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**The Primacy of Pedagogy: Pedagogical considerations in Flexible Delivery. ®**

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**Abstract**

Rapidly changing educational technology is by far the most prominent of forces driving current curriculum development. Despite the willingness of many educators to adopt new technology, limited time, money and personnel hinder optimal technology implementation. Even the most willing technology users have trouble adjusting to the wealth of opportunities offered to education by technology. Improved technology appears to offer ease in achieving educational goals. However, an over-riding concern of educators really ought to be with the basic pedagogical design of subject delivery. This paper concerns a subject that enrolls over 1,000 students annually & has been ear-marked for technology-based teaching. Alpha & Beta trials with students have been completed. In semester 2, 1999 the subject will be taught totally via flexible delivery means. The university has spent considerable funds developing the subject for delivery via advanced technology, yet very little has been spent on reviewing educational efficacy. This paper examines subject delivery design in light of pedagogical principles. The paper examines a number of key elements that educators will recognise as desirable in any course whether traditional or online. Elements discussed include learning environment (teacher or student centred), catering to learner differences, student empowerment to form their own cognitive schemata, the promotion of integrated student activity and cooperative learning.

**1. Introduction**

Pedagogy should take note not only of the content and processes of learning subjects, but of the media of transmission. At a teaching seminar attended by the author at RMIT in November 1997, one of those present claimed that a book written in the 1840's had academics arguing for the "lecture" to be abolished in favour of a better medium. Since that time there have been numerous similar arguments made for the abolishment of the lecture & related forms of teaching. For example a couple of decades ago a popular approach was that of the Personalised System of Instruction (PSI). This was a pedagogy in which lectures took on more the role of motivational seminars. The development of online education has created the possibility of finally removing the lecture as a primary means of tertiary education. However in the case of this paper, it is argued that whilst the substance of the lecture may be done away with, the form ought to be maintained, at least until the current generation of students gain a better appreciation of the mediums employed in flexible delivery strategies. In the work presented here, a familiar (to tertiary students today) paradigm of lectures, tutorials (tutes) & laboratory sessions (labs) is used to guide students into effective utilisation of educational technology. This paradigm is used not because there is an inherent efficacy in the use of these traditional means of imparting knowledge, but because the new mediums are just that, they are "new". Pedagogy is of primary importance & one should avoid situations in which students cannot learn from the educational environment because the medium employed

inhibits learning. For example, in one early trial students who took home a subject related CD, complained that the Internet links did not work. They clicked on the links & nothing happened. At first it was suspected that the CDs were faulty (there is a 5-10% error rate in their production). Later it was discovered that these students had no modems, let alone an agreement with an Internet Service Provider (ISP), so of course the links did not work. I.e., these students were prevented from learning what was intended, because they lacked the requisite understanding of the technology employed [it also highlighted the need for more explicit instructions to students on the use of the technology]. The argument in this paper is that as far as practicable, the learning medium's development should be pedagogically driven, not purely an exercise driven by economic rationalism.

As one looks to the future of educational development, one increasingly sees the impact of the World Wide Web (WWW). Swinburne University of Technology (Swinburne) is no exception amongst universities of today in repositioning itself for this strategic educational development. Chancellery committed \$2 million over 2 years (1997-1998) to convert significant course offerings to various forms of flexible delivery, with particular focus on using the WWW as a primary delivery platform.

This new, innovative, even revolutionary medium of teaching presents tertiary educators with both opportunities and challenges. For Swinburne, as for other institutions, here is the opportunity to reach a customer base that extends far beyond the geographical boundaries that have limited its expansion in the past. This wider customer base may be an appropriate response to the economic rationalism imposed by government. But if learning efficacy is sacrificed in the process, forecast long term economic benefits may not be realised. I.e., students will soon learn that use of the technology alone does not lead to good learning environments and "vote with their feet" by taking their custom elsewhere.

This paper begins with a description of the media context, before going on to discuss the medium of delivery. It then examines that delivery from a pedagogical perspective and concludes with suggestions for further research.

## 2. The media being delivered

At Swinburne Database 1 is a subject that appears in a variety of courses. The main contingent of students traditionally in this subject has been Business students, which has heightened the need to emphasise the importance of the setting of many database applications in business. In the last 18 months as a result of economic course rationalisations across the University, this subject now also has become the first, and in many cases only, database subject for students from as diverse a course range as Arts, Humanities, Engineering & Applied Science. Though the majority of students are undergraduates, there are also large numbers of Graduate Certificate and Graduate Diploma students; there are even Master of Engineering students who choose this subject as an elective. Within this diversity business students still comprise a significant proportion (approximately 35%) of the more than 1,000 students who take this subject annually. All these students have 4 contact hours of on-campus classes, consisting of a two hour lecture, one hour tutorial and one hour laboratory session initially, that part way through the semester changes to no laboratory session and two hours of tutorial work instead. This diversity in the student population has meant a number of changes in the curriculum so that each stream is adequately catered for.

A significant reason for targeting Database 1 for flexible delivery development was the large numbers of students who take this subject annually. It is currently being developed for flexible delivery starting semester 2, 1999. Prototype trials were completed in summer semester 1998/9 & in semester 1, 1999. Database 1 is a development of earlier subjects offered both in computer science and information systems teaching streams at Swinburne. Significant pedagogical review went into one of these predecessor subjects, Data Analysis and Design (Burmeister, 1995a; Burmeister 1995b; Eden, 1996), and this has informed the pedagogy of its flexible delivery implementation.

### 3. The medium of delivery

A significant amount of Swinburne's first year funding for the on-line development project went into "training" for academics. This has been both direct training and provision of expert assistance to facilitate the production of quality teaching resources.

A frustrating and ongoing difficulty is that the medium itself is undergoing rapid changes. Should academics learn how to present information kept in documents written in a text formatting language called Hyper-Text Markup Language (HTML)? HTML documents are located on a web server and can be accessed by web browsers such as Netscape or Internet Explorer. It is a means of supporting access to files of various types, such as images, sounds and animations, through tags of various types. For example, the <IMG> tag indicates that the following text refers to an image and should be interpreted accordingly.

Having learnt the basics of HTML, academics - most from backgrounds that have little if anything to do with computer programming, are confronted with Java, developed by Sun Microsystems and released in 1995 (Sun Microsystems, 1997). It enables one to write interactive, platform independent applications. Some wanted to learn it, many did not. So Swinburne decided to hire professional programmers to support the pedagogical requirements of subject specialists and instructional designers.

Then there was the advent of JavaScript, a hybrid that facilitates the exploitation of interactive Java capabilities, yet is essentially HTML. So some academics decided to learn this, others added it to the ever growing list of too many things to learn and do, in the midst of the real work of teaching and subject development.

#### 1. What about the student?

If all of this is frustrating for the academic, the discipline expert, how much more of a maze of terminology (both fascinating and frightening) is it for students?

Swinburne is targeting a potentially gigantic market of off-campus students. Though many of these may be from geographical regions very close to its traditional campuses, many could be full-fee paying overseas students, who enroll overseas, do the course from there, and eventually graduate without ever having set foot in Australia, let alone on a Swinburne campus.

A very real concern in the midst of this must be that students will have all the same technology problems experienced by Swinburne course developers. The concern is that intellectually capable students, who if they were learning in traditional on-

campus mode would easily pass the course, might fail because of the mediums employed in flexible delivery, particularly web based technology.

#### 4. Pedagogical factors in delivery

Flexible delivery is in large part based on a foundation of constructivism. Central to an understanding of how constructivism views people/learners is the idea of "choice". People are not bound by their conditioning, family dynamics or heredity, unless they choose to be bound by them. People can however construct alternatives for themselves and their peers. In "principle at least, (the individual) can always find an alternative way of looking at a situation" (Candy, 1991, p. 258). In this sense, constructivism incorporates similar ideas as those of philosophy, psychology and education about people "becoming" mature, self-actualising, fully functioning. From a learning perspective, there are significant implications arising from this viewpoint of people. Inherent in this view of people is the concept of autonomy. Self-constructing learners are people who are autonomous, they have a desire to study independently. Candy also emphasises the point that such people (particularly adult learners) engage in a *process* of learning. They are self-*constructing*, not self-constructed learners. For the author this has serious implications. The students who enroll in Database 1 are mostly undergraduates in their late teens or very early twenties predominantly. One might therefore assume that the level of autonomy called for by constructivism will not be present for many of the students. From a teaching point of view one also needs to consider what factors in the educational environment are likely to facilitate such independence of learning, and if that facilitation is successful then it needs to be quantified in some way - this will be addressed in semester 2 with specifically designed survey instruments. Candy argues that providing students with comprehensive and readily available learning resources encourages self-directedness. Such self-direction in learning increases the learner's control of the educational environment, whilst engaged in on-campus study.

##### 1. Employment of a familiar paradigm

It has been argued (Candy, 1991; Candy, Crebert & O'Leary, 1994) that when learners are viewed as active constructors, educators who attempt to facilitate this process must understand and enter into the perspective of the learner. In fact instructional events themselves need to be understood from the vantage point of the learner.

Candy (1991) argues that in teaching one should not introduce to students both new processes & new content. That for effective learning a new process ought to be taught using familiar content & that new content is best taught effectively when the learning process is familiar to students. This is the thinking behind the author's reason for using a familiar paradigm as part of the pedagogical approach in the Database 1 implementation of flexible delivery. By using terminology & concepts about process that are familiar to existing tertiary students, such as lectures, tutes & labs, students who are totally unfamiliar with technology used in Database 1 can better cope with the dual demands of both learning subject content & learning to navigate the complexities of the medium.

The familiar paradigm creates an educational environment intended to facilitate learning by its very familiarity. Biggs (1991) and Ramsden (1993) have demonstrated the necessity of a good environment for empowering student learning. Yet the choice of the WWW for teaching is often not made

for its learning efficacy. By using a familiar paradigm student learning in a new medium can be facilitated. Alpha testing of this concept began in 1998, but the results were inconclusive because resource constraints limited the follow-up of student volunteers in that trial.

The concept of a familiar paradigm is not new. It has been used successfully in other forums. For example, the phenomenally successful "Lotus Organizer" produced by Lotus Development Corporation (now owned by IBM) is software that mimics a paper based diary system. Similarly, the computer managed learning package "Toolbook" (owned by Asymetrix) develops modules that mimic actual books. The paradigm is familiar to users and they are thus eased into using a new medium.

Nor is the idea of online lectures new. There are numerous examples of this in other courses. For example the teaching of statistics at Illinois State University which uses online lectures, tutorials and laboratories (Chizmar & Williams, 1998). Thomas (1998) did a survey of various online (he prefers the term 'hypermedia') courses and found the array of technology the student is presented with is often a hindrance to effective learning. What is distinctive about Database 1 is that lectures, tutes and labs are used as part of a deliberate strategy to ease students into effectively using the technological environment, thereby facilitating their learning.

Database 1 students are familiar with traditional on-campus teaching styles. All of them are taught virtually all their other subjects via traditional tertiary mediums that involve lectures, tutes and labs. A significant proportion are post-graduates, i.e., they have experienced the traditional medium previously and are therefore even more familiar with it than undergraduate students.

Students need to gain basic familiarity with access to the WWW and particularly to the course materials, but within the subject all the terminology and presentation mimics the traditional on-campus modes.

#### 1. The "lecture" as a familiar paradigm

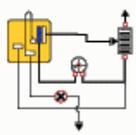
In Figure 1 below is an example of the "lecture" paradigm. Just as in the traditional lecture an overhead presentation takes place, so here the lecture material is provided in PowerPoint'97 slides converted into HTML format. To the left of that is a graphic display that is used to provide visual illustrations. The opening graphic for each lecture is a portion of the subject learning map that if clicked on takes the student to the learning map for the subject, illustrating how the current topic of study integrates into the learning for the whole subject.

Swinburne Online Education Module 1 Topic 2





Requirements  
elicitation &  
analysis

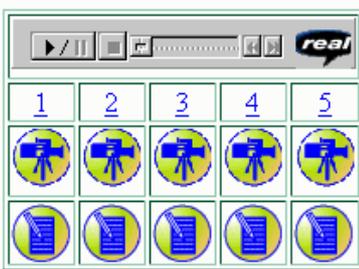


Derive a  
logical  
schema

## Relational Data Model

First proposed by Ted Codd in 1970  
Based on solid mathematical principles (Set Theory)  
Well researched before Prototype DBM S's were built to support the model.  
Standard Language (SQL)  
Now widely used in industry  
Some well known relational DBM S's:

DB2	Ingres	Oracle
Sybase	Informix	rdB
SQLBase	Nonstop SQL	dBASE
Access		



Select slide number for audio

1



Slides 6-10

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URL: <http://www.online.swin.edu.au/subjects/s034/a02/h01.htm>  
Last Updated: 03/16/99 05:46:12

**Figure 1: Design of Lecture**

Notice the section at the bottom left of Figure 1. This accompanies each slide presented in numbered sequence. It is an area that provides additional multimedia support materials. The numbers not only correspond to slide numbers, but are also audio links, elaborating on what students may perceive as the more difficult aspects of a given slide. The movie camera icon is for graphic support and may include simple images, animation and even video segments. The notepad icon is for additional textual support material. The button bar across the top includes buttons for linking to related tute and lab work, context specific references and the topic home page.

Alpha testing of lectures began in March 1998. Beta testing of lectures took place in semester 2, along with alpha testing of tutes and labs. Other academics in the online project were responsible for testing asynchronous communications technologies during 1998, with all interactions electronically recorded, like threaded messages in email discussion groups. That way students unable to be present at the time of the tutorial, do not miss out on the things that are discussed. Students were encouraged to "post" questions they had to specially set up discussion groups, in which both students and staff interacted. Earlier co-operative learning and communication trials had

been attempted in a contained environment in a study that investigated ways of developing Interactive Learning Communities (Burmeister & O'Dwyer, 1996). Then in summer semester 1998/9 the technology was first employed with students in Database 1, involving all 42 students in the summer program. Given the success of the system it was then used again in semester 1, 1999 with an enrolment of over 600 students in the subject, and problems with the tool being used became readily apparent. This led to an investigation of other vendor products and select trials of their products. A new tool will now be used in semester 2, 1999. Hence as the final implementation of the flexible delivery platform draws near, there is still much work needed to ensure the customers of Swinburne taking this subject are well catered for - both from a technological viewpoint and in terms of learning efficacy. The latter will be explored through surveying students and in some cases interviewing them.

Lab sessions require further investigation of platform independent access. For lab sessions students will need access to a database engine. Current investigation centres around whether or not to require students to purchase such an engine. One alternative to such purchases by students is the Java DataBase Connectivity (JDBC) Application Program Interface (API) which makes it possible to facilitate remote access of the underlying database engine, such that the university can purchase and control that database and allow transparent use of it by students. Such "thin-client" technology is made possible by advances in internet programming (Burmeister & Creek, 1998). It enables connection to a database, whether that be on the local machine or on some other machine accessible over the internet. Using a Java Applet students will be able to interact with the database by sending SQL statements. The JDBC API then processes and interprets the results of the statements (Hamilton, Cattell & Fisher, 1997). In this way it may be possible for students to carry out lab exercises by accessing the University database server remotely.

## 2. Learning structures

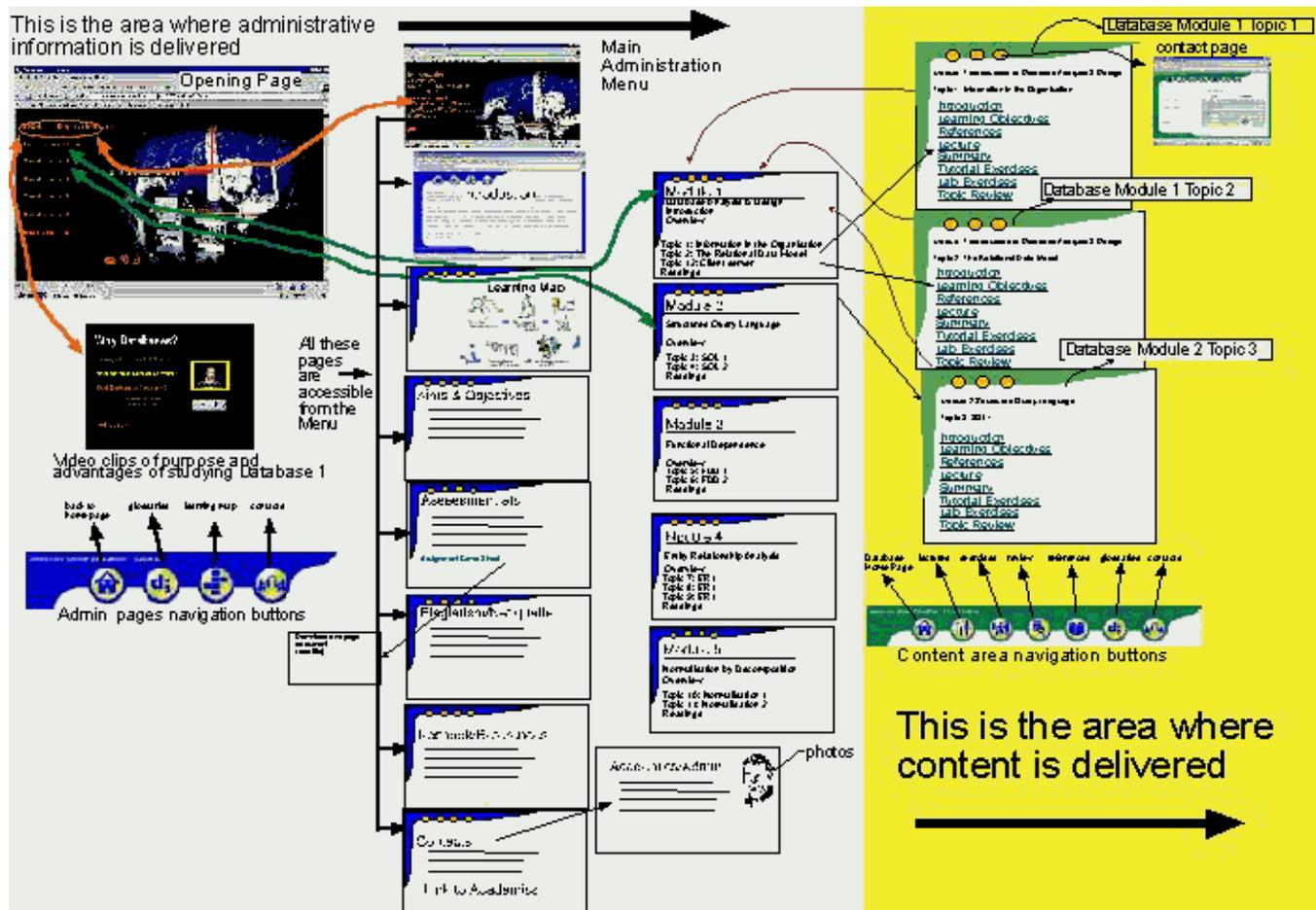
Using thin-client technology facilitates the main concepts of flexible delivery. Students can access learning materials any time and from any place at their own convenience. It also promotes similar flexibility for staff involvement. Asynchronous communication further facilitates this whole process. Yet as many have experienced with the use of educational technology, particularly WWW based products, there is often enormous frustration for students in navigation through a maze of new materials. Particularly on the WWW where clicking on related topic links can easily take one out of the environment of the University learning material into anything else in any part of the world. For new students this can be and often is a bewildering experience (Evans & Rex, 1999). What is needed is some guidance and from a pedagogical viewpoint this can be achieved by providing structural frameworks for navigating through the flexible delivery materials.

### 1. Structure of Database 1 online

Candy expresses the view that whilst an educator can enable students to exercise freedom in the learning process, it is not desirable to give learners complete autonomy (Candy, 1991, p. 260). An educator needs to provide some structure to guide students, at least during the initial stages of a new learning task.

Figure 2 is a visual synopsis of the structure of all online materials available to students in Database 1. It shows that students have directed learning structures. The subject is divided into 5 modules, each of which is sub-divided further into 2 or more topic areas. All administrative sections have a blue button bar border, whereas all content delivery (the right shaded area of Figure 2) has green shading instead. All links within topic areas only allow movement within the topic; other areas of the subject can only be reached by a hierarchical process of going through to the module level and back to the subject home page. There are two exceptions to this. Firstly, the references section not only refers to reading out of the text, the Multi-Modal Learning Guide, and other references, but also has links to online materials around the world that deal with the topic area; i.e., following these the students are able to leave the subject material altogether. The second exception is the fact that all this is run from within an internet browser and the browser itself has search engines that facilitate connection to anywhere, they are not limited to searches within the subject material.

Figure 2 is available to students in two ways. Firstly in full colour in a subject overview section of the online "Administration" pages. Secondly in "grey scale" on the last page of the Subject Learning Page; it is placed there as a quick reference guide to all the online components of the subject.



## Figure 2: Overview of online delivery format

### 2. Learning maps

Knowledge from the constructivist viewpoint is neither an exact copy nor a mirror of objective reality. Instead, active interaction between the individual and the environment gives rise to the forms and content of knowledge through the cognitive structures of the individual. Candy citing Nystedt and Magnusson states "What we learn in interaction with the environment is dependent upon our own structuring of those experiences" (Candy, 1991, p. 263). Thus if one accepts the notion of people as active constructors, it is possible for learners to derive personal constructs of the same reality in different ways. Constructivism holds that these cognitive structures are representational systems whereby people model reality, such personal constructs act as guides to their actions.

Database 1 employs a learning map that is designed to help students understand the interrelationships of the whole subject. It can be accessed directly via the administrative area (see Figure 2) and is linked to at the start of every lecture within each topic (see top left corner of Figure 1). The students also have a comprehensive Multi-Modal Learning Guide that has the learning map on the front cover; throughout the learning guide references are made to how the current learning fits back into the overall subject learning, using the learning map as the mechanism for doing so. The Multi-Modal Learning Guide is one of the most significant developments that has evolved in Swinburne's flexible delivery implementation (Jeffery, Noble, Murby, Northcott, Weal, McPherson, & Olson 1996; Jeffery, Smith & Weal, 1998). This is a vehicle for communicating learning expectations and modes, that maps a common route for students to follow. The learning route communicated through the Multi-Modal Learning Guide serves to guide learning in a clear, well structured and consistent format.

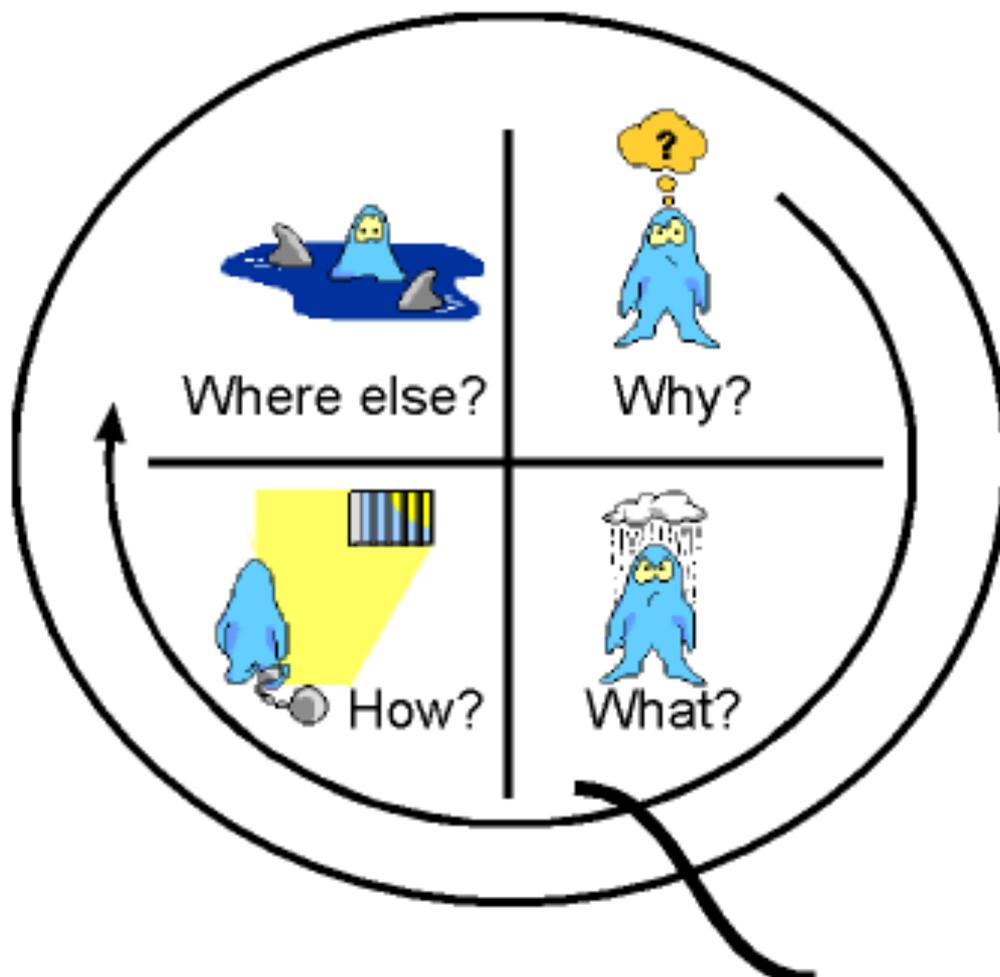
A learning map is cognitive scaffolding that students can use to facilitate their processes of integrating, contextualising, memorising and cross-contextualising their learning in a particular domain area. Research into learning (Evans, 1991; Lawson, 1991) shows that deep learners are able to structure their learning, integrating concepts and thus are able to facilitate their recall of pertinent information and apply it in contextually relevant situations. Yates & Chandler (1994) who use synonymous terms such as "mental models" and "mental schemas" see the use of learning maps as an integral aspect of using prior knowledge to best advantage. The larger the knowledge base of the learner, the easier it becomes for them to acquire new knowledge in the same area. Yates and Chandler see learning maps as facilitating the construction of new knowledge. They say: "Contemporary cognitive theories of learning see the development of knowledge as a process of active construction" (Yates & Chandler, 1994, p 5). Learning maps are employed in Database 1 to give students an insight into the purpose of each topic and how each topic relates to the whole subject domain.

### 3. Learner differences

Amongst the benefits of flexible delivery is the facilitation of educating the masses, not just the elite. It has the potential to provide a safety net for students who, in an era of mass education at the tertiary level, do not cope well with the traditional modes

of tertiary instruction that are dominated by lectures and aimed at students with well developed visual and auditory skills. Modern educational emphases have gone on to recognise a wider sensory base amongst learners, that if utilised effectively can enhance learning for many types of people not traditionally found at tertiary institutions (at least not in significant numbers). Sensory based instructional strategies are based on the Neuro Linguistic Programming (NLP) modelling process developed by Bandler and Grinder (1975) and later enhanced by Woodsmall (1988). Their early work has been applied to tertiary education in general and business students in particular in recent years (Evans, 1993; Evans and Paterson, 1994). Evans and Paterson, in working with students with relatively low tertiary entrance scores, found that many new, non-traditional tertiary entrants are not strongly skilled in visual and auditory senses. Particularly disturbing is that visual ability, on which much of the university educational system has relied is often very limited if present at all. The predominant sensory ability appears to be some combination of visual, auditory and kinesthetic. For this reason Database 1 flexible delivery instructional materials have been designed to use sensory predicates to facilitate learning by a range of students with different sensory preferences. For example, care was taken in describing business scenarios for the purpose of data analysis, to describe enough detail that students with poor visual ability would be able to *glimpse* the situation. This is necessary because modern conceptual data modelling is a highly visual methodology (Eden, 1996; Eden, 1997; Burmeister & Eden, 1999).

Another attempt to cater to learner differences in the flexible delivery of this subject has been the use of the 4Mat system (McCarthy, 1980;Grinder, 1996). Early attempts at incorporating the 4Mat system and preferred modality teaching into a predecessor subject to what is now Database 1, were not used very successful, apparently because that particular study tried to introduce too many changes at once (Burmeister, 1995a). In the online version of the subject this has evolved to using the 4Mat system as Grinder suggests, namely to capture the attention of the 4 main types of learners at the very start of the introduction of a new topic. The way is now being done is seen in Figure 3 below. This Figure is the last part of every topic introduction. The intention is to be thought provoking. As the mouse is moved over each quadrant in this large "Q" (for "question"), questions specific to each of the 4 main types of learners McCarthy has identified are shown next to that quadrant. There are questions targeting students mostly interested in "why" type issues, and others focussing in on "what" the subject matter might cover, and others on "how" this can be applied in the real world. Lastly, there are question that extend the learning in this topic area beyond the topic into other related issues. McCarthy points out that all 4 types of learners need to pay attention to all four areas to ensure a comprehensive picture is built up. It is therefore quite appropriate that all students are able to view all the different types of questions raised in each such introductory section. Grinder argues that by deliberately asking questions targeting these different learners up front, one is more likely to capture their attention (at least initially).



**Figure 3: Addressing learner differences with 4MAT**

5. Further investigation

As full implementation in semester 2, 1999 draws near, the work of ensuring pedagogical efficacy in flexible delivery continues. Further investigation into many other areas of flexible delivery for teaching is needed, as well as continuing polling of the customers (students) to see how well the technology is servicing their needs. For instance a recent survey of second and third year undergraduate students found that they have a perceived need of training in the use of the technology that is employed to deliver their education; students reported the felt they were not getting the full benefit from the technology because they lacked technological expertise (Evans & Rex, 1999).

In addition to the very real concerns expressed in this paper about student learning in this new medium, is the concern for sessional staff. Often these are post-graduate students who teach in order to supplement their income and in some cases to test out academia as a career option. Yet like Swinburne academics and our future students, these sessionals may be unfamiliar with the medium and will need assistance. How to assist such sessional staff requires further investigation.

There are also other concerns that need addressing regarding the presentation of lectures. Ongoing maintenance is a real concern. Perhaps not so much if the content presented were 'ancient history', but with the rapid changes taking place in the database field, continual changes are required to the lecture presentation, to keep pace with industry changes. Figure 1 above show one attempt at resolving this dilemma with the inclusion of audio, graphic and textual support for every slide in a lecture presentation. That way the latest changes in the field can easily be added without disrupting the overall flow of the lecture. Another solution concurrently being trialed is the use of video-on-demand (VOD) recordings of all lectures. It is deemed easier to re-record a new lecture, than it is to make all the requisite changes to an equivalent online lecture.

In this paper the focus has been on pedagogy. But there are also technical considerations that affect the pedagogy. For example, a few years ago Dearden, in relating the experience of the Department of Physics, University of Queensland, reported that the workload required for implementation is very high and that the operational workload rather than being reduced was increased. Equipment breakdowns (already experienced numerous at Swinburne), and errors in questions and answers "Greatly increased student requests for advice", causing "colleagues to avoid involvement" (Dearden, 1993, p. 3) in their computer based training system. The repeat of similar experiences more recently at Swinburne and elsewhere has been to define flexible delivery in broad terms, which whilst certainly including computer technologies, do not limit instructional resources to such a narrow focus. Flexible delivery at Swinburne has seen a variety of teaching materials develop. Learning guides, videos, Computer Managed Learning modules, electronic communication such as e-mail, electronic bulletin boards, the use of the internet and many other resources have been developed. With the advent of ever new technological innovation in education, understanding the technology, let alone pedagogically efficacious uses of it, is an ever increasing challenge to educators.

More recently, attempts at digitised video segments quickly revealed problems of bandwidth and of the sheer quantity of space they take up on disks. For instance the VOD recordings are made available to students over the on-campus Swinburne student networks. But putting the material on CD-ROMs and making these available to students for home use, let alone over the WWW for home use is not viable. Each VOD lecture of one hour takes 1 gigabyte of storage, yet a CD only hold 650 megabytes, i.e., each lecture could potentially require several CD-ROMs, given lectures typically have a length of 1.5 to 2 hours. There are then issues of compression, digitising, bandwidth, electronic delivery and the like that need to be considered. Nor are these small problems. Swinburne is investigating making whole courses, not just individual subjects, available to students via flexible delivery technologies. When one multiplies the space and communications requirements for teaching materials covering this many subjects, the problems become daunting indeed.

These and many related concerns continue to challenge academics and institutions around the world.

## 6. Conclusion

The use of a familiar paradigm empowers students to use a new medium by disguising it as an older one. It has been argued that difficult content in a subject should be taught when the process is perceived as familiar. In the case of the WWW not only are the processes and content of Database 1 new to the student, but so is

the medium in which the learning takes place. This adds a level of complexity to the learning process not envisaged in earlier tertiary environments.

To succeed in the competitive tertiary market place of the present, institutions should not only consider economic factors. Instead the foremost considerations ought to be pedagogical, both in the design and delivery of course. Then they will create courses that will facilitate learning and empower students to boldly go where no student has gone before.

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