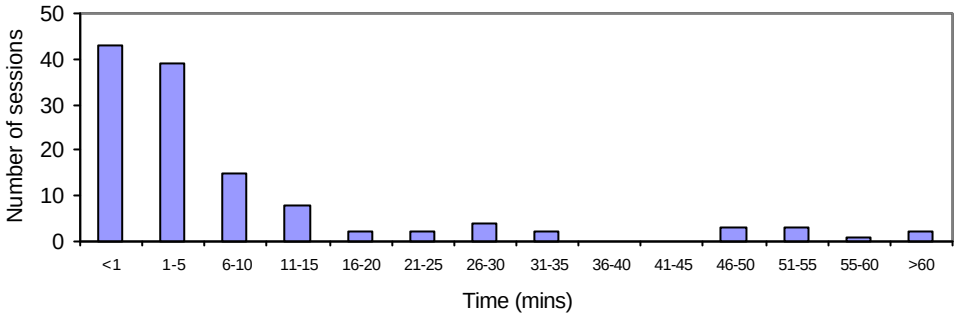
> 'Once you've lost a customer, you've lost him for good. The costs of flipping to another Web site are so low it doesn't make any sense for people to go back to a site that failed them the first time. In the Web world, this phenomenon is called churn. People check out your site once or twice and never return' (Kuniavsky, 1998)

Figure 4-1 Count of sessions by users



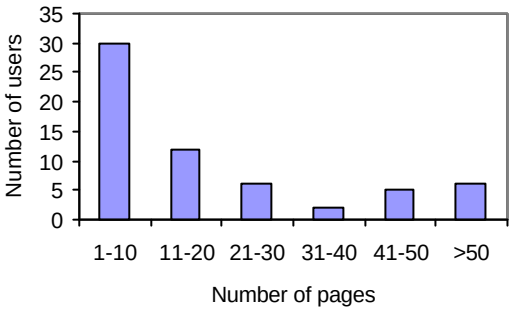
The amount of time spent at the site showed a similar pattern. The majority of sessions lasted for five minutes or less. This is also reflected in e-business research. Neilsen (2000) suggests that the attention span of an e-commerce transactor has gone down from twelve seconds to about five seconds.

Figure 4-2 Time spent at site



Given the low amount of time spent it is not surprising that the average number of pages viewed was also low.

Figure 4-3 Number of pages accessed by users



Part of the attraction of providing staff development online as a voluntary rather than a formal or accredited program, is that staff can use it as they see fit. Of course, this means that they may not use it as expected or as was intended. In traditional workshops staff tend not to walk out when unsatisfied, if only through politeness. On the Web a hasty exit is only a mouse click away. As one participant said –

> SUSAN: *'Anything past about 2 clicks for me, the 3rd click often doesn't get me there'*

As noted in the previous chapter, the SoC questionnaire and the LoU survey were major disincentives to entry and both were eventually discontinued. Responses from staff who entered the site but did not complete the survey include –

> Email response: *'I was curious to see what online teaching was about but when confronted with a survey, I decided to exit and return later'* [she didn't]

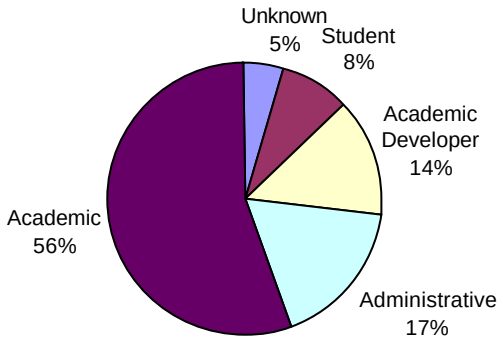
> Email response: *'I was just browsing so I had a quick look. The moment I realised that I had to concentrate on something for more than a minute I ran away. ..I will come back one day'* [he didn't]

The problem of churn had a significant effect on this site. Methods to minimise churn will be discussed in the next chapter. Thus the site had gone from an apparent success to an apparent failure at a different level of analysis. However, it was still not known whether the problem associated with churn was uniform across all different staff types and levels. In particular, was the target audience less affected?

4.2.3 Access by staff type and level

While the majority of participants were academic staff, they were certainly not restricted to this category as the following graph indicates.

Figure 4-4 Participants roles (n=63)



As a group, the second largest number of staff entering the site were administrative staff. This was surprising given that the site was clearly about online teaching. However, administrative staff have been increasingly using PlatformWeb for its administrative functionality, such as timetabling, tutorial registration and exam results processing. Given the ease of clicking on the entry button, curiosity rather than a desire to learn about online teaching may have led to access by some. If so, it was probable that this category contributed proportionally more to the large initial dropout. One administrative staff member mentioned this explicitly.

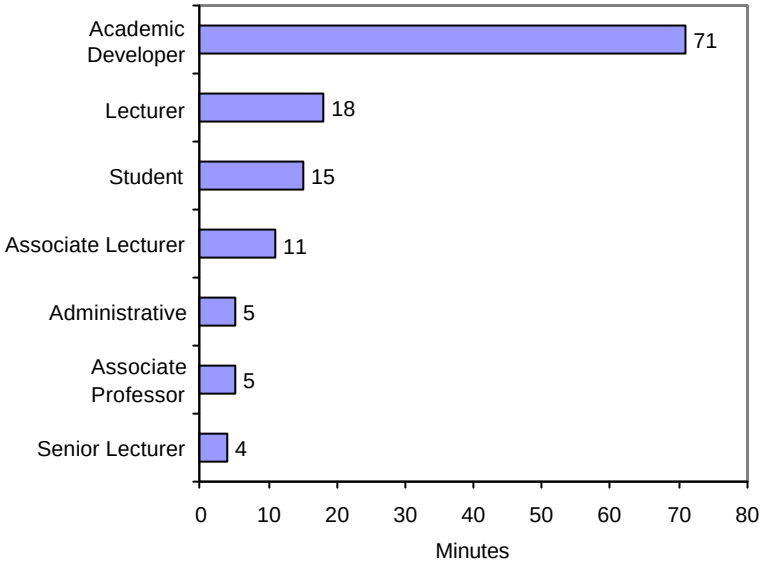
> Email reply: *'I don't recall, but I would imagine that I probably stumbled across it by accident. As I don't teach (admin staff) I probably wont go back'*

Interestingly, the curiosity factor was not restricted to administrative staff.

> Email reply from lecturer: *'I visited the site out of curiosity but not for any teaching or learning'*

The amount of time spent on the site varied widely based on the type of participant. While the site was developed to assist lecturers new to online teaching the site was used most extensively by academic developers.

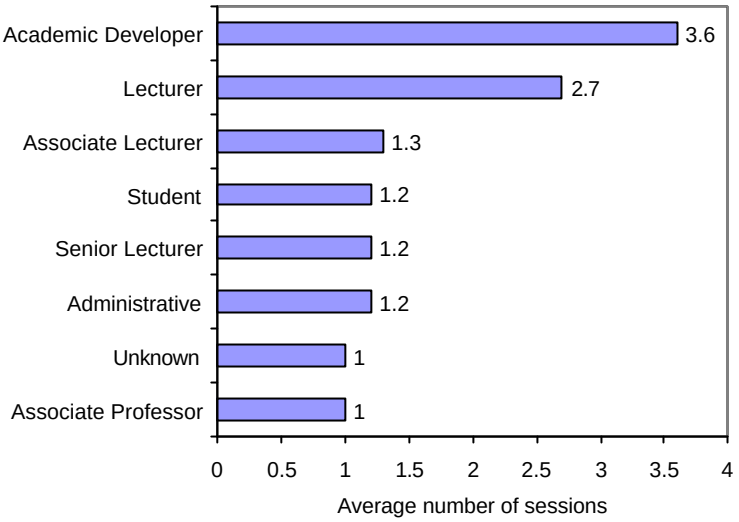
Figure 4-5 Average time on site by staff type



In Australia, the average time spent on Web sites is approximately 24 minutes (Kroder et al., 1998). While the figure for academic developers clearly exceeds this, the figure of 18 minutes spent by lecturers is comparable. Gillham & Hall (2000) monitored the use of an undergraduate online course and found that the length of visits ranged from 2 – 90 minutes with an average of 14 minutes. The average times spent by lecturers, students and associate lecturers are roughly comparable to this. Nevertheless, these figures must be compared with caution as the average time on site in this study is calculated over all visits rather than a single visit.

While most groups averaged around one visit, academic developers and, to a smaller degree, lecturers demonstrated repeat access.

Figure 4-6 Average number of sessions per staff type



It can be seen that the problem of churn was not uniform. There are a number of possibilities as to why certain groups did not return. The site was not designed for the needs of administrative staff or students. Senior academic staff may be under more severe time pressures, particularly during a time of restructuring.

> Email response: *'this was an unusual year with the long Olympic break and restructuring causing a number of time pressures'*

However, it was disappointing that one of the main target groups, associate lecturers, was also in this category. Associate lecturers at UWS are often involved in the teaching of subjects with large class sizes. This may put increased restrictions on their available time. In addition, they may be less likely to coordinate subjects, particularly those with smaller numbers that may be more amenable to certain online strategies, such as online discussion. Thus, while many express interest in online teaching, they may have less opportunity to design and implement online strategies at this stage.

The other major target group, lecturers, did exhibit repeat access and spent an amount of time commensurate with other statistics in terms of time online. The unexpected result arising from the analysis of the logs is the large degree of use by academic developers. This result was also reflected in the analysis of use relating to concerns profile.

4.3 Relationship of concerns profiles to patterns of use

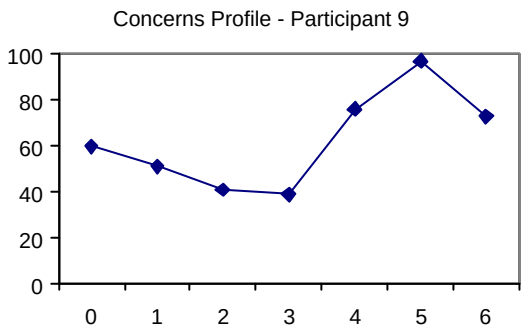
4.3.1 Types of Profiles

For each participant who completed the SoCQ, a concerns profile was drawn up. This section describes the types of profiles identified and gives an example of each. The relationship of these profiles to patterns of use is discussed in subsequent sections.

- Single Peak User Profiles

Studies have found that the most frequently occurring profiles have a single peak at either Stage 3, 4, 5 or 6 (Hall et al., 1986). The interpretation of these profiles relate to the stage that has the highest score. For example, the profile for participant 9 shows a peak at Stage 5 Collaboration concerns, which suggests that this individual is most intensely concerned about collaborating with colleagues or others to coordinate the use of online teaching.

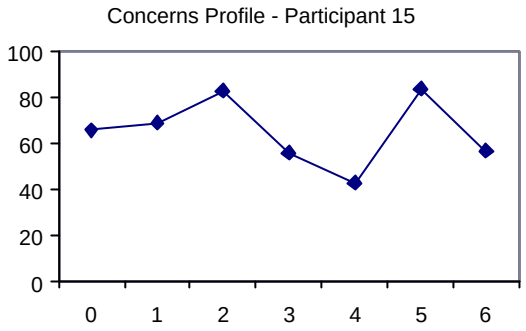
Figure 4-7 Profile showing high collaboration concerns



- Multiple Peak User Profiles

Less commonly users exhibit multiple peaks.

Figure 4-8 Profile showing high personal and collaboration concerns

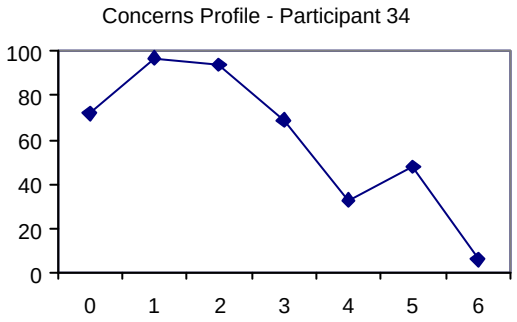


In these instances the users were classified with the category exhibiting the highest concerns.

- Positive Nonuser Profile

Previous research has found that the nonuser concerns profile tends to stand out the most consistently and clearly (Hall et al., 1986). These individuals tend to have the highest concerns at Stages 0,1 and 2 and lowest at Stages 4, 5 and 6. Participant 34 exhibited a typical non-users profile.

Figure 4-9 Typical non-user profile



Users often confirmed this status in the LoU survey. For example, in response to the question 'Describe how you currently use the web in teaching, this participant (34) stated 'I do not use it at all at present'.

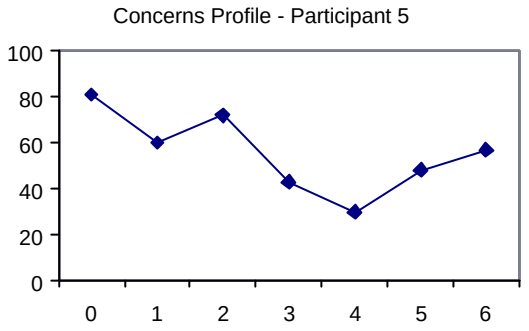
The low tailing-off Stage 6 score suggests that this participant didn't have potentially competitive ideas regarding the innovation. This type of profile reflects an

‘interested, not terribly over-concerned, positively disposed nonuser’ (Hall et al., 1986).

- Negative Nonuser Profile

One form of nonuser profile deserves special mention. Doubt and potential resistance are indicative where a nonuser has higher personal concerns than those regarding learning about the innovation. This is even more pronounced if the individual has ideas that they see as having higher merit than the proposed innovation indicated where the Stage 6 concerns tail-up.

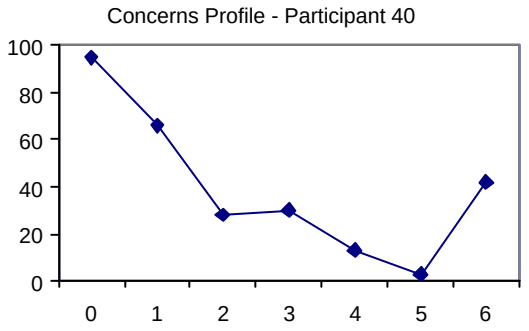
Figure 4-10 Negative non-user profile



- Unconcerned User Profile

One final type of profile was found, that of a user who is not concerned about the innovation as indicated by the very high Stage 0 score, particularly in relation to the other stages. Participant 40 was the only user who exhibited this profile.

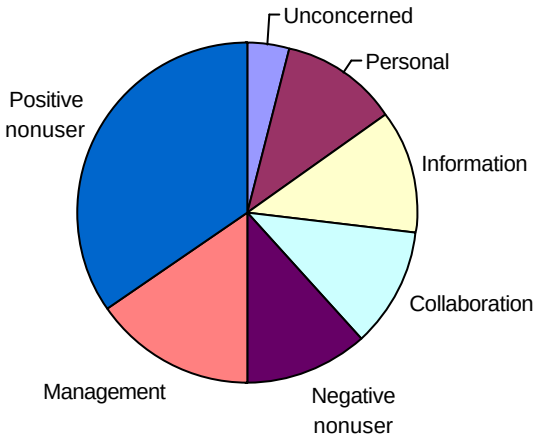
Figure 4-11 Unconcerned user profile



4.3.2 The frequency of profiles

The largest number of users taking the time to fill in the questionnaire and enter the site were nonusers who were positively disposed to online teaching. There was only one participant who displayed an unconcerned profile. Other than these cases, there was a fairly even spread of profiles among the participants. None of the users exhibited a peak at Stage 4 – 'Consequence' concerns or Stage 6 – 'Refocusing' concerns.

Figure 4-12 Frequency of profiles (n=26)

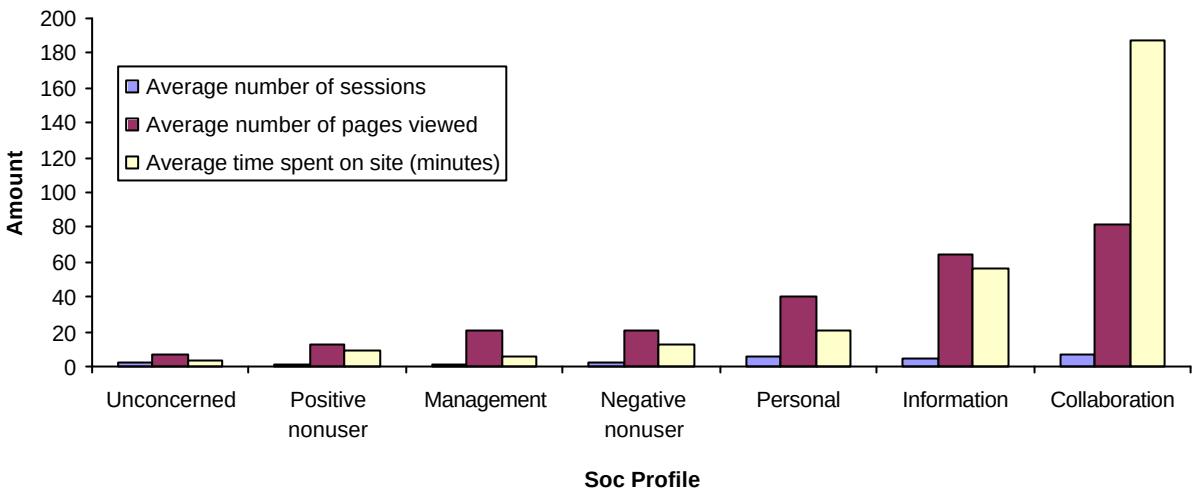


The level and role of staff in most categories showed some variation. However, all of those exhibiting collaboration concerns were academic developers.

4.3.3 Access by Concerns Profile

The frequency distribution suggests that the initial marketing was successful in targeting one segment of the intended audience ie. nonusers of online teaching. However, the patterns of access for profiles show a similar trend to that for type of user. While the majority of users attracted to the site were positive nonusers, this group did not view many pages while there.

Figure 4-13 Patterns of use per profile



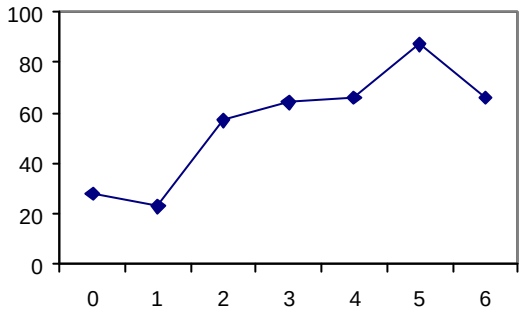
Again, the academic developers, those exhibiting high collaboration concerns, exhibited the largest degree of use. This particular finding will be explored further in the next section. Apart from this group, repeat use was generally associated with participants with high self concerns (personal or information) who were already using the web in teaching to some degree. This may be a reflection of the content of the site. However, staff who have already begun to use the web in teaching may be more highly motivated to develop further skills in the area. Nonusers, who by definition also have high self concerns, and those with high task concerns (management) were much less likely to return to the site after an initial short visit. This failure may also be related to the content of the site. Greater emphasis was provided on theoretical aspects and information related to 'what is online teaching?' rather than the practical issues of 'how do I go about teaching online?'. As noted previously, many staff development courses introducing online teaching focus on the mechanical aspects of getting material online. This approach may simply be a response to demand. The priority of nonusers may be to gain familiarity with the available tools before examining the pedagogical issues involved. That doesn't mean that such issues need be neglected, but methods to incorporate these into the process of learning mechanical aspects need to be employed. Possible methods will be examined in the next chapter.

The fact that none of the academic staff exhibited impact concerns (consequence, collaboration or refocusing) gives an indication of the immaturity of online teaching currently. At this stage, staff are still coming to terms with questions relating to self and task concerns such as 'I would like to know more about it?', 'How will using it affect me?' and 'How do I use it?'. As staff gain greater experience it is likely that they will move towards issues relating to impact concerns such as 'How is my use affecting learners?' and 'I have ideas for improving my use'. This conclusion has to be treated with caution as experienced online teachers may not have been attracted to a site entitled 'Introduction to Online Teaching'.

4.3.4 Need for Participatory Design

The author also completed the SoCQ on March 31 2000. The resulting profile shows a single peak at stage 5 indicating high collaboration concerns.

Figure 4-14 Profile of developer



The correlation with the pattern of use stands out. As an academic developer with high collaboration concerns the site developed by the author was most successful with academic developers with high collaboration concerns. This connection was specifically discussed by one participant (another academic developer) -

> SUSAN: *'I was in a site constructed by a person that was probably coming philosophically from the same point that I was coming from, so I felt a sort of synergy with the site and it would be interesting for, to talk to somebody else who came from a very different philosophical position or stance about teaching and learning, how they viewed it because I found quite a lot of the information was aligned with where I was currently at and my beliefs and my position about teaching and learning and my values about teaching and learning. So that was very compatible and it was easy for me to then work through the material. I wasn't confronted by the material, now that again could be good and bad'*

This problem has been found in other studies. McKinnon and Nolan (1989), found that ‘the initiators constructed early professional development activities to meet their own concerns rather than those of the teachers’. McKenzie (1999) notes the particular difficulty in designing professional development activities for ‘reluctants’ or negative nonusers. He found that technological enthusiasts, who typically design such activities, rarely understand reluctants or how they learn and often fail to address their very real concerns.

Today, anyone who dares question the implementation of new technology is often derogatorily labelled a ‘Luddite’.

> ‘In conversations with colleagues we have heard those faculty members who don't participate in such activities labeled "disinterested," "hard to reach," "resistant," and the putdown of last resort-"luddites”.’ (Donovan & Macklin, 1999)

The Luddites are usually considered as a group who set about the mindless destruction of machines in the early nineteenth century. A definition provided by the Concise Oxford Dictionary promotes this convention, labelling a Luddite as a person ‘engaged in seeking to obstruct progress’. However, Jones (1982) paints an entirely different picture of the original Luddites. He notes that they were skilled workers in various crafts who were concerned about the de-skilling brought about by the introduction of technology rather than the technology itself. They concluded (correctly) that the technology would bring an end to both their crafts and livelihoods. When we consider the quality of goods available today at many of our stores we can only lament their passing.

Similarly, teachers who are resistant to change are often seen ‘as "problems" or "hurdles" to get over or around’ (Wilson, Dobrovolny, & Lowry, 1999). However, they are likely to be assessing the innovation for its possibilities and adequacy (Grant, 1996), and may be precisely the people that need to be consulted.

This case study involves the evaluation of an already constructed site. The results suggest that the intended users should be consulted during the analysis and

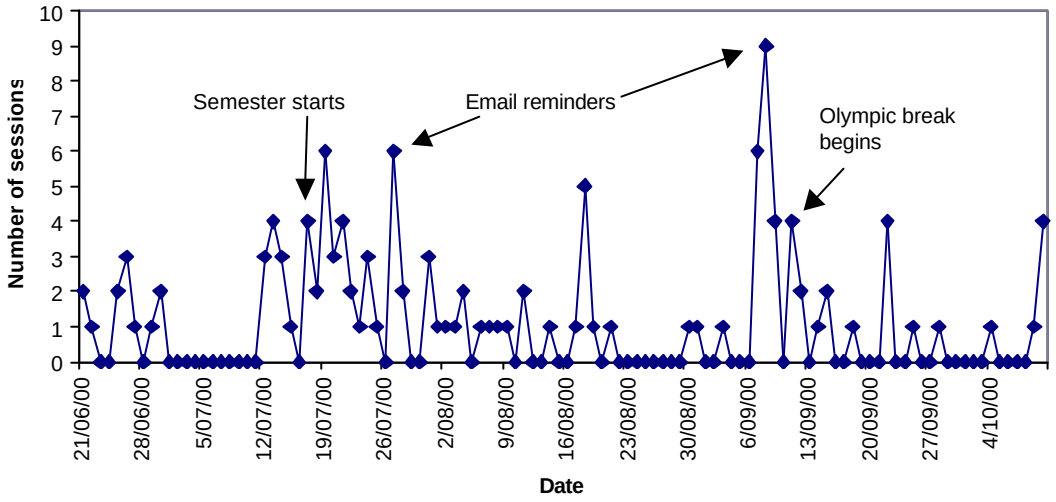
development stages. While this is known in theory, user-testing early in the development cycle is often neglected in practice.

4.4 Other factors influencing patterns of use

4.4.1 Access over time

After initially announcing that the site was open, there was some activity as staff were notified of the opening as a response to their expression of interest. Activity dropped to zero for a period of eleven days, but resumed again close to the start of the semester. Staff may have been concentrating on the development of teaching materials during the inter-semester break. As they began to move materials online to PlatformWeb they would be reminded of the presence of the site and also the need for development in the area of online teaching.

Figure 4-15 Sessions by Date



Activity declined in the second week of semester. An email message sent on July 27 2000 to all participants who completed the SoCQ stimulated increased interest in the site. Another email reminder sent on September 7 2000, which provided a direct hyperlink to the site and noted that the survey had been removed resulted in the largest number of sessions in a single day. Nevertheless, in both instances this effect was short-lived.

In previous studies, reminding and encouraging staff to participate has been found to have mixed effects on actual participation. Bostock found 'about a third said they had been influenced by encouragement to collaborate' (Bostock, 1998, p232). However, Creaner & LittleJohn (2000), were disappointed with the response rate in their study despite two email reminders.

A number of participants commented on the need for frequent reminders.

> Email reply: *'because of a stint overseas in the middle of the year, I think I plain forgot. So perhaps one or more follow up emails would have penetrated the head-down syndrome and concern over the restructure arrangements'*

> Email reply: *'it is one of those things which slipped past me. You probably told me the site address in a previous email but I then completely forgot about it in amongst all the running around we have been doing as part of the UWS restructure'*

It would be interesting to see the effect of more frequent reminders. It is possible that reminders that are too frequent may have a negative effect. Future research could look at determining an optimal frequency for sending reminders.

A major finding is that the majority of staff who originally expressed interest did not even visit the site. Out of 77 expressions of interest only 30 (39%) actually entered. On the other hand, responses to emails were relatively high, including requests for information from those who expressed interest but never visited.

Table 4-2 Response to email messages

Message	Sent	Replied	%
Expressions of interest	m-all	77	<5
Expressed interest but did not visit	46	29	63
Request for comment by those not completing the survey	30	16	53
Request for interview	13	8	61

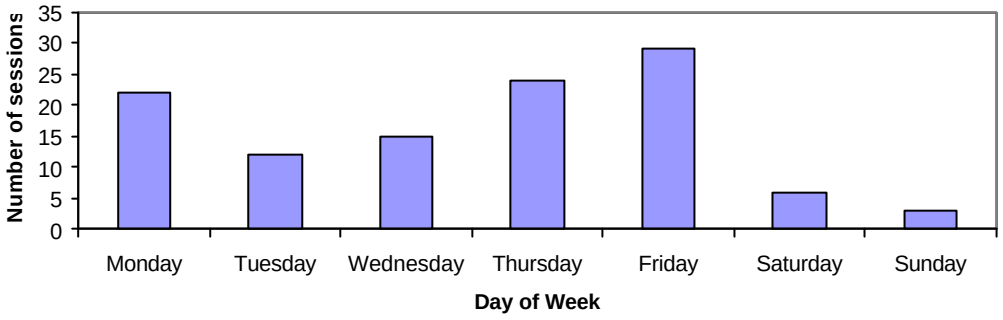
Staff probably feel more obligated to answer an email than to view a web site as they know that email records are kept while they may consider they are anonymous on the Web. The concept of web logs is much less familiar than email logs. This was demonstrated by the response from two members of staff when asked why they didn't complete the survey -

> Email reply: *'Well you have amazing tracking to know that I did click on the link. Aha! You can track us down I see!'*

> Email reply: *'"Big Brother" is watching!?'*

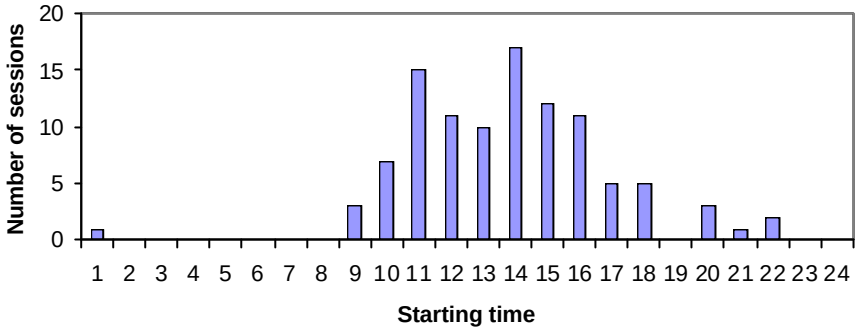
Access varied across day of the week and time of access and seems to correlate with times that academics are most likely to be in their office.

Figure 4-16 Sessions by Day of Week



Weekend access was considerably lower than weekday access. Mid-week access was also lower. This may reflect the fact that fewer classes tend to be timetabled on Mondays and Fridays. As many public holidays occur on a Monday, some subject coordinators avoid scheduling classes when there are multiple offerings as this can cause problems maintaining continuity. Friday usually does not include evening classes. (Another possibility for not scheduling classes on these days, dare I say, is the possibility of the occasional long weekend – only by a minority of course).

Figure 4-17 Starting time of weekday sessions

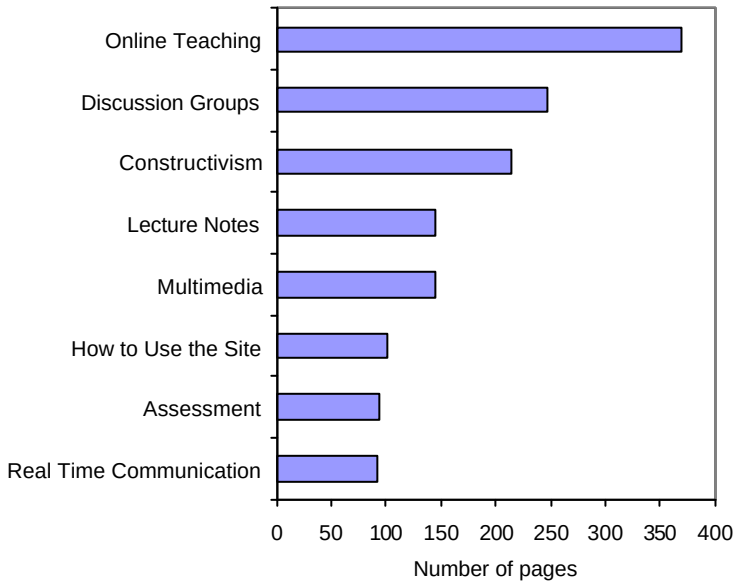


Again, the starting time of weekday sessions seems to reflect the most likely times that staff are in their office with peaks after morning sessions (11:00 am) and before afternoon classes (2:00 pm). Similarly, a smaller amount of activity in the evening may correspond with a return from evening classes.

4.4.2 Topics Accessed

The number of pages accessed for each category gives a crude measure of the relative interest in different topics.

Figure 4-18 Pages accessed by category



'Online teaching' is somewhat over-represented as the default page fell into this category. Even taking this into account this topic was popular. Given that the theme

of the site was 'Introduction to Online Teaching' this result is perhaps not unsurprising. The next most popular topic was 'discussion groups'.

> MAHEESHA*: 'it [the site] was there when I wanted to find out information on discussion groups before I started on discussion groups'*

Based on my experience in staff development and the responses to the LoU survey, staff typically begin online teaching by posting lecture notes, resources and links. When they are ready to move beyond this and try something more interactive they often move to the establishment of discussion groups.

Table 4-3 Examples of LoU survey responses

Participant	Current use of online teaching	Future use of online teaching
45	I don't	I'd like my lecture notes to be available on the web, but haven't thought beyond that
10	putting lecture material on email	putting more material on internet and more interactive tasks
31	I contact students and pass on messages re subject content and tasks on-line	to provide opportunities for students to engage in discussion with me as lecturer and with their fellow students
38	As a supplement to traditional lecture/tutorial though many topics have links back to the Internet	increasingly for forum discussions

One of the topics in the discussion area of the site itself was to allow users to ask specific questions about how to do something online. The only request in this section related to setting up discussion groups –

Discussion post: *'I want to set up a discussion group with about 25 students who are considering overseas field placement. How do I do this?'*

A major benefit of having a discussion area for participants was that it gave opportunity for them to participate in the process and learn many of the mechanical aspects.

SUSAN: *'just becoming familiar with the use of electronic discussion, while conceptually I think I understood the power of electronic discussion, mechanically, I needed to get a handle on it and it gave me the potential to get a handle on it'*

The topic 'Constructivism' was also quite popular. To some degree this may represent academic developers confirming, as noted previously, their own 'philosophical position'. However, it was pleasing to observe that many of the accesses could be attributed to academic staff not associated with education as a primary discipline. Staff are beginning to reflect on their teaching techniques as they move online.

Email reply: *'The whole on-line learning approach with platform web has actually changed my teaching and learning style entirely and caused me to reflect much more deeply on the pedagogical style I use and what I am hoping will be achieved by students'*

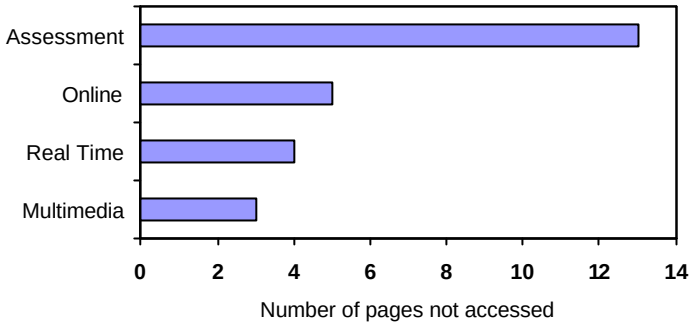
Email to author: *'Your content on constructivism cleared many of my concepts and similarly was the material on discussion groups really offered me an insight into problems which I had not realised so far'*

As well as taking an interest in educational theories such as constructivism for use in curriculum development and teaching, a growing number of academics are seeing educational research as a valid supplement to their discipline-based research. A comment from a non-education based participant highlights this.

MAHEESHA: *'There was some information that was useful in providing me with ideas for my own research .. it focussed on student centered learning and constructing learning environments. There was certain terms that were explained very nicely and provided useful learning reference for me'*

The topics 'Lecture Notes' and 'Multimedia' drew moderate interest. 'Assessment' and 'Real Time Communication' drew the least attention. This was also reflected in the frequency of pages that attracted no interest.

Figure 4-19 Pages not accessed by category



It would seem that, at least for inexperienced online teachers, it may still be too early to consider more complex technologies such as chat and online assessment. Another possibility is that there is little need for these particular facilities. Asynchronous methods such as viewing lecture notes and participating in discussion groups can be handled in a distributed manner. However, real time communication and online assessment typically require access to a large number of computers, such as a computer laboratory, at a particular point in time. At a university where the current computing facilities are already stretched it is not an easy task to make casual laboratory bookings for non-computing classes.

> LoU response participant 20*: 'a number of students have expressed concerns about access issues for students who do not have Internet access from home (and the xtreme difficulty in accessing computer labs for those not enrolled in a computer subject)'*

In addition, assessment is one area where staff often do have considerable pedagogical awareness. Apart from logistical problems, the lack of interest may reflect the limited functionality currently available in online assessment.

On the other hand, the lack of access to the assessment section is somewhat contradictory as a number of staff expressed interest in learning more about online assessment. The responses to the LoU question 'How do you expect to use the web in teaching in the near future (1-5 years)?' include –

> Participant 15: *'Possibly incorporate some assessment tasks'*

> Participant 30: *'need to engender dialogue and a more sophisticated assessment and feedback system'*

> Participant 50: *'I hope to put assessment tasks on the web, eg multiple choice tests, where the answers are graded and marks recorded automatically. Also, I would like to collect student feedback on the different aspects of my subject, with results being collated and analysed'*

Overall, 8 of the 31 responses specifically mentioned assessment. However, of these only three spent more than six minutes visiting the site, so it is perhaps understandable that they may not have viewed the assessment pages.

Another area that received less attention was 'How to Use the Site'. This is to be expected given the lower number of pages in this section. Nevertheless, like reading a manual this is an area that tends to be overlooked.

> TIM: *'it took a while for me to learn about how it worked because I hadn't seen it before, you know that kind of arrangement. But once you realise it. At first I think I missed a few things because I didn't realise that there were more pages. Probably because I didn't read the how to use the site'*

This suggests that the structure and navigation of the site should not rely on a 'How to Use' section.

4.4.3 Is multimedia worth the effort?

A range of multimedia examples were provided (see figure 4-20 over page). While the elements used in this site were not particularly interactive they rarely attracted even initial visits.

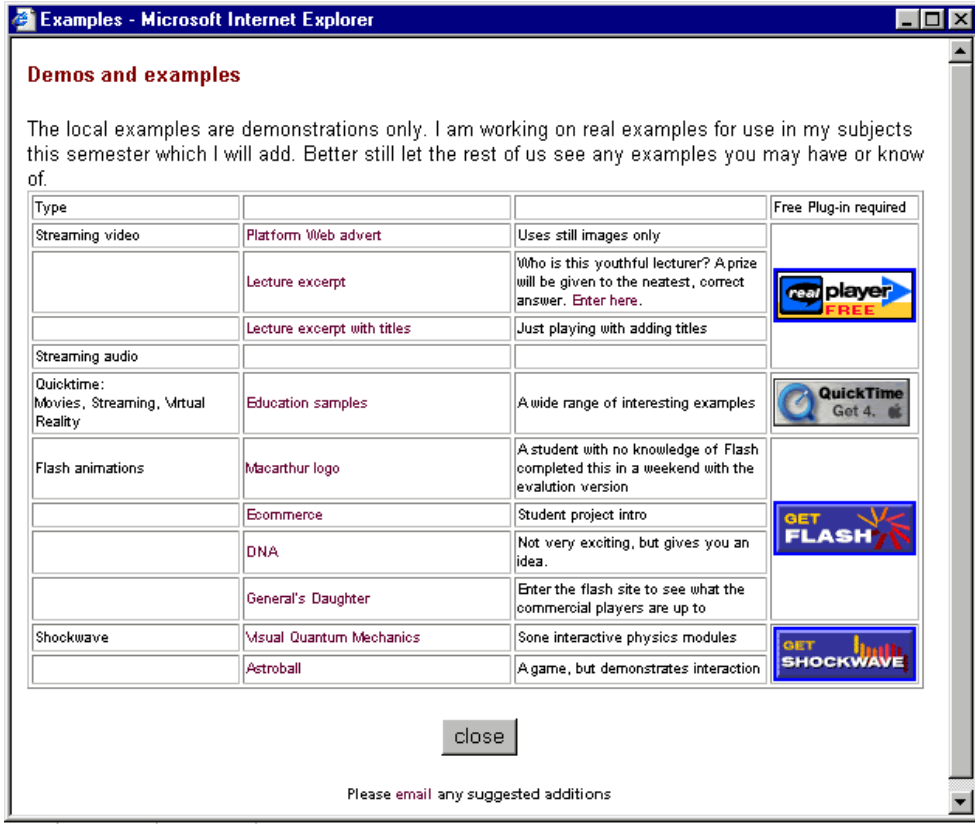
The demonstrations of Flash animations caught the attention of only one participant who looked at three demonstrations. The video files attracted only two visits. At least the only comment from a participant who viewed these areas was positive.

> SAHED: *'the video and audio section of it was very effective'*.

The streaming video attracted one visit. This result is of significance because one participant was particularly interested in streaming video, but did not visit the relevant pages.

> KAY: *'I tried to find the video, you had references to video on there and I never actually found that. Was that there all the time? I was expecting to see it, because I wanted to see how you were streaming video that's what I was really looking for'*

Figure 4-20 Range of multimedia examples provided



Examples - Microsoft Internet Explorer

Demos and examples

The local examples are demonstrations only. I am working on real examples for use in my subjects this semester which I will add. Better still let the rest of us see any examples you may have or know of.

Type			Free Plug-in required
Streaming video	Platform Web advert	Uses still images only	
	Lecture excerpt	Who is this youthful lecturer? A prize will be given to the neatest, correct answer. Enter here.	
	Lecture excerpt with titles	Just playing with adding titles	
Streaming audio			
Quicktime: Movies, Streaming, Virtual Reality	Education samples	A wide range of interesting examples	
Flash animations	Macarthur logo	A student with no knowledge of Flash completed this in a weekend with the evalution version	
	Ecommerce	Student project intro	
	DNA	Not very exciting, but gives you an idea.	
	General's Daughter	Enter the flash site to see what the commercial players are up to	
Shockwave	Visual Quantum Mechanics	Sone interactive physics modules	
	Astroball	A game, but demonstrates interaction	

close

Please email any suggested additions

This suggests a flaw in the design of the site. The site may have been too big, too complex or difficult to search. This issue will be taken up later in the discussion. As well as difficulty finding the multimedia sections, the complexity of use may have been a deterrent.

> MAHEESHA: *'is there somewhere for feedback right at the bottom and I wasn't sure how to use it and I clicked on a few buttons and I thought hang on what's going on here and I got somebody's email and I don't know. I gave up on that one'*

One participant even set up a topic in the discussion area to comment on the complexity of the feedback tool.

> Discussion post: *'Has anyone else tried to send Graeme feeback using his flash blue thingo!. Did you feel confused like me - I just wasn't sure if I had actually done the right thing? - I found it a bit confusing/frustrating -but am I the only☹. I only realised it must have worked when I received an email from Graeme. ☺'*

Multimedia elements typically take the most effort to develop. However, the expenditure of this effort has been questioned. A study into online staff development by Bennett, Priest & Macpherson (1999) also found that the use of multimedia files was quite low.

> 'The majority of participants were either not interested in these files, unable to configure their browsers for them, or unwilling to wait for them to download and play. This was a challenge to our original assumption that multimedia components were worth the effort of including' (Bennett et al., 1999, p215)

These results suggest that careful consideration should be given to the need and potential use of multimedia elements before putting in the time to design and develop them. However, in the future as more staff have multimedia-capable computers and browsers come equipped with the appropriate plug-ins this may become less of an issue. The next section demonstrates that staff are already comfortable with certain required plug-ins.

4.4.4 To read from the screen or not?

Many authors comment on the need to provide easily-printed versions of Web pages in order to avoid complaints about having to read large amounts of text from a computer screen (Bostock, 1998; Carr-Cheilman & Duchastel, 2000; Donovan & Macklin, 1999; Gillham & Hall, 2000). Apart from the lower portability of a computer monitor this may also be related to the physical difficulty of reading from the screen. It is claimed that reading from the screen is approximately 25% slower than reading from hard copy (Pressman, 2001). However, Gillham and Hall (2000) suggest that age may also play a factor. They found that while some of the participants in their study preferred to print information for reading others were happy to read off the screen. One young participant said 'most of us are fairly used to reading off a computer screen…we have been exposed to it from a relatively young age'. There are some who state that there has been a paradigm shift in methods of information retrieval by the 'MTV' generation (Prensky, 2001), but this interesting line of enquiry has not been pursued in this study.

Nevertheless, as noted in Chapter Two, a deliberate design decision was made to provide text-based material in screen sized chunks, but include the option of

downloading and printing whole documents in PDF format. Some welcomed this choice.

> TIM: *' you could download the PDF that had everything or you could just roam around. I liked having the choice. In fact, I wanted at one stage to print out the whole section to take home to read but the printer wasn't working.'*

Unlike the multimedia section, participants noted that this was not a complex task.

> SUSAN: *' if you were the kind who didn't like reading on a screen you had the facility to print out in a range of different formats. I thought that was very good and that was fairly easy to do, it wasn't complex.'*

Most academics are now used to obtaining significant text-based information off the web as part of research and course development. It is likely that many have downloaded and used the required plug-in (Acrobat reader) previously and therefore perceive it to be less complex.

However, even though participants liked the choice provided and did not find the task of accessing the PDF documents complex, only 26 files were actually downloaded. This is similar to a finding by Bostock. Although complaints about reading from the screen were common and 'despite the general preference for paper materials, only a fifth printed any Web pages and few said they would do so even if they could print them on the spot' (Bostock, 1998, p231-232).

In the present study, the fact that 65% of the downloads were by participants external to UWS, who represented only 12.5% of the total users, suggests a possible explanation. PlatformWeb has been stable for a number of years and internal staff have come to expect that the site will be available when needed. Given this expectation, there would be less pressure to download and/or print the files.

> *JOHN: 'If there were things there that I really wanted to know, I know it's there and hopefully it would still be available so if there's things I do want to look up, say gee I want to know how people do that, then I'll go back and look at it'*

On the other hand, external staff would not have the same expectation and have probably experienced links to useful sites suddenly dying or disappearing. If they

have found information that may be useful then it is a simple matter to download it for future use.

4.4.5 Lack of Interactivity

One of the major reasons for claiming that the site was designed around a constructivist approach was the opportunity for interaction, particularly through the discussion area. However, the amount of interaction that occurred was very limited. Of course, this has serious ramifications in relation to the theoretical rationale for the site. These will be explored in the next chapter.

The following table shows a summary of the use of the discussion area.

Table 4-4 Use of discussion area

Name of Conversation	Number of participants	Number of posts	Generated discussion
Have you tried this?	4	4	Yes
How do I …	2	2	No
Who is this?	2	1	No
Web as threat	6	6	Yes
Exploring the use of 'Blackboard' for online teaching	6	6	No
Graeme's Blue Feedback thingo!!!!!	2	2	No
Oh dear! Critical pedagogy time …	1	2	No

The first three 'conversations' (the term given by the software package used) were provided to get things started. The next four were generated by the participants. The maximum number of posts to any conversation was six. However, when the content of the conversations was analysed it was observed that only two of the conversations generated interactive discussion where participants replied to the posts of others.

Again, this is not an isolated finding. Ferraris and her colleagues 'had a hard job fostering and sometimes pressing for participation both in the discussion and the group work at a distance' (Ferraris et al., 2000, p86). Marx, Blumenfield, Krajcik & Soloway note the importance of developing a community of practice through telecommunications to discuss teaching practices and share artifacts on a routine basis, but go on to suggest that 'the literature on teacher telecommunications does not report major successes in this regard' (Marx et al., 1998, p48).

There were other opportunities for interaction but these were similarly disappointing. The feedback mechanism generated 13 visits and, of these, only three left comments (as noted previously, this may also be related to the perceived complexity of the tool). It was hoped that the site would generate interest for staff to attend face-to-face workshops. However, there were no applications expressing interest in this.
On many of the pages there was an email link welcoming additional suggestions or comments. There were none forthcoming. Apart from a number of phone calls received, it is not known how much interaction away from the site, such as face-to-face discussions with colleagues, may have been generated.

Those staff who did interact using the discussion area found it worthwhile.

> SANDRA: '*I think the forum was good, even though you didn't get a lot of people actually*'

One participant found it useful from both technical and a pedagogical perspective –

> SUSAN: '*while conceptually I think I understood the power of electronic discussion, mechanically, I needed to get a handle on it and it gave me the potential to get a handle on it …it also reaffirmed my views gave me greater courage to do what I was doing with my class and reconfirmed the need to do the kinds of things that I felt and believed were important and that was to encourage dialogue and interaction with the students, who I suppose were fairly passive*'

The author has had considerable success in the past using discussion groups, but this has involved undergraduate classes where participation could be included as an assessment item and the students encouraged during face-to-face meetings (Salter,

2000). However, in a voluntary online activity encouraging participation is much more difficult to achieve. Some participants recognised this problem.

> SANDRA: *'It would have been better if more people had of got involved, but anyway that's something that you can't really control… getting people to actually participate in things is not all that easy'*

> SUSAN: *'it's pretty hard to compel academics to do anything'*

While encouraging participation is not totally beyond control, it will require novel methods and incentives in voluntary settings such as this. To develop such methods it is important to examine the possible causes of reluctance to participate. Possible causes include –

- Limited structure

In order to maximise participation in discussion areas it is useful to require a deliverable, limit the scope of in terms of size and/or time and provide closure (Salter & Hansen, 1999). However, in this study the discussion area was largely open ended and left to the participants.

- Lack of face-to face interaction.

A number of the discussion postings would not have happened without chance 'corridor encounters' between the author and the participants concerned.

- Lack of incentives

There were no rewards for using the discussion area. While this was not specifically commented on, Tim alluded to it –

> TIM: *'the research you are focusing on that because of the reward, in that you get publications, like you would spend more time on teaching if there were greater rewards*

- The permanent nature of discussion transcripts.

The ease of responding has the potential to cause professional embarrassment. 'Write in haste, repent at leisure' (Harasim et al., 1998, p212).

> SUSAN: *'I do hesitate in a discussion group to post intellectual content until I've checked it out, until I'm sure of what I'm actually saying or can back it up. As opposed to a free ranging discussion that may occur in class, where I would feel quite confident to participate in an intellectual discussion and have no inhibitions about putting forward a view and then knowing by the end of the*

conversation my view may have been modified and shaped and reformed, however, when its in print I feel much more inhibited to do that'

It is interesting to note that one participant who understood that 'it provides a written record of transactions between students and academic staff' thought it would have the opposite effect.

LoU response participant 50: '*breaking down the reluctance of students to comment for fear of appearing as fools to their peers. I believe students will be more forthright when talking to an impersonal, non-critical "program"'*

This suggests a lack of understanding of current communication tools. It is not surprising that this individual exhibited a positively disposed non-user concerns profile.

- Lack of a critical mass.

The small number of participants in the discussion may itself have been a self-limiting factor. It may be necessary to have a 'critical mass' before a professional online community is able to develop (Marx et al., 1998).

- Lack of time.

SUSAN:*' I have from time to time come across a variety of different discussion sites that I have been really interested in, but in the end I have first of all just become a lurker or in the end become a lurker and then ultimately withdrawn because of the time factor, it does take time, well it takes time for a person like me to formulate my ideas and my thinking, to crystalise it in a form that I feel comfortable enough putting into words'*

Of course, the issue of time limitations was not restricted to use of the discussion area. It was identified as a major issue overall.

4.4.6 Lack of Time

The only theme common throughout the interviews was lack of time. All of the academic staff interviewed mentioned this issue at least once, but usually on multiple occasions. These comments include –

SANDRA: *'I'd like to get more involved in that area but I can't at the moment - your whole life is timetabled'*

MAHEESHA: ' *Time - that's the greatest barrier'*

SAHED: *'I think my personal constraint has been the time. If I can really devote the time to really explore what is out there I'm sure then it would facilitate the use of the application in normal teaching day to day'*

JOHN: *'Again it's the time, its not the understanding, it's the time. I mean I would love to change my website and make it like some of the stuff like your web students do. But I just don't have the time'*

TIM: *'anybody who does it well is doing it really in their own time'*

SUSAN: *'I have a desire to participate in intellectual discussion in the topic areas surrounding my field, but I do get caught up in the daily grind and I don't make a time or a commitment in which I say, a discipline, where I say I'm going to visit this site at 5pm every afternoon and see what's up there. It just doesn't occur to me. It's a serendipitous thing that I'm suddenly working on something and then it reminds that there's a site on something and so I will go back with it'*

The only participant interviewed who didn't explicitly mention the problem was a non-academic who did view online teaching as a potential means of saving of an academic's limited time.

KAY: *'if you've got 200 students in a subject, you're not going to ever get in one semester a face to face of any quality with every single one of those students. And yet the student can feel like there is personal contact if there is email going out to some sets of that group of students for some particular reason or whatever, that's a tremendously empowering thing and saving the lecturer, it's a win win situation in terms of the lecturers own time and resources and the students are benefiting as well'*

Lack of time was also mentioned consistently in email responses and to a lesser degree in the LoU survey.

Email response: *'it was only pressure of time which prevented me from accessing the site'*

LoU response participant 10: *'My concern here is how much time this will take; I already lose a large slab of my life to email'*

However, the fact that many visits were of such short duration suggests that this may not be as all-encompassing an issue as it first appears. One participant noted that using the site for a smaller amount of time than that given over to traditional workshops, may have been of benefit.

SUSAN: *'if most people had of spent an hour looking on that [the site] they would be significantly wiser about online learning. If only they would invest that, an hour of time, and its hard to get them to do that though*

A number of participants commented on the usefulness of 'just in time' staff development.

KAY: *'time, resources, access in terms of the right piece of training being available at the right time to meet my need'*

JOHN: *'I don't have the time for dilettante learning, but when I'm ready to learn, I'll go digging'*

SEAN: *'I feel probably like a lot of people do, that I'm working at my limit and to start something like that, I'd rather dip in as I need, and as it suits me with the time and inclination'*

SUSAN: *'the thought that I've got to sit through being told to suck eggs… I'm not the one, the kind of person to put my hand up to go to a 2 hour session of having somebody run through a whole lot of stuff that I already know or hear some other windbag from a department or faculty hog the floor for 3 hours that's unrelated. I'm too impatient for that and my time is too precious… most staff won't commit 3 hours or are too busy for whatever reason, they don't physically get their bodies into a room for a staff development traditional learning opportunity. However, having it in a position like that means that staff can be in control, they can go in for 5 minutes, they can go in for 1 hour and they can go as deep as they want to go'*

Email reply: *'I had to wait till Sunday to check your site…If I would have known how convenient to the needs of a user with restricted time I would have gone right there'*

Staff are likely to find the time if there is enough perceived value in the activity (ie. it meets their current learning needs).

SANDRA: *'it's almost like you've got to prove to them that there is something in it for them before they'll take that step'*

Obviously, on a web site, this needs to be communicated very quickly to the potential user or they will be lost, possibly never to return. One of the keys to this is the design of the site.

4.5 Comments on the design of the site

There was general consensus that the site was easy to access and there was approval of the aesthetics and design of the site.

> MAHEESHA*: 'it was easy to access'*

> SUSAN: *'I liked the immediacy of it. It was there, it was easy to access, it was pretty clickable, you know a couple of clicks and you had the information'*

> SANDRA: *'I think the design and the navigation was good'*

> KAY: *'simple lay out and design, not too much text on one page. Good clean clear design, I think that's really useful and helpful for people, doesn't intimidate people'*

> JOHN: *'I like the colour scheme. It's aesthetically pleasing'*

> SUSAN: *'I thought I was quite good visually. It was bright, clear, it wasn't cluttered'*

Donovan and Macklin (1999) note that creating a clean, intuitive look and feel for the site is a key to good information design. However, a website needs to be functional as well as aesthetically pleasing. The same team also 'understood that attempts to provide "good information" would fall flat if end users were unabIe to find the information they needed or otherwise experienced frustration with the site' (Donovan & Macklin, 1999).

Participants who spent more than a cursory glance at the site tended to find that the amount of information was appropriate.

> TIM: *'I liked the amount of information that was there, that was really good'*

> SUSAN: *'It provided a good level of information, at the beginning there was just this very basic level, a summary level if you like, then you were able to go down for further information'*

> SANDRA*: 'I find it quite easy to navigate and have a look and see what was going on'*

In fact, Susan went on to say that 'there's the potential for the site to contain material even at greater depth'. She had little trouble with the design of the site.

SUSAN: *'It was presented in a logical format for me, in which I felt I could easily, systematically find the information I wanted. You didn't need very sophisticated searching tools to get to the information that was in the site'*

However, both Tim and Kay found difficulty in finding information.

TIM: *'it took a while for me to learn about how it worked because I hadn't seen it before, you know that kind of arrangement. But once you realise it. At first I think I missed a few things because I didn't realise that there were more pages. Probably because I didn't read the how to use the site'*

KAY: *'when you got down to about your 3rd level page that I was getting a bit lost. Probably a bit more information on screen probably would have been a bit helpful'*

Perhaps the most telling comment regarding the site came from an email from an external participant.

Email reply: *' thanks for providing access to your Online Teaching Module. I have had a swim around in it but it is very extensive and I'll be returning to it. I'll have to get my oxygen tank and flippers'*

While presenting the preliminary results of the study at a conference (Salter & Hansen, 2000), one member of the audience asked about the seemingly obvious inclusion of a search engine. Other methods for improving the site design based on these results are given in the next chapter. Results from the interviews suggested other improvements that could be made to the site.

4.6 Suggested improvements from the users

The participants interviewed were asked specifically about improvements that could be made to the site. These suggestions were -

- Provide more emphasis on the mechanical aspects of online teaching

MAHEESHA: *'I would like some more information on how to build, or to help students build their own resource site for a subject. I think I've got an idea on what I want but does that meet their needs and also how can I facilitate that process. I'm not sure how to do that from a technical point of view - how to make that happen'*

- Provide tools or templates to experiment with

In line with the previous point, staff would like tools or templates to actually practice the techniques.

JOHN: *'[another institution built] a whole lot of tool kits that academics could use to support their teaching'*

SUSAN: *'set up little templates for them to practice setting up their own courses'*

- Greater use of examplars

Participants noted that they were learning serendipitously by using online materials.

SANDRA: *'It's only through actually using it [online teaching] that I've gained that familiarity'*

SUSAN: *'my experience very quickly led me on to believe that if I structured a learning opportunity using the technology, serendipitously using the technology they then experience the technology and how it can be used and see its potential and possibilities'*

However, they also recognised that seeing exemplars, particularly in a range of discipline areas, could identify even more possibilities.

SANDRA: *'some examples would be good. I'm thinking for people who don't know what's possible. Just like a mock subject or a couple of mock subjects in different disciplines'*

SUSAN: *'I would like to see lots of little vignettes that I can click on and sit back in my chair and glance at my screen occasionally and see my tutor talking to me but then be listening and thinking about what is actually being said. So in a sense its like a personal dialogue that you can actually have and then have the facility somewhere to go, to click for responses or questions that can be then logged into the system'*

- Cater for different levels of competence

Even though the site was designed as an introduction, it is still difficult to design a 'one size fits all' site that meets all needs.

SANDRA: *'it was good for beginners but if there was also a section for the next level up… everybody's at a different level and being able to get the common ground is sometimes difficult.'*

In some respects this issue overlaps with the next suggestion.

- Increased instructional guidance

Rather than providing an open site it was suggested that participants, depending on their knowledge level and preferred learning style, be given the choice of a structured or unstructured learning experience.

> SANDRA*: 'personally I'm happy just looking at things I want to look at. So I would look at those first and then I might go back and look at the other things as well. If you were doing it for other people then maybe some structure in it might help them. It's sort of a level thing'*
>
> SAHED*: 'if the learning exercise made that assumption that the students they don't know anything about this then it would be good to take them through, but it would be very frustrating for the students that know the subject material, not to give them the chance to jump'*
>
> KAY: '*I'm a real structural thinker, I want to know the structure of the whole thing before I go in so, and I know that lots of people aren't they are just explorers'*
>
> JOHN: '*I like the free roaming, because there's structure there if you look for it anyway. I mean there's a navigation system'*
>
> SUSAN: '*letting the students know where they need to be in this point in time, so that if they're not they can go back and re-read that section again'*
>
> Email reply: *'Of course, you will find a way to create a step-by-step interactive learning process, additionally'*

- Include questions and prompts in the text

Rather than being plain text, the site could make use of questions and prompts to guide the learner. These forms of prompts are widely used in printed distance learning materials. Again, this relates to the amount of guidance given to the learner.

> SUSAN*: 'its always useful to put in amongst the text … some little prompts or questions to the reader. For example you might be talking about a particular issue or concept and you might have got a couple of paragraphs into it and then you might put in a couple of lines of blue text where it says "by now I hope you can see that I've drawn together this concept and this concept" so that in terms of a learner it actually acts as a state change and helps them to concentrate and it guides them as your probably could do if you were in a lecture theatre'*

- Cater for people with disabilities

One aspect that is often neglected in web design is the issue of accessibility.

KAY: *'Can I ask about accessibility issues, have you dealt with those at all?'*

The World Wide Web Consortium (W3C) has published guidelines from their Web Accessibility Initiative. Some recommendations, such as providing alternate text for images, are good practice in any case. Others such as adding headers to fields in tables may add a small amount of development time. Nevertheless, this allows the site to be used by a wider audience and addresses some of the equity issues involved.

4.7 Did it make a difference?

The development of the site entailed considerable effort so it is reasonable to ask whether it made a difference and led to enhancements in teaching. However, given that the majority of users spent less than five minutes examining the site it was unlikely to have much impact. This was acknowledged by some. (Note – the minutes online are shown in brackets).

JOHN (7 minutes): ' I can't remember anything about it…. I'm sorry. I looked at it and thought interesting, but I don't have time to go any further into it'

SAHED (4 minutes): 'I wish I could refresh my memory – I think it was effective in the sense that it had a personal touch to it and it emulated as close as possible the real world'

Those who spent a little more time made general comments about how the site would impact their teaching.

SANDRA (8 minutes): 'with a couple of things I may just do online so they get the notes and they go away and do it themselves. I'd like to develop along that line a little bit more rather than having everything where every week at this time we meet. That puts the onus on them to learn what they're supposed to learn instead of us… I use the discussion group now and I think that over the last couple of years I've tried to do a few things, I've got ideas to do more and looking at that was good because I thought to myself well yes, this is the way that we could go'

KAY (17 minutes): The points about using multimedia as part of online learning, as an online learning resource and the web itself, but multimedia specifically in addition to the web.

Those who spent a greater amount of time mentioned specific changes they would make.

> *TIM (27 minutes) 'The grading and discussion groups - if you could grade that and there were some good ideas there I thought on how to do that, because that was something that I'd been thinking about. You know getting students to bother'*

> *SUSAN (486 minutes): 'just becoming familiar with the use of electronic discussion, while conceptually I think I understood the power of electronic discussion, mechanically, I needed to get a handle on it and it gave me the potential to get a handle on it. I wouldn't say I'm an expert on the program Discus and all its little ins and outs, but fundamentally and principally I understand how it operates and how you can use it and that was useful, because I did want to use it in my class to model online learning … it also reaffirmed my views gave me greater courage to do what I was doing with my class and reconfirmed the need to do the kinds of things that I felt and believed were important and that was to encourage dialogue and interaction with the students, who I suppose were fairly passive…and it certainly did provide the impetus for online discussion … there were lots of little slabs of information in there that caused me to think and reflect and be interested in following particular tangents in relation to teaching'*

It is interesting to note that the interviewee who spent the least time on the site mentioned a specific decision made by visiting the site. However, this was also as a result of printing one of the articles and following up with a phone call.

> *MAHEESHA (2 minutes): 'it was there when I wanted to find out information on discussion groups before I started on discussion groups, the benefits of asynchronous and synchronous. I think I'd read some sort of article, you've got an article in there somewhere that I read or skim read and that was useful for making my decision on whether or not to use it in my teaching and how to use it and I followed up with a phone call to you about it'*

With increasing use of the site, participants tended to be more specific about the changes they would make to their teaching as a result. However, even the specific changes noted were not extensive. Nevertheless, it is difficult to assess what the future impact may be, given that seeds may have been sown in relation to future decisions.

4.8 Summary

As noted in the introduction, the results reveal trends that were unexpected as well as others that were expected. This section summarises the main findings.

Email marketing tended to attract the target group although the majority of potential users who expressed interest never visited the site. Usage patterns clearly exhibited the phenomenon of churn. That is, many users viewed the site very briefly and did not subsequently return. This effect was more pronounced by individuals from non-target groups entering the site. Having a survey on entry proved to be a major disincentive and their use was eventually discontinued. Email reminders resulted in increased use, particularly when the reminder included a direct link. However, the effect was very short-lived.

Degree of use and patterns of use of the site varied depending on participant role, staff type, staff level and concerns profile. While attracting the target group, the site failed to retain important sections of that group – associate lecturers, positively disposed non-users and users with high task concerns. This may reflect a deficiency in the content of the site, which did not place a heavy emphasis on the mechanics of teaching online. Thus, the site may not have met the needs of these participants. However, other factors may also have played a role. For example, staff at associate lecturer level may have less opportunity to design and implement online strategies. The site was more successful with lecturers and participants with high self-concerns who were already using the web in teaching to some degree. As with the previous result, this may be a reflection of the content of the site. However, staff who have already begun to use the web in teaching may be more highly motivated to develop further skills in the area. Use of the site was highest by academic developers. These individuals, along with the author, exhibited high collaboration concerns. This correlation and the low use by other sections of the target group highlight the need for participatory design early in the web development process.

None of the academics surveyed exhibited impact concerns (consequence, collaboration or refocusing). This may reflect the immaturity of online teaching

currently. However, it could also be related to the fact that experienced online teachers, those more likely to exhibit these concerns, may not have been attracted to a module on 'Introduction to Online Teaching'.

Staff tended to view the site during office hours. They showed interest in the topics on online teaching, discussion groups and constructivism. This may be indicative of the progression of staff in relation to online teaching. The survey results suggest that staff tend to progress from providing static information online to experimenting with methods for providing interactivity. One of the initial methods for providing this interactivity is the use of discussion groups although a smaller number provide, or are at least interested in, online assessment. The interest in constructivism may reflect the fact that some staff are starting to engage with 'pedagogical re-engineering' and/or educational research. The least popular areas of the site were assessment and real-time communication. This may be related to logistical problems in accessing sufficient computers synchronously, the limited functionality of current online assessment tools and the relative inexperience with online technologies in general.

The site contained a number of multimedia examples. While they were not particularly interactive they rarely attracted even initial visits. Multimedia elements usually require greater effort to develop. The results suggest that careful consideration should be given to the need and potential use of multimedia elements before putting in the time to design and develop them. However, this may become less of an issue over time as more staff have multimedia-capable computers and browsers come equipped with the appropriate plug-ins.

Nevertheless, staff are already comfortable with certain required plug-ins. Users appreciated the choice of having PDF files and did not find downloading them complex. These files were predominantly downloaded by external users. This is probably because external staff have less confidence that the site will remain active.

There was very limited interaction in the discussion and feedback areas and no interaction regarding face-to-face workshops or suggestions for additional content.

Factors involved in the lack of interaction include - limited structure, lack of face-to-face interaction, no incentives, the permanent nature of discussion transcripts, lack of a critical mass and lack of time.

The issue of lack of time was raised by many participants and was the major reason given for non-participation. However, the results suggest that staff may 'find' time where there is perceived value, particularly if the time can be broken into smaller sections under the control of the user.

The users tended to approve of the design of the site. However, the results suggested a number of design flaws (such as the lack of a search mechanism), which could be changed to improve functionality. The users had a number of relevant suggestion for improvements.

With increasing use, participants tended to be more specific about the impact use of the site would have on their teaching. Nevertheless, these changes were not extensive and given that most users visited the site for less than five minutes, the impact of the module was slight. Given that the site did not live up to expectations, it may be tempting to label it unsuccessful. However, it needs to be remembered that the site was a model to be tested.

> 'The history of educational technology teaches us that it is necessary to study failures as well as successes' (Hara & Kling, 1999)

Defining appropriate online pedagogical skills and best practice will take time, particularly given the rapid changes in technology and the relative immaturity of the field (Morris et al., 1999). The results from this research add to the body of knowledge in the area and can inform future developments and research. The next chapter examines the implications these results have for both theory and practice, which include an expanded theoretical framework and a revised model for developing online staff development.

Chapter 5 Discussion and Conclusion

5.1 Introduction

The previous chapter focused on the results and themes found from the data gathered. The major findings were that

- The degree of use and patterns of use of the site varied depending on participant role, staff type, staff level and concerns profile.
- Usage patterns clearly exhibited the phenomenon of churn. That is, many users viewed the site very briefly and did not subsequently return.
- Lecturers with high self-concerns who were already using the web in teaching to some degree and academic developers who exhibited high collaboration concerns demonstrated the highest levels of access.
- There was a correlation between the concerns of the developer and those of the high-level users.
- The interaction generated was limited.
- Email marketing and reminders had varied success.
- Participants appreciated being able to set their own pace and select their own choice of material.
- Users tended to approve of the design of the site although they also had useful suggestions for improvements.
- Lack of time was cited as the major barrier to use.

A number of significant issues that may influence future developments were also identified. These included -

- Identifying and meeting the needs of learners
- Catering for a diverse range of learners and their concerns
- Attracting and retaining visitors
- Encouraging participation and interaction
- Overcoming the barrier of lack of time for participants
- Encouraging effective change

This chapter examines these findings and issues with particular reference to the final research questions posed -

> **Are the findings consistent with current theories or do they point to possible modifications or new understandings?**
>
> **What factors or strategies might lead to increased participation and effectiveness of online staff development?**

The chapter presents an argument for an expanded multi-theoretical and multi-disciplinary approach, suggestions for improvements and a modified model for developing online staff development.

5.2 The case for an expanded theoretical framework

5.2.1 A constructivist approach?

The reasons for claiming that the development of the site followed a constructivist approach were outlined in Chapter Two. However, analysis of the use of the site makes it clear that it did not live up to these claims in a number of ways. It can be seen that basing a design on a particular theoretical perspective does not necessarily mean that users will follow that perspective in actual operation. Therefore, any failure of the site does not necessarily reflect on the theoretical under-pinning of constructivism. What it does suggest is that each of the reasons for claiming a constructivist approach need to be examined in greater detail.

a. Authentic problem

The claim that 'the content was related to the real-world problem of becoming an effective teacher in an online environment' is still valid. However, responses to the surveys indicate that within this broader aim there are many possible authentic 'sub-problems'. While teachers may desire to become effective online teachers, they are at various levels with different concerns and needs. For one, the problem may be simply 'how do I log on to try this environment?' whereas for another it may be 'how do I make the most effective use of discussion groups to encourage

interaction?'. In order to more adequately address this characteristic of constructivism the learners could be given a choice from a selection of different problem areas to investigate. In this way they could choose one or several that were most closely related to their present needs. These areas would need to be ascertained before development.

b. Multiple representations of content and complex learning environment

Participants appreciated the ability to 'dig' into the material in the manner and amount they preferred. However, they also noted the need to cater for different levels of competence and learning style.

> 'Unfortunately, the existing drive-by models for in-service are inadequate, and one-size-fits all training doesn't work. Teachers are, obviously, in different stages on the technology adoption curve' (Jackson, 1999, p26)

This research has shown that positions on the 'technology adoption curve', in this case measured by stages of concern, do influence patterns and degree of use. Usage also differed across other variables such as staff type and level. This may also be the case for learning styles. These were not measured in the present study, but participants specifically commented on them.

Unfortunately, determining which characteristics to measure and cater for can be problematic. In learning styles alone Smith provides the following non-exhaustive list of variations: Field dependent/independent; Analytic/innovative reasoning; Dynamic/common sense reasoning; Visual-auditory/tactile/kinaesthetic; "Right-brained"/"left brained"; Serialist/Holist; Abstract/concrete perceivers; Reflective/active processors (Smith, 1997, p38). Given the lack of enthusiasm for entry surveys it would be difficult to ascertain individual problems and characteristics even if an appropriate metric could be determined. Thus, rather than direct learners to parts of a site based on certain characteristics it may be more appropriate, in this case, to provide access to multiple areas in which the problem being addressed and perhaps the mode of interaction is stated explicitly.

This is not to say that the use of 'intelligent agents' to assist in finding appropriate areas of study could not be used. However, in voluntary, web-based settings the

learner profiles that inform any intelligent agent may need to be developed from data other than up-front surveys. For example, these profiles could be built up from patterns of use determined from log files collected unobtrusively over time. Learning needs could also be determined in other ways and appropriate learning 'pushed' when needed (Drinis & Corrigan, 2002).

For any particular problem there could be multiple offerings with differing modes of interaction (such as collaborative discussion, simulations, tutorials etc). There could even be different entry points into individual modules depending on what participants know and need (Grant, 1996). This of course adds considerably to the development time and complexity. Practical techniques for addressing this will be considered later in the chapter.

c. Social negotiation and collaboration

The main tenet for claiming a constructivist approach was the ability of participants to interact with each other and the developer. Given the very limited nature of the interaction it would be fair to question labelling the site constructivist in practice.

It was recognised that discussion areas work best when structured. Methods of structuring discussions include limiting the scope of discussions in terms of size and/or time, providing closure to discussions, actively moderating discussions, conducting collaborative projects and interacting with guest speakers (Salter & Hansen, 1999).

However, it is difficult to be prescriptive when all access is voluntary and unpredictable. As stated previously, the difficulty in developing collaborative communities in voluntary professional settings is not an isolated finding. Pragmatists tend to be 'far more interested in finding just-in-time support than in finding like-minded supporters' (Donovan & Macklin, 1999). Nevertheless, the low level of interaction highlights the need to avoid having open-ended discussions and the danger of basing most interaction on this method alone.

d. Understanding the knowledge construction process

This was one area in which the claim might be partly justified. As noted in the last chapter, a number of participants acknowledged the usefulness of experiencing online teaching as a learner. Susan commented ‘not only are you educating staff about online learning, you’re demonstrating and modelling how online learning can occur’. However, the low degree of use and limited interaction gave little scope for participants to be self-critical or reflective.

e. Student-centred instruction

Participants welcomed the ability to choose their own path through the material. Comments included ‘I like the free roaming’ and ‘I’d rather dip in as I need’. However, many did not put in the effort to pursue personally meaningful problems. A number of factors may have contributed to this. The size and layout of the site may have made it difficult for participants to locate information relevant to their particular learning needs. For example, the participant who was particularly interested in streaming video was not able to find the sections dealing with this. While a site map was provided, there was no explicit guidance to assist in choosing relevant paths. The classification of the material and the navigation on the site was based on the assumed needs as determined by the developer. Giving members of the target groups the opportunity to have input early in the development process would allow a closer match to actual needs. In addition, forms of guidance for these particular needs could also be provided. For example, if one of the identified needs was ‘how do I set up an online discussion?’ the site could provide a suggested path to assist with this.

While participants were encouraged to provide input into the site by suggesting links or providing resources, there were no contributions. As with the other claims a large part of the failure was the inability to generate interaction.

f. Active engagement

It is impossible to ascertain how many made use of external activities such as downloading and using software or working through other online tutorials. Nevertheless, as noted in Chapter Two, the main expectation for engagement was through the discussion area. The danger of relying on this alone has already been

noted. Given the failure of peers to interact through the discussion area, there is considerable scope for participants to interact with the computer. This, of course, also adds to the complexity of development.

Overall, the site was developed with a constructivist approach in mind. However, in practice, the over-reliance on the discussion area as the means for interaction meant that a failure in this area tended to negate the constructivist assertion. To make such a site more constructivist in actual use, methods to promote active participation in the discussion area and/or other methods of interaction that promote critical thinking and reflection, such as simulations, would need to be employed. Techniques that could help improve the constructivist nature of the site will be considered later in the chapter. However, the results also suggest that development could benefit from a multi-theoretical and even multi-disciplinary approach.

5.2.2 Multi-theoretical and multi-disciplinary approach

> 'Learning and teaching theories function better as resources than as a Rosetta stone. A skill training task can draw much from the behavioral approach, for example, while personal growth-centered subjects seem to draw gainfully from humanistic concepts. An eclectic, rather than a single-theory based approach to developing strategies and procedures, is recommended for matching instruction to learning tasks' (Zemke & Zemke, 1984)

While disappointed that the site was used in a more uni-directional rather than interactive manner, a number of comments alluded to the possibility that this may be a preferred model for some learners. Typically these comments suggested providing 'step-by-step' instructions. A similar result was found in an evaluation of the technology-enhanced learning environment developed by APCOT. Teachers who wanted to emulate the highly constructivist model suggested that the developers 'write something like a "recipe book" for teacher development that would deliver the same results' (Apple K-12 Education, 2000). Similarly, Slay (1999) found that academic staff preferred a descriptive or even prescriptive approach to developing online materials. Zemke and Zemke (1984) suggest that the need for straightforward how-to information is often the primary motivation for an adult to begin a learning

project. However, as Sahed noted, this kind of approach ‘depends on the subject itself, which subject and what is the objective of that learning exercise’.
As noted in Chapter 2, one of the assumptions was that ‘factual material often provides a fundamental base from which deeper learning can take place through reflection and social interaction’. Examples of this kind of material include ‘how to administer a needle?’ or ‘how to log on to an online system?’. As interpretation is required (such as ‘when to administer a needle?’ or ‘why use online learning?’) more reflective approaches take on greater significance. Providing some of the more ‘factual’ or mechanical aspects initially in this fashion may help to cater for the ‘profound differences between "traditional" and "constructivist" teachers [and the] chasm between early and late adopters’ (McKenzie, 1999c).

The challenge will be to move staff from mechanical aspects treated in this way to more reflective models of staff development which relate to the underpinning educational theories (Creanor & LittleJohn, 2000).

> ‘Professional development must help teachers move beyond “mechanical use” of curriculum and technology to become facilitators of inquiry’ (Grant in Norton & Sprague, 1998, p211)

This transition could well be the key to moving staff from primarily information-transmission methods to more constructivist approaches in their own teaching. Staff could be slowly made more comfortable with more reflective approaches, that promote deep rather than surface learning, by beginning with prescriptive material ‘sprinkled’ with components that promote reflection. The idea of specific ‘reflection objects’ will be taken up later.

An examination of more specific learning theories rather than the wider constructivist framework can also inform development and evaluation. For example, as the site was geared towards adults, adult learning theory provides another method for interpreting the results. The site was successful in relation to some principles of adult learning. Adults are autonomous (Lieb, 1991). They prefer self-directed and self-designed learning projects where they can control pace and the start/stop time (Zemke & Zemke, 1984). Participants commented specifically and positively on these aspects. The use of the web to provide instruction also helped to overcome

some of the common barriers to adult learning such as 'scheduling problems, "red tape", and problems with child care and transportation' (Lieb, 1991). However, the theory also states that adult learners tend to focus on goals and relevancy. 'Learning is a means to an end, not an end in itself' (Zemke & Zemke, 1984).

> 'the best way to energize a room full of adult learners is to show them how a skill or concept will make them better at what they do. Workers participating in e-learning must know how new information will make them more efficient or better at their job' (Drinis & Corrigan, 2002)

As noted previously, the level of granularity of the assumed problem (ie. becoming an effective teacher in an online environment) was too high. While the learners knew their own personal goals, there was no structure in place to show them how the site would help them attain these goals. Indeed, many probably entered the site through curiosity rather than a specific attempt to learn anything in particular. The low incidence of repeat visits may be related to not being explicit about the goals that could be achieved. Given the problem of churn and the need for adult learners to see a reason for learning something, it is important to demonstrate the relevancy or value of the site very early on.

In addition to churn, the fact that most people who expressed interest never even visited the site, suggests there is also a need to examine theories outside the education discipline such as marketing. In particular, much could be gained by examining recent advances in e-commerce. For example, in their textbook on Electronic Commerce, Schneider & Perry (2001) list the following objectives for achieving web presence goals –

- Attracting visitors to the site
- Making the site interesting enough that visitors stay and explore
- Convincing visitors to follow the site's links to obtain information
- Creating an impression consistent with the organization's desired image
- Building a trusting relationship with visitors
- Reinforcing positive images that the visitor might already have about the organization
- Encouraging visitors to return to the site

The results of this research suggest that these objectives are equally critical in online staff development. Theories relating to e-commerce, like theories relating to e-learning, are still emerging. For example, 'the cluetrain manifesto' (Levine, Locke, Searls, & Weinberger, 2000) challenges some of the corporate assumptions about doing business online. The primary thesis is that 'markets are conversations' and that markets are getting smarter faster than most companies. This sounds familiar to the constructivist notion that education is dialogue. While there is considerable research to draw on for the use of computer-mediated communication in education, new theories of communication emerging from the business world, particularly those that relate to attracting interest online, have relevance in the development of online staff development.

The study and application of diffusion theory is also potentially valuable (Surry, 1997). This case study has attempted to develop a staff development activity based on a theoretical perspective and see the effectiveness relative to concerns. However, adopter-based theories of diffusion, suggest that the reverse may be more successful.

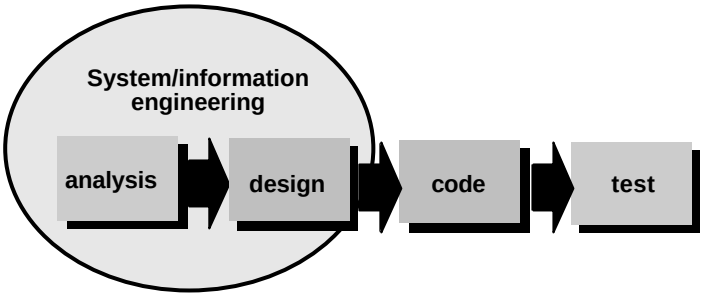
> 'Perhaps a place to start is by determining where school personnel are in the innovation-decision process and what their concerns are (self-, task, or impact)... with this information can we begin to design appropriate professional development programmes' (Dooley, 1999, p40)

In fact, the theory of participatory design and modern process models associated with the discipline of software engineering recommend that the users should be considered throughout the process not just at the beginning and/or end.

> 'end users become co-designers of the innovation, participating not only at the end, but throughout the entire design-and-adoption process' (Wilson et al., 1999)

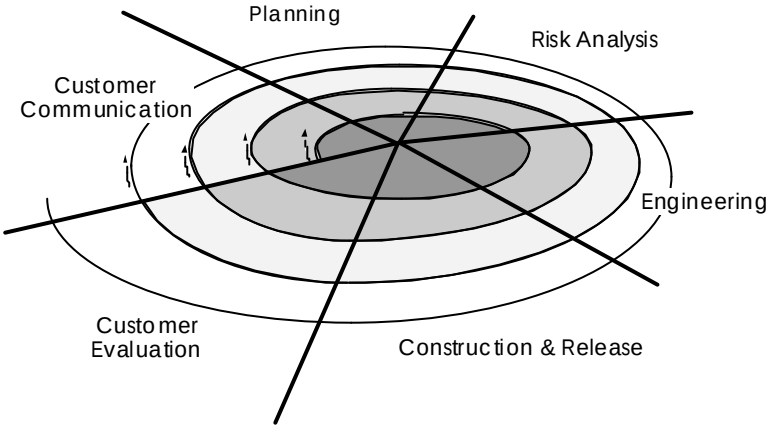
In the past, software development often followed primarily linear stages. A classic example of this is the waterfall or linear model (see fig 5-1 over page). .

Figure 5-1 The Linear Model (Pressman, 2001, p29)



Douglas (2001) claims that these linear models have considerably influenced instructional design models in educational technology. With the move to object-oriented approaches to programming, more recent models such as prototyping, incremental and spiral, are gaining greater acceptance.

Figure 5-2 An Evolutionary (Spiral) Model (Pressman, 2001, p37)



These models are more iterative and include the users much more heavily in the design process. Indeed, Kennedy suggests that these types of models 'are congruent with a constructivist perspective of teaching and learning, and software development' (Kennedy, 1998, p384). He goes on to say that object-oriented technologies 'may offer better solutions in the future for the large courseware projects being developed in higher education' (Kennedy, 1998, p375).

While there are relatively strong links between technical areas of computing and education (eg. programming), there is a case for more closely examining software engineering models and their links to instructional design. Most conferences and publications on educational technology focus on implementation and pay relatively

little attention 'to the analysis and design that should precede implementation' (Douglas, 2001, pF4E-4).

In some ways, the web poses unique problems for software development. These typically include shorter developmental lead-time, greater emphasis on visual creativity and the need to cater for diverse audiences. This has led to the more recent discipline of 'web engineering'. In particular, there has been a move away from the ad hoc development of web sites which are difficult to maintain and don't scale easily to the development of complex web-based systems based on 'systematic techniques, sound methodologies and quality assurance' (Ginige & Murugesan, 2001, p15). Web Engineering models often take object-orientation a stage further by examining adaptable component-based systems, which can evolve over time. Such approaches, based on reusable components, standards and repositories offer a framework that can be used for educational product development (Douglas, 2001), particularly in the web environment.

The issue of time has been discussed in relation to participants, but not in relation to development. Most approaches to online staff development are likely to change over time as content, technology or best practice change. The model used in this research has been shown to need modification and such modifications or additions will not be trivial. Web engineering can provide models and frameworks that are more easily scalable and maintainable. This will entail looking at new paradigms for development.

> 'This involves a paradigm shift from what is currently a predominantly craft based approach to educational product development, which currently has few standards and much duplication of effort' (Douglas, 2001, pF4E-3)

5.2.3 An expanded framework

The 'horseless carriage' syndrome is still in evidence. Some people viewed the online module as a traditional course. Comments in emails that alluded to this included –

> *'I would like to enrol in this course'*
> *'I would like to be considered for this introductory course'*

'What is the cost please'

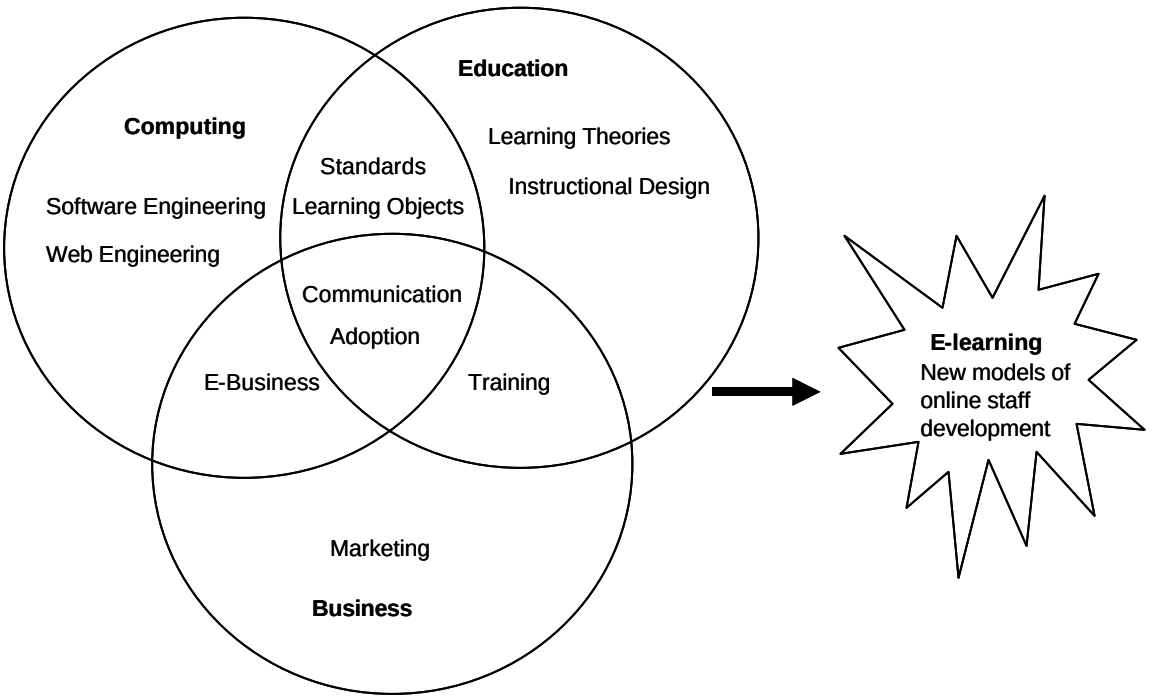
'Do you have any idea, roughly, when it would start'

Drinis & Corrigan (2002) state that for online training, 'the existing course paradigm is failing'. In a number of ways the model used in this research did not follow the traditional course paradigm. For example, there were no start or end dates or set assessments. However, this led to problems in encouraging participation and interaction. Nevertheless, this does not necessarily mean that we have to revert back to the course paradigm. John summed up a common opinion to many web-based courses that follow this format.

> JOHN: *'I think courses on the web are boring… I find that these computer based training things that I've done in the past and web based training stuff, I don't remember any of it'*

Cook (1997) suggests that we need to 'think outside the box' when planning and implementing ambitious educational reform. Part of this shift may include looking beyond a single educational theory, such as constructivism, and indeed examining theories beyond education. Figure 5.3 below gives a possible framework, which may result in better models of online staff development.

Figure 5-3 An expanded theoretical framework for developing online staff development



The following section details the practical steps that can be used to overcome the problems identified. Finally, a suggested model for future development and research, based on the above framework, is presented.

5.3 Implications for practice

5.3.1 If I build it will they come?

> ‘Anytime, anywhere training offers flexibility, but it can very easily turn into "Anytime, anywhere…so why not tomorrow?” With online training, unlike mandatory classroom training, employees might never even get through the door’ (LGuide, 1999b)

The first step in any voluntary online program is to get staff to visit the site. One obvious method it to make use of the site mandatory. However, mandatory professional development, at least in higher education, tends to be linked to statutory obligations and is quite limited. Unless there are obvious benefits, compulsion may actually dampen enthusiasm and interest. As noted in Chapter One, this may make future attempts to attract participants more difficult. Staff ‘may see little value in investing more time in professional development if their previous experience have been predominantly negative’ (Cook, 1997). Susan also notes that there may be little transference when work is mandated.

> *SUSAN: ‘if we had a compulsory component that said you must participate in the discussion within the graduate certificate, I think at the end of the day most of the staff would just do it because they had to do but not actually get a great deal out of it and then not be able to go on and engage in that and use it in their own teaching’*

Use of the site could be linked to an established face-to-face workshop, but this would negate many of the benefits associated with online teaching, such as reduced travel, described in Chapter One. This is not an argument for providing all staff development in this way and it is likely that mixed-mode approaches may be particularly useful. For example, many authors comment that some face-to-face contact either initially or during an online course can reduce feelings of isolation, help build working relationships and strengthen the online community (Gillham & Hall, 2000; Harasim et al., 1998; Levin, Waddoups, Levin, & Buell, 2001; Nisan-Nelson, 1999). In fact, most students highly value face-to-face contact with staff and

peers (Gillham & Hall, 2000) and some show a distinct preference for face-to-face collaborative learning in small groups (Marjanovic, 1999). Cavanaugh & Cavanaugh describe offering a mix of face-to-face, distance learning and more frequently face-to-face workshops which feature web support that in turn 'falls along a continuum from highly structured to user-generated' (Cavanaugh & Cavanaugh, 1999). Providing such a mix has much to recommend it as it moves away from the 'one-size-fits-all' approach.

> 'Administrators and faculty often fear that addition of technology supports can spell the end to on-campus, residential learning experiences. However, research suggests that availability of traditional plus virtual learning options will create new environments in which students make choices to customize the learning experience to suit their personal and changing needs' (Smith, 1997, p41)

Another potentially useful face-to-face approach is to provide a mentor system for staff, particularly those with high self-concerns. Typically, 'online teaching has been the province of individual academics with the interest, energy and resources to develop their own materials for the Internet' (Bennett et al., 1999, p210). A mentor system can help to overcome the lack of transference caused by this isolation and address many of the personal concerns of the novice online teacher. However, it may be important to ensure that the mentor is a peer 'who is just a step ahead of them' (Dooley et al., 1999, p114). If a colleague is too advanced 'their levels of expertise may discourage other staff members who may be alienated by the language of online technologies and feel comparatively unskilled' (Bennett et al., 1999, p210).

Other face-to-face methods could be elaborated upon. However, it needs to be remembered that the original aim of the module was to encourage the 'mass migration' of staff to online teaching in some form. Mixed modes limit the ability to scale up. In addition, it is hoped that staff development provided totally online may encourage staff who never attend professional development opportunities to take part. Therefore, while recognizing the potential benefits of mixed mode approaches, in keeping with the limitations of this study, further discussion will focus on the provision of activities that are totally online.

The site did not cater well for users at a different level and/or with different concerns to the developer. Using a model that includes greater participatory design is likely to create a site that caters more for perceived needs and is more inviting to a larger audience. In addition, developers need to avoid over-identifying with the project. Other people can often perceive this allegiance and an innovation may become know 'as "Sharon's project" or "Bill's baby"' (Wilson et al., 1999). In these cases, developers often react to comments and suggestions as 'obstacles or attacks from those who don't understand or appreciate the hard work that has gone on' (Wilson et al., 1999). Ultimately, however, it is the users who have to work with the innovation on a regular basis. As well as consulting the early-adopters it is probably even more important to co-opt potential resistors so that their concerns and needs can be met (Harasim et al., 1998). Techniques for consulting users throughout the design process include 'peer review, walk-through of a rapid prototype, observation of target group using the software, user-tracking, and interviews individually or in focus groups' (Kennedy, 1998, p383).

If an innovation has been developed elsewhere, it should not be assumed that it will necessarily be adopted smoothly even if tested thoroughly with users at other sites and successfully adopted there. There are a large number of cultural aspects that can affect adoption and diffusion within a local setting. Many useful innovations and resources have had an early demise due to the 'Not Invented Here' syndrome.

> 'The adoption process is well-served when end users are invited to co-design the solution at all stages in the local setting. The adoption process, then, moves away from a technical application model toward one of cultural integration, adaptation, and accommodation' (Wilson et al., 1999)

Workload and lack of incentives are other issues that can affect adoption (Carr Jr, 1999; Grant, 1996). Staff recognise that online teaching increases their workload. Sandra noted that 'unless you're really comfortable with it and you use it in your work, it's an increase in your workload'. After redeveloping his teaching website because he had time to do so, John had the unfortunate experience of being given an extra course to teach. Tim recognized the rewards given to research and noted that he would 'spend more time on teaching if there were greater rewards'. In another study '65 per cent stated that student benefit and the attendant personal satisfaction of a job

well done were the only rewards for their innovations' (Hagner, 2000, p30). For staff to participate in staff development related to online teaching, there need to be incentives not only for that participation, but also for involvement in online teaching.

> 'In addition to time for training, faculty members need time to experiment with new technologies, share what they have learned with others, and work the bugs out of their material once they implement them' (Spotts, 1999, p97)

This requires a commitment to staff development. At the University of Florida they were able to successfully integrate technologies in teaching. Rather than simply making sure that everyone had access to technology on their desk they took pre-emptive steps to ensure that staff development was strong and continued to have value (Goral, 2001a). For 'e-learning to succeed, supervisors need to schedule some time in the workflow' (LGuide, 1999b). There was a time when teachers were only considered to be working when they were face-to-face with students in the classroom (Cook, 1997; Grant, 1996). However, with modern workload agreements there is perhaps more scope to schedule time for training or development.

Incentives do not always have to take the form of funds or time release. Staff appreciate 'pleasant and well equipped facilities, materials, access to course credit for professional development, and technological and pedagogical assistance' (Grant, 1996). In many instances simple encouragement or acknowledgement in front of peers may be all that is needed to provide sufficient motivation (Hagner, 2000). Given that lack of time is a key issue arising from this study and that 'time has emerged as *the* key issue in every analysis of school change appearing in the last decade'(Cook, 1997) it may also be prudent to provide assistance in time management either through planning (North et al., 2000) or workshops (McKinnon & Nolan, 1989).

Providing email reminders, particularly when they included a link to the site were found to increase participation although it must be remembered that this effect was found to be short-lived. As well as providing a link in reminders, the URL (or web address) should be as visible as possible. For example, it can be added to a range of objects such as letterhead, email signature and t-shirts. Commercial web sites even

make use of the sides of buses, sky-writing etc. Commercial sites also frequently make use of competitions in order to attract visitors although this may have less application in higher education.

Many commercial sites have also found that one of the best ways to sell in cyberspace is to give away something for free (Anonymous, 1999). This might include a free subscription to an email newsletter, a free software program or a free online manual. This form of promotion may equally apply to staff development. While this has not been quantified, anecdotal results suggest that face-to-face workshops which include a meal or refreshments tend to gain higher ratings in evaluations. Workshops which also include a free give away, such as a book, tend to rate higher still. Linking the provision of a free item to an opt-in scheme allows a database of interested staff to be built up which can be used to target reminders. For ethical reasons, and also to maintain trust, there should be an option for staff to opt-out if they so desire.

As well as providing a link in relevant emails, the actual message is extremely important. In a 'marketing tips' newsletter, Rudl (2002) states that to attract people to a site you need to emphasize benefits, not features. A feature is one of the components of the site whereas a benefit is something the site will do to offer a solution to a problem. As noted previously, adult learning theory highlights the need for relevancy. This 'marketing tip' is equally applicable whether trying to sell a product on the web or trying to encourage adult learners to participate in online learning.

For example, the email inviting entry to the site dealt with features -

> *After you log on to PlatformWeb you should notice a button that looks like a blackboard. Clicking this should take you into the Introduction to Online Teaching site…*

whereas the more successful email requesting expressions of interest included benefits –

Do you want to develop skills in using the Web in teaching? Haven't got time to attend workshops? Do you already use the Web, but want to learn more about and perhaps try some innovative practices such as moderating discussion groups, running desktop-video conferencing or developing multimedia presentations?

Because the site is not going to appeal to everyone the 'sales pitch' needs to be written to the targeted audience and should be 'brief, compelling and effective' (Rudl, 2002). Demonstrating benefits does not necessarily have to be in an email or part of the online package. Spotts suggests that staff should be encouraged to meet with others bringing ideas and show how 'improved delivery, easier record keeping, or new communications can enhance learning and help make them more efficient and effective faculty members' (Spotts, 1999, p97). Such show and tell sessions tend to be highly valued. Staff 'are often able to make the conceptual leap required to see how a colleague's use of technology might apply in their own discipline' (Hagner, 2000, p37). Related cases can help 'scaffold or supplant memory by providing representations of experiences that learners have not had' (Merrill, 2001). In one study looking at staff development in this area 'the most requested support was "advice on what is available" in terms of technology for teaching and learning' (Ellis et al., 1998, p193). In another, the group were 'actively seeking further means by which tutors can share their positive experiences… and thereby inspire their colleagues to take advantage of the online facilities open to them' (Deepwell & Syson, 1999, p124). This was echoed in this study.

SANDRA: '*some examples would be good. I'm thinking for people who don't know what's possible. Just like a mock subject or a couple of mock subjects in different disciplines'*

SUSAN: '*I would like to see lots of little vignettes'*

As well as providing these online, opportunities for information exchange include 'swap-and share' lunch meetings, special interest groups and 'road-shows' to and from other departments or institutions (Creanor & LittleJohn, 2000; Hagner, 2000). Donovan and Macklin (1999) describe how there project 'transformed into becoming " an RD&D space" (research, development and *demonstration*)' .

Lack of time was found to be the major disincentive for visiting or returning to the site. Coupled with the desire for 'just-in-time' assistance and concerns about the size of the site there is a strong case for breaking the site up into smaller components which could be completed in a short period of time.

> 'Short bursts of on-site learning are perfect for busy teachers. Fifteen minutes here, ten minutes there' (McKenzie, 1998)

Drinis & Corrigan (2002) describe the success one company had with the use of online 'coureslets' which only required a short amount of time to complete and were targeted to an expressed need.

> 'Don't torture the learner with five hours of fluff to fill space around a half-hour of meaningful content. It's cruel and unusual punishment and also is the best way to watch your online learning usage statistics plummet' (Drinis & Corrigan, 2002)

A component-based approach also makes it much easier to maintain the site and cater for different learning styles. It helps overcome the time problems that the developer(s) face as the site can scale-up in an incremental way over time. In addition, it fits nicely with a constructivist approach to learning because over time, staff can work through courselets of their own choice that match their particular needs. This model will be further developed throughout the chapter.

5.3.2 Minimising churn

The Web is a new medium. Not only do we need to ask, 'if I build it will they come?' we also need to ask 'if they come will they stay?', 'will they return?' and 'will they interact while they are there?'. After going to the trouble of attracting visitors there must be incentives for them to explore and then to return to the site later. One of the keys to this is to regularly update the site. However, this information needs to be relevant. Dynamic content is not simply 'about having today's news headlines scrolling across the top of your homepage' (Rudl, 2002).

> 'a good website needs to be dynamic and updated constantly. Internet users are becoming much more savvy…they want it and they want it now' (Neilsen, 2000, p5)

The designers of another project where churn was a problem found that that their original design was so focused on making the site useful that they 'neglected to make the site timely' (Donovan & Macklin, 1999). In order to draw repeat visits, or in e-commerce parlance, make the site 'sticky' they included dynamic content which changed often such as 'News & Reviews, 'Tips & Tricks' and 'Events' sections. In a separate study, a student undertaking an online business course commented that the information 'was alive on the Internet, you wanted to look at the stuff because it was updated all the time' (Gillham & Hall, 2000, p59). Similar requests for updated information come from this study.

> JOHN: *'You need a news page and you need a changes page'*

> MAHEESHA: *'I think I checked it out thoroughly and no I don't think I would go in again unless there was some announcement made. If there was a here's the latest on sort of flashed up when you went into Platformweb and it might be something else that you have done or another aspect of on line teaching that could be useful for people that use this medium'*

Increasing participation, such as having an active discussion area, can also generate repeat visits. The results from this research suggest that discussions should be focused and be for a limited time with definite closure rather than being open-ended. Methods to generate interest may be needed to attract the critical mass needed for the discussion to work effectively. These techniques could include inviting interesting or controversial 'guest speakers' or in providing a benefit such as the chance for collegial peer-review of draft publications.

Nevertheless, it may still be difficult to generate enough interest in a voluntary setting so the opportunity to provide interaction with the technology should not be ignored. For many, the only strategy used for 'computer interaction' other than discussion groups is the online multiple-choice quiz. Horton (2000) presents a range of strategies from providing tools and templates through to full simulations. As an example, Banks outlines the use of 'reflection objects' which are templates that allow 'learners to assess their current skills, learning goals etc' (Banks, 2001). Another form of reflection object is an 'annotation window' which allows learners to make and edit notes which are linked to the content (Donovan & Macklin, 1999).

In an object-oriented learning environment these could be sequenced with other types of objects such as information objects and assessment objects. Susan alludes to a form of reflection object with her comment –

> SUSAN*: 'its always useful to put in amongst the text … some little prompts or questions to the reader. For example you might be talking about a particular issue or concept and you might have got a couple of paragraphs into it and then you might put in a couple of lines of blue text where it says "by now I hope you can see that I've drawn together this concept and this concept" so that in terms of a learner it actually acts as a state change and helps them to concentrate and it guides them as your probably could do if you were in a lecture theatre'*

Of course, the greatest way to encourage repeat visitors is to have satisfied participants. This means meeting their needs and catering for their concerns. Again, the idea of short 'courselets' targeted to meet needs identified through participatory design may not only draw initial visits but is likely to attract return visits.

> 'Shorter, just-in-time, on-the-job, accessible learning modules are growing in popularity. Audiences will find ways to complete 10 to 15-minute modules long before they open a two-hour course' (Drinis & Corrigan, 2002)

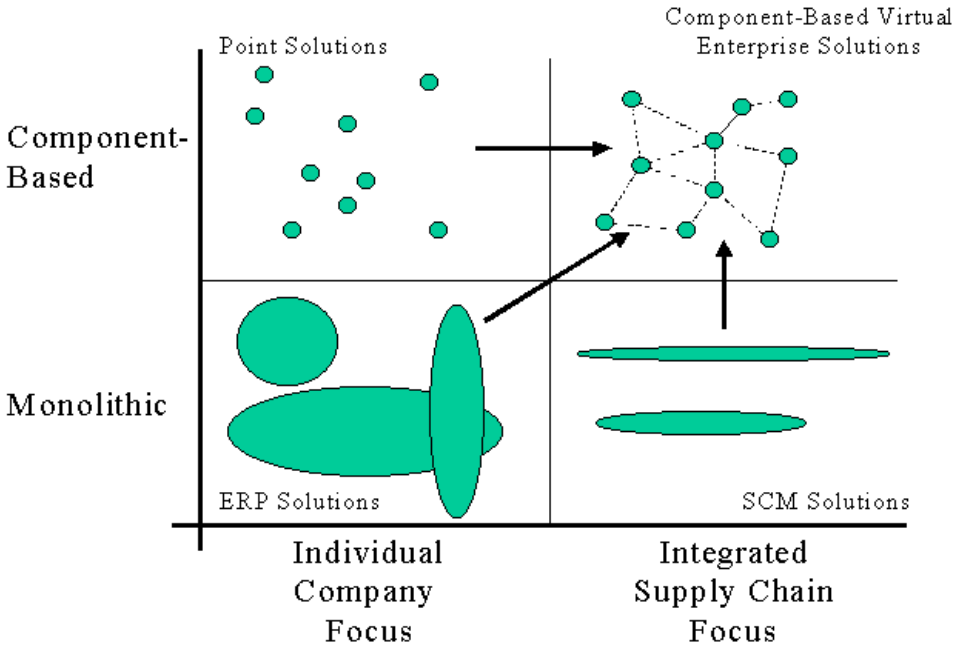
In order to judge the success or otherwise of these strategies in attracting and retaining visitors, log files can be used to regularly monitor use of a site. There are numerous automatic reporting packages for web log statistics that provide instant graphical reports. However, these may need to be complimented with some customized programming, as with this study, in order to keep track of individuals.

5.4 A revised model of online staff development

5.4.1 Trends in Online Educational Software Development

In attempting to refine the model for online staff development, it is useful to look at the current trends in educational software development. Brown (1999) provides a good illustration of the types of software solutions in business which can also be directly related to educational applications (see Figure 5-4 over page).

Figure 5-4 Current Vs desired state of software solutions (Browne, 1999)



Monolithic solutions are the large projects typically costing vast amounts of money and usually time to develop. They tend to cover many of the user needs initially, but have considerable trouble coping with changing needs. In fact it is not unknown for multi-million dollar projects never to be used because they were out of date by the time they were finally developed. Educational administrational software in universities would be considered monolithic solutions. However, it is also applicable to many teaching resources.

> 'The majority of current learning materials such as textbooks and computer-based instruction are designed as large integrated packages rather than as collections of small independent components that can be individually used and modified for multiple purposes' (Douglas, 2001, pF4E-1)

Costly computer-based packages can sometimes have a difficult time justifying return on investment. Recalling from Chapter One, many projects in educational technology, funded at an average cost of US$100,000-US$1 million, have never been 'used outside of the university at which they were conceived and sometimes not even within that' (Bondaryk, 1998).

The module in this project would fit into the point-based solution model. In education, examples include the ‘home grown’ innovations developed by individuals or small groups who may have professional expertise or be enthusiastic amateurs. In the past, the author found a niche developing databases using this model, which were needed to make up for the deficiencies in monolithic solutions found in large organisations. While much cheaper to develop, point-based solutions suffer from their own problems. These include difficulties in scaling, maintainability and a lack of interfaces to other systems. They tend to suffer greatly when the ‘champion’ moves on to another place of employment or even simply to the next interesting project.

The advent of object-oriented programming and more recently the development of web-based applications has heralded a significant trend towards integrated component-based solutions. This model is cheaper and quicker to implement than monolithic solutions but overcomes the problems associated with point-based solutions. Scaling is easier because a complete system doesn’t need to be built before implementation. The system can grow as components are added over time. Similarly, the system can improve over time as improved components become available. Development can be shared - one team or person doesn’t have to develop all of the components. Maintenance, required because of changing specifications or bugs, is easier as only a single component needs to be attended to at a time. Unlike point solutions, which form data islands and lead to issues with data redundancy, components are integrated through the use of shared data repositories or data warehouses. One of the greatest benefits is that components can often be shared or re-used by separate applications, speeding up development as new applications can be assembled from different combinations of existing components (Douglas, 2001).

This model is gaining wider acceptance in the development of educational products. Donovan & Macklin (1999) describe their move from a point-based model to that of an integrated component based one.

> ‘Our development activity has shifted from a focus on highly customized, boutique solutions that met the need of particular educators - but did not scale - to the development of a modular Web-based suite of services that

> meet common needs identified through discussions with a wide range of educators' (Donovan & Macklin, 1999)

For example, they developed one of the components, a peer review tool, because it addressed a widely shared need that could be used by the campus at large (Donovan & Macklin, 1999). By using smaller components it becomes easier to provide more complex instructional design. For example, developing a simulation on a small but difficult to teach concept would take much less effort than to develop a full-simulation, such as one of the successful Sim-City series. This approach also allows the designer to introduce a range of different instructional design models in order to cater for different learning styles.

In some ways this model is comparable to the eclectic process teachers typically use when designing teaching and learning activities. While it may be possible to follow a text-book in an introductory subject, content for higher level units typically comes from a wide range of disparate sources for which the teacher provides the integrating framework. Now that the technology makes it possible, textbook publishers who recognise this are beginning to offer customised online texts built up from chapters requested from a range of books.

In relation to web-based learning, more developers are beginning to examine the possibilities of learning objects (which are also known as reusable learning objects or RLOs). There are a range of definitions for learning objects as well as considerable argument over the granularity or size of learning objects. For this discussion, I will use the definition provided by Wiley – A learning object is 'any digital resource that can be reused to support learning' (Wiley, 2000). This includes smaller objects such as digital images, animations, video snippets as well as larger objects such as 'entire web pages that combine text, images and other media or applications to deliver complete experiences' (Wiley, 2000). However, it should be noted that the capability for re-use diminishes as an object becomes larger and/or contains more contextual information.

The Centre for International Education at the University of Wisconsin notes the following characteristics of learning objects –

- Learning objects are a new way of thinking about learning content. Traditionally, content comes in a several hour chunk. Learning objects are much **smaller units of learning**, typically ranging from 2 minutes to 15 minutes.
- Are **self-contained** – each learning object can be taken independently
- Are **reusable** – a single learning object may be used in multiple contexts for multiple purposes
- **Can be aggregated** – learning objects can be grouped into larger collections of content, including traditional course structures
- Are **tagged with metadata** – every learning object has descriptive information allowing it to be easily found by a search (Center for International Education, 2001)

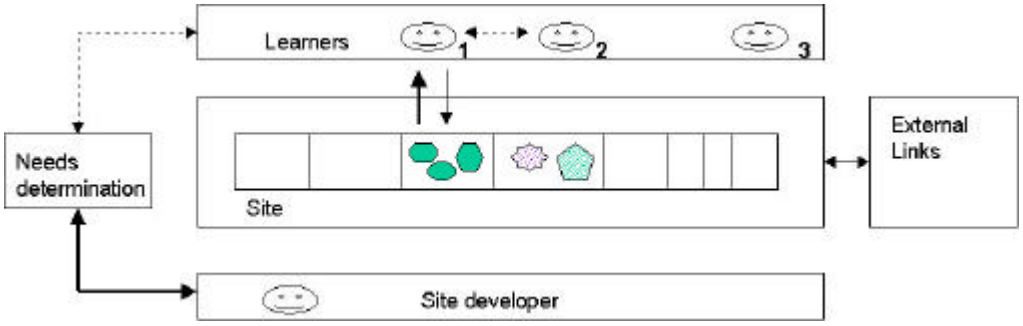
In order to be re-usable, aggregated and integrated these objects need to follow standards. A range of standards, such as IMS (IMS Global Learning Consortium, 2001) and SCORM (Advanced Distributed Learning, 2002) are being developed. At first these were being developed in isolation, but now the various organizations are cooperating and the standards are converging.

As well as standards, storage areas or repositories are needed in order to access and exchange objects. Objects are 'wrapped' in metadata, following a standard, allowing them to be more easily located within the repository. 'Standards and repositories set the technological framework necessary for a component based approach to educational product development' (Douglas, 2001, pF4E-3). The next section looks at how this kind of technological framework can link with the theoretical framework presented earlier to come up with a new model for developing online staff development activities.

5.4.2 A New Model

As stated previously, the model used to develop the site in this study could be considered a point-based solution.

Figure 5-5 Model used to develop site

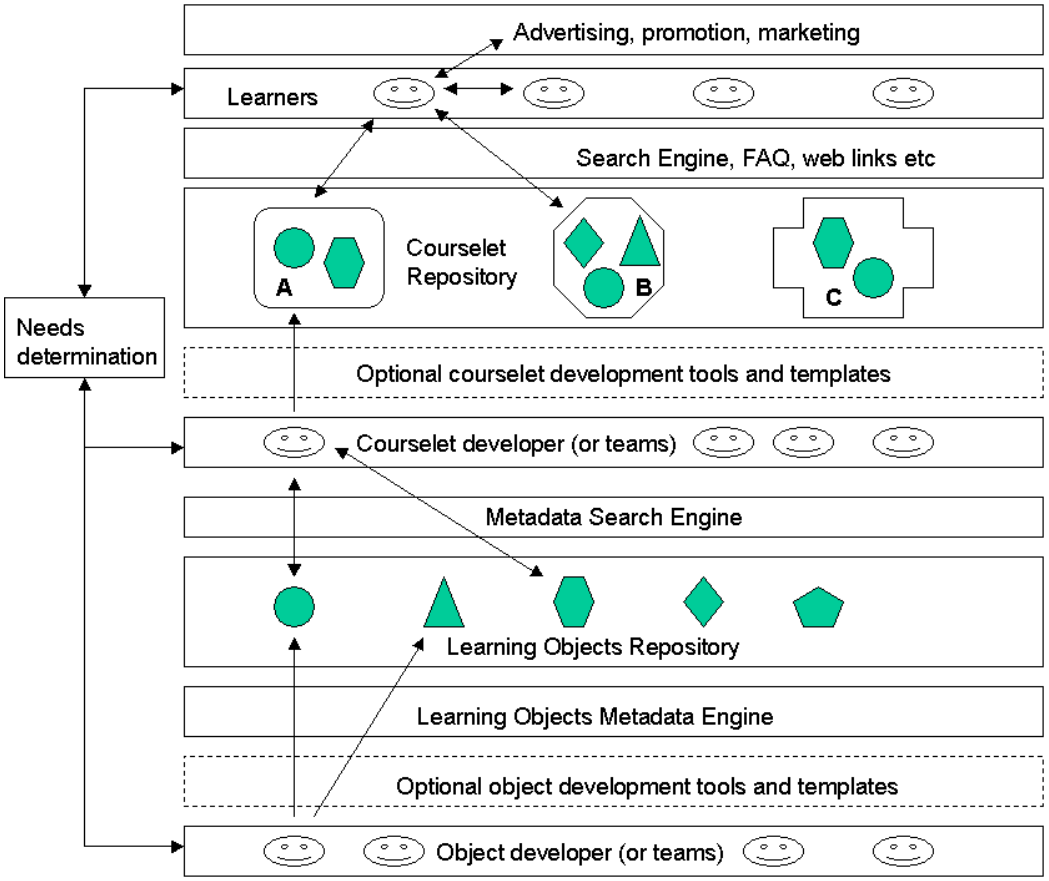


Most of the needs determination was conducted by the single developer. Information transmission was primarily from the site to the learner and little the other way. There was limited interaction between learners and while there were some learning objects included in the site, such as PDF files, these were not standardised in any way. The site was in essence a final product, albeit one for research and evaluation.

> 'It may be wise to think about new media projects, Web - based, CD - based, or otherwise, in terms of dispensable media, rather than as a finished entity. If you can allow a project to grow and change as it is adopted, it will be stronger and more flexible as a result' (Bondaryk, 1998)

The revised model is based on an integrated component-based design and attempts to deal with the major issues identified in this research. These include identifying and meeting the needs of learners, catering for a diverse range of learners and their concerns, attracting and retaining visitors, encouraging participation and interaction, overcoming the barrier of lack of time for participants, recognising that the developer(s) also have limited time and encouraging effective change. Figure 5.6 (over page) provides a diagrammatic representation of the model.

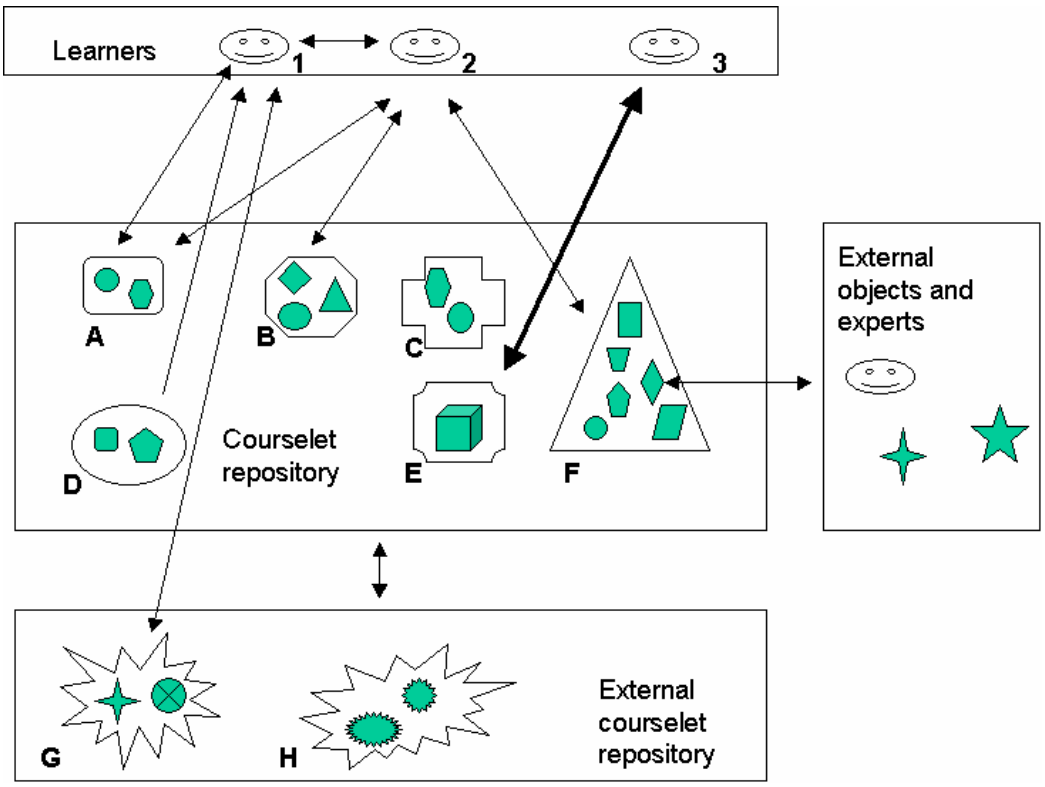
Figure 5-6 Proposed new model



Needs determination is done in consultation with the learners throughout the design process. Self-contained courselets are developed by grouping learning objects within a framework that provides contextualisation, sequencing and instructional design. The courselets require only a limited amount of time to complete. The time to complete, and perhaps even the mode of interaction, is stated up-front. Consideration is given as to how these courselets will be marketed and promoted. Rather than having a single learning site, there is a portal where learners choose the courselets required to meet their specific needs via appropriate search mechanisms and links. Courselets and learning objects can be added, modified, or even imported from external sources over time. Development could be conducted by a range of individuals or teams. Tools and templates could be provided to assist novices develop their own courselets or objects. A metadata search engine is provided in order to locate appropriate learning objects. A user-friendly mechanism is provided for adding metadata to the objects before being uploaded to the repository.

The following diagram may help to describe how this could work in actual practice.

Figure 5-7 An example of courselets in practice



Learner 1 completes courselets A, D and G. Learner 2 also completes courselet A and interacts with learner 1. However, due to differing needs, learner 2 then goes on to complete courselets B and F. Courselets A and C contain the same learning objects, but the contextualisation, sequencing and instructional design are different. Courselet F contains more learning objects than others, including one which promotes interaction with external experts and resources. Courselet E contains only one complex learning object, a simulation. The interaction with this courselet is much higher. On the other hand, courselet D is simply for information transmission. Courselets G and H are imported from an external repository. Some coureslets, such as C and H, are not visited by anyone and this information helps future development and marketing.

While this model may seem much more complex and perhaps time-consuming than the original model it must be remembered that objects and coureslets are much smaller and can be added over time. Nevertheless, considerable development is still

needed for tools, templates, engines and repositories. However, much of this work is already underway or already available. There are an increasing number of learning object repositories such as the Apple Learning Interchange (Apple, 2001) and the Campus Alberta Repository of Educational Objects (University of Calgary, 2002). Metadata engines such as the Developers Toolkit for Creating IMS Learning Resource-Compatible Meta-data (Sun MicroSystems, 2002) are becoming available. We are also beginning to see the development of IMS/SCORM compatible tools such as SCOmaker, which is an Add-In that allows SCORM compliant content to be saved directly from MS-Office applications (Boxer Technologies, 2001). Some of the latest tools are working towards more interactive content. For example, 'Challenge' is a courseware authoring tool designed to develop case-based scenarios where students need to analytical skills in order to solve a 'mystery' (Massey University, 2002). While not compatible with current standards it is an interesting example of a generic tool designed specifically for constructivist, problem-based scenarios.

Another factor which reduces development time is that the work of development can be spread. While incentives and rewards may assist, many academics 'want to teach well because it provides so much satisfaction to do so' (Freeman & Capper, 1999). Developing online educational products can be enjoyable for this reason and also because it exercises creativity. Some of the most popular subjects within the School of Computing and Information Technology at UWS are those that cater for this creative urge. For example, in the popular unit 'Interactive Website Design' the major assessment item is to create an attractive and functional website. Nevertheless, not all teachers will want to develop their own complex learning objects. However, most are already creating simple ones such as PowerPoint presentations. In addition, teachers are already very conversant with building sequences of instruction using resources from disparate sources. If the process to do this in digital format is made relatively simple with appropriate tools and engines and if there is access to a large pool of learning objects, it is likely that the number of developers could increase greatly.

> ‘The Web and other collaborative software development techniques are introducing us to new ways of developing projects, which have the potential to make the community a community of authors, not just of adopters’ (Bondaryk, 1998)

> ‘Think about a world where control of content is truly put into the hands of every individual or their designated assistants, where everyone in need of a given skill or knowledge can be connected directly with those who have it. What will it mean to have potentially billions of authors and publishers?’ (Hodgins, 2000)

Staff are more likely to develop material if they can be assured that it is readily reusable. For example, a staff member will more readily develop a digital quiz item bank if they can be assured that it will fit different standards compliant learning management systems should they happen to move universities. Having a range of developers also reduces the chances of having material that only caters for one particular group.

Of course, no claims can yet be made about the proposed model as it still needs to be tested by research. However, like software development, research works well when an iterative approach is taken. This case study is simply the first step in working towards an answer to the question - ‘what factors or strategies might lead to increased participation and effectiveness of online staff development?’. There is also no suggestion that this system is the only model that could, or should, be used. The appropriate model will depend on a range of factors including needs, resources, expertise and local issues. For example, a team wanting to develop online problem-based learning may find a non-standard package such as ‘Challenge’ the most appropriate solution. Nevertheless, in order to demonstrate the concept an example of a simple courselet, which includes a dummy template, is included with the practical thesis.

5.5 Summary of Recommendations

The following is a summary of the recommendations for developing voluntary, online staff development based on this research study. They are presented under the major theoretical categories outlined in the framework in Figure 5.3. Many of the recommendations are responses to the results presented in Chapter Four and will themselves need to be tested by future research. In keeping with a constructivist approach, readers are also encouraged to analyse the results in light of their own knowledge and settings and to adapt or develop their own recommendations where appropriate.

Adoption

- Design of online staff development should be user-centric. Participatory design techniques should be included throughout the design process and include potential resistors as well as the early-adopters. Techniques for getting feedback include peer-review, walk throughs observation, user-tracking, individual interviews and focus groups.
- Rather than have a large single site, it may be preferable to break material up into smaller chunks such as 'courselets' which can be completed in 10 – 15 minutes. The amount of time needed to complete can be made explicit up-front.
- Where possible, incentives to undertake training and also develop online materials should be provided. Incentives may include funds, materials, improved working environment, time release, assistance, encouragement and acknowledgment in front of peers.
- Where possible, tools and templates that make it easier for novices to access, develop and sequence material should be provided.

Learning Theories & Instructional Design

- It should not necessarily be expected that development of material based on a particular learning theory will mean that it is adopted that way in practice.

- In voluntary settings, a 'constructivist' design should not rely too heavily on online discussions.
- Instructional design can be built into individual learning objects and/or courselets. The underpinning for the instructional design chosen should be based on the type of content and desired learning outcomes.
- Areas to be covered should be ascertained through needs analysis.
- There could be a range of courselets or modules dealing with the same need in order to cater for different levels, preferred learning style or concerns profile. In particular, there could be a mix of courselets using highly structured and directive styles and those that are more open-ended which allow greater choice.
- There could be different entry points into individual courselets or modules depending on what the participants know and need.
- More factual, mechanical aspects may be handled in a more uni-directional transmission style, but there could be incentives and encouragement to move towards more reflective approaches that encourage deep learning. This could include an increasing use of 'reflection' objects.
- Learners should be able to choose their own paths although suggested pathways to reach a certain goal could be provided.
- Relevancy needs to be demonstrated up-front, very early on.
- Examples, demonstrations and vignettes are popular and can provide new ideas for staff to trial in their own setting. These can be provided both face-to-face and online.

Marketing & E-Business

- Steps should be made to make the site or portal timely. Information needs to be dynamic and updated constantly.
- There should be frequent email reminders, which include a link. The optimal frequency of reminders may need to be determined through research.
- The text of invitations and reminders should be brief and compelling. The copy needs to highlights benefits not features

- The URL to the site or portal should be highly visible, through placement in appropriate areas such as email signatures, letterhead etc.
- Free give-aways and competitions may attract interest. Opt-in schemes for these can allow a database of interested staff to be established although there should also be a choice to opt-out.
- As well as provide new ideas, demonstrations and road-shows can generate interest and enthusiasm.

Training

- Courselets should try to meet the 'just-in-time', 'just enough' needs of staff.
- Assistance with time management, particularly for junior staff, may be beneficial.

Communication and interaction

- Generating online discussions and interaction online in voluntary settings is problematic. Discussions should not be open-ended, but have a definite time-frame, purpose and closure. Methods to increase participation could include inviting interesting or controversial 'guest speakers' and providing benefits such as the chance for collegial peer-review of draft publications
- The difficulty in generating the critical mass needed for worthwhile online discussions in these situations may prompt a greater use of human-computer interaction such as simulations or games.

Software & Web Engineering

- A range of development models could be chosen from depending on needs, resources, expertise and local issues.
- A component-based integrated approach is more readily scalable, maintainable and re-usable. In the longer term this should save time for the developers and has the potential to allow many more teachers to become 'developers' themselves if the appropriate tools are provided.
- Whatever model is chosen it should include an iterative approach to participatory design.

Learning Objects & Standards

- In order for a component-based approach to successfully integrate internally and exchange components externally, the components and system need to meet the emerging standards. In the future, staff are more likely to develop standards-based objects as an increasing number of commercial learning management systems become standards-compliant.

5.6 Conclusion

There are numerous potential benefits in providing staff development online. These include reduced travel, the ability to provide just-in-time and just-enough learning, potential for increased collaboration and reflection, a degree of privacy that can overcome fear of being seen as foolish, modelling of online teaching, lower need for facilities and supplies and the potential to reach large numbers of staff. However, this study has shown that it cannot be assumed that these benefits are automatic. In particular, online staff development will fail if it cannot attract and retain visitors and encourage active participation.

Many of the problems associated with the site reflect the voluntary nature of the activity. By providing a more formal structure many of the problems could be minimised. However, the model tested in this case study was intended as a supplement and not a replacement for other forms of staff development. There will always be a need for face-to-face workshops and other programs. However, as this study has also shown, lack of time is a large and continuing problem for academics. Using technology is one of the creative ways we may help educators carve out time for staff development and make more efficient use of the time that is available (Cook, 1997).

The development of the model was based on an underlying constructivist philosophy. However, the results show that a particular choice of learning theory to guide design does not necessarily mean that this is how the online material will be used in practice. Therefore, there is little that can be conclusively said about the effectiveness of a constructivist approach in this particular case. Indeed, a case has been made for expanding the theoretical framework beyond constructivism and even

education. Nevertheless, the use of a constructivist approach linked with the research design has led to a high degree of personal reflection leading to a proposed new model for online staff development or, in other words, pedagogical reengineering.

> ‘Constructivism has had a strong influence on instructional design in the past decade and challenged many of its previously accepted tenets. There is still strong debate as to the value of the newer approach, but certainly, it forces a level of theoretical questioning that is extremely valuable in itself. It is likely that refined models of learning and instruction will emerge out of the ongoing debate and lead to yet further perspectives in these areas’ (Carr-Cheilman & Duchastel, 2000, p240)

The proposed new model and many of the recommendations are still untested and form the basis of future research. Best practice will only emerge as we ‘explore alternatives and try them with real users in real business settings, refining’ our strategies along the way (Drinis & Corrigan, 2002). The challenge will be to prompt a high level of reflection and interest not only by the researchers of online staff development, but also the participants.

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Note – A number of sources cited were electronically accessed. In these cases the relevant URL has been provided. For web pages the date of access is also included. Because electronic sources do not usually provide standard pagination, references to these materials in the text of the report do not include a page number.

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Appendices

Appendix A – Consent Form

CONSENT FORM

I, ...…… of
.....

.....……
……

Hereby consent to be participate in a study to be undertaken by Graeme Salter of Northern Territory University and I understand that the purpose of the research is to assess the impact of a web-based, interactive approach to staff development in online teaching. I recognise that this project forms the basis of a Doctor of Teaching thesis.

I acknowledge that:

- the aims, methods, and anticipated benefits, and possible risks of the study, have been explained to me by Graeme Salter
- I voluntarily and freely give my consent to my participation in such study.
- I understand that aggregated results will be used for research purposes and may be reported in a thesis, conference proceedings or academic journals.
- individual results **will not** be released to any person except at my request and on my authorisation.
- I am free to withdraw my consent at any time during the study, in which my participation in the research study will immediately cease and any information obtained from me will not be used.

I give specific permission for (please tick appropriate box):

	Yes	No
Audiotaping the final interview	☐	☐
Access to PlatformWeb subjects	☐	☐

Signature: ..... Date: .....

Appendix B – Stages of Concern Questionnaire (SoCQ)

Original SoCQ Copyright, 1974Procedures for Adopting Educational Innovations/CBAM Project R&D Center for Teacher Education,The University of Texas at Austin

The purpose of this questionnaire is to determine the types of concerns of staff using, or thinking about using, the web in teaching. Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with web-based teaching. There is no one definition of web-based teaching, so please think of it in terms of your own perception of what it involves. Please read each of the following 35 questions and then click the radio button that most closely matches your concerns about each item. A number of items may appear to be of little relevance or irrelevant to you at this time. For any completely irrelevant items, please click 0 on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale. When you have completed all items press the Submit button at the bottom of the form.

Thank you for taking the time to complete this task.

1. I am concerned about students' attitudes toward web-based teaching.
2. I now know of some other approaches that might work better.
3. I don't even know what web-based teaching is.
4. I am concerned about not having enough time to organize myself each day.
5. I would like to help other faculty in their use of web-based teaching.
6. I have a very limited knowledge about web-based teaching.
7. I would like to know the effect of reorganization on my professional status.
8. I am concerned about conflict between my interests and my responsibilities.
9. I am concerned about revising my use of web-based teaching.
10. I would like to develop working relationships with both our faculty and outside faculty using web-based teaching.
11. I am concerned about how web-based teaching affects students.
12. I am not concerned about web-based teaching.
13. I would like to know who will make the decisions regarding web-based teaching.
14. I would like to discuss the possibility of using web-based teaching.
15. I would like to know what resources are available if we decide to adopt web-based teaching.
16. I am concerned about my inability to manage all that web-based teaching requires.
17. I would like to know how my teaching or administration is supposed to change.
18. I would like to familiarize other departments or persons with the progress of this new approach.
19. I am concerned about evaluating my impact on students.
20. I would like to revise web-based teaching's instructional approach.
21. I am completely occupied with other things.

22. I would like to modify our use of web-based teaching based on the experiences of our students.
23. Although I don't know about web-based teaching, I am concerned about things in the area.
24. I would like to excite my students about their part in this approach.
25. I am concerned about time spent working with nonacademic problems related to web-based teaching.
26. I would like to know what the use of web-based teaching will require in the immediate future.
27. I would like to coordinate my effort with others to maximize web-based teaching's effects.
28. I would like to have more information on time and energy commitments required by web-based teaching.
29. I would like to know what other faculty are doing in this area.
30. At this time, I am not interested in learning about web-based teaching.
31. I would like to determine how to supplement, enhance or replace web-based teaching.
32. I would like to use feedback from students to change the program.
33. I would like to know how my role will change when I am using web-based teaching.
34. Coordination of tasks and people is taking too much of my time.
35. I would like to know how web-based teaching is better than what we have now.

You are finished the SoCQ survey. Thank You! Click the Submit Button to send your responses.

Appendix C - Emails Sent to Staff

C1 - Registration of Interest

Subject: Using the Web in teaching
Date: 31/05/00

Do you want to develop skills in using the Web in teaching?

Haven't got time to attend workshops?

Do you already use the Web, but want to learn more about and perhaps try some innovative practices such as moderating discussion groups, running desktop-video conferencing or developing multimedia presentations?

CELT is trialing an online staff development module called 'Introduction to Online Teaching'. It is designed to be used at your own pace, to the extent that you want, from your own office. There will be opportunity to collaborate and discuss issues and ideas with colleagues using the technology if you desire.

The module contains a wealth of information on the how, what and why of topics such as -
putting resources on the web
discussion groups
multimedia
online assessment
chat groups
etc..

To register an expression of interest please reply to this email or contact me directly on x3511.

Regards,
Graeme

C2 - Announcing launch of site

Subject: Using the Web in teaching
Date: 24/06/00 – 26/06/00

At 01:42 31/05/00 +1000, you wrote:
> (expression of interest)

Thank you for your expression of interest.

My apologies for the delay in responding, but I was overwhelmed with the number of staff expressing interest and I had to change my plans. Originally, I was going to give each staff member a separate ID and password to enter the site. Instead I have made the site accessible through PlatformWeb at
http://pweb.macarthur.uws.edu.au/platformweb

After you log on to PlatformWeb you should notice a button that looks like a blackboard. Clicking this should take you into the Introduction to Online Teaching site.
Let me know if you have any trouble accessing it or have any other comments, particularly suggestions for improvement.

Regards,
Graeme

C3 – Reminder 1

Subject: Online Teaching Web Site
Date: 27/07/00

Thank you for taking the time to fill in the survey for the 'Introduction to Online Teaching' site. The site is proving popular. Over 1000 pages have been accessed to date. You are welcome to return to the site as much as you want until September 14th when it will close for evaluation.

I find discussion groups to be one of the key tools in online teaching. If you haven't used an online discussion group, you may want to add a comment or two there (in a friendly, collegial environment) to get some experience of this powerful way to communicate. For example, suggestions for additional links to sites you can recommend would be useful.

I am interested in any feedback on the site either publicly using the forum/feedback or privately via email. I will put a copy of the evaluation report on the web early next year and let you know how to access it if you are interested.

Thanks again,
Graeme

C4 – Reminder 2

Subject: Free entry to online teaching web site
Date: 07/09/00

The survey associated with the Introduction to Online Teaching site has now been removed and entry is unrestricted. For all those interested in using the Web in teaching, the site will remain open over the semester break. After this the site will close for evaluation and re-development.

The site can be entered via PlatformWeb (look for the picture of the blackboard) or via the following link -

http://137.154.72.224/onlineteaching/

Thank you to all those who took the time to complete the survey.

Regards,
Graeme

C5 - Invitation for Interview

Subject: Online Teaching module evaluation
Date: 17/11/00

Thank you for trialing the Introduction to Online Teaching module. By analysing the logs of use I already have many ideas on how to improve it.

However, in order to complete my research and evaluation, I would be very interested in your opinions/comments regarding it or other aspects of online teaching. Would it be possible for me to come to your office some time in the next week or two to go over your thoughts?

If so, could you give me some indication of your availability (eg. what are the best days and times to try to organise a meeting). I envisage it would take around 20 minutes.

Thanks,
Graeme

C6 - Message to those who didn’t return

Subject: Introduction to Online Teaching Evaluation
Date: 01/12/00

I am currently evaluating the 'Introduction to Online Teaching' module I developed. Some time back you visited the site, but didn't complete the survey. I probably would have done the same thing, but I am interested in your thoughts at the time (if you can remember) regarding why (eg. haven't got the time) and whether this was final (eg. I won't return / I'll come back when I have more time etc). Any honest comments would be much appreciated.

Thanks,
Graeme

Appendix D – Code to track user information

```
<% response.buffer=true
user = session("ID")
PreHour = session("hour")
PreMinute = session("minute")
PreSecond = session("second")
H=Hour(Now)
M=Minute(Now)
S=Second(Now)
ses=session.sessionID
timeon=0
If PreHour<>H then
timeon = 60*((60-PreMinute)+M)+(60-PreSecond)+S
else
If PreMinute<>M then
timeon = 60*(M-PreMinute -1)+(60-PreSecond)+S
else
timeon = S-PreSecond
end if
end if
pagename=Session("pagename")
userlog =user+"#"+cstr(timeon)+"#"+pagename
'log off if invalid
if len(user) < 2 then
response.redirect("http://137.154.72.224/onlineteaching/logoff.htm")
end if
'add ID to log file
Response.AppendToLog userlog
'add to database log
set conn = Server.CreateObject("ADODB.Connection")
conn.open "SOCQ"
d=now()
if user="a8050557" then
sql = "INSERT INTO log_Graeme (session,ID,timeon,pagename,currdate)
SELECT '" & ses & "','" & user & "','" & timeon & "','" & pagename &
"','"  & d & "'"
else
sql = "INSERT INTO log (session,ID,timeon,pagename,currdate) SELECT
'" & ses & "','" & user & "','" & timeon & "','" & pagename & "','"
& d & "'"
end if
conn.execute sql
conn.close
'set session variables
session("hour")=Hour(Now)
session("minute")=Minute(Now)
session("second")=Second(Now)
session("pagename")=Request.ServerVariables("URL")%>
```