GENERIC CLASS MANAGEMENT STRATEGIES FOR AN EDUCATION LECTURER IN INFORMATION TECHNOLOGY

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ABSTRACT

Class management procedures for a lecturer preparing students for teaching in a technology rich environment fall into three time slots – formation of the management framework prior to the start of classes, evolving and regular management procedures during the running of the subject(s), and the orchestration and archiving of student work and subject evaluation after the subject is complete. It is not sufficient to lecture about these aspects – students need to see these procedures modeled. Each of these phases of class management will be discussed based on personal experience across several classes at undergraduate and/or postgraduate level.

Use of the World Wide Web does not dominate these procedures. It is one of a suite of tools which help ensure smooth class organization, effective communication with students and appropriate use of past resources to assist students in understanding the skill-based design tasks they are set. With the rapid rate of technical development in Information Technology, our students are often asked to perform tasks, which they may not yet see modeled in a typical classroom. They have to draw on their experience of technology on campus as a basis for the development of teaching and learning strategies which integrate technology in a manner now required of new graduates in the profession.

The minimum hardware/software requirements are that students have adequate on-campus or home-based access to the World Wide Web, and there are sufficient PC terminals for student production to avoid frustrating delays in access to public computer laboratories. Of potential interest to lecturers in other disciplines is the management of student work once you adopt the role of facilitator and allow your students to use the multimedia 'tools of delivery' for the production of their assignments.

KEY WORDS

Pre-service education, professional development, management strategies, web support, technological fluency, constructivism, cognitive tools, asynchronous chat.

1. INTRODUCTION

Amidst a general trend in university education to support 'flexibility', with particular emphasis on open and distance learning, it remains important for us to value the face-to-face experience, especially if our role is to prepare students for the teaching profession of the future. The social dimensions of teaching and learning need to be balanced with the development of skills using information technology tools, so our future teachers will be capable of creatively meeting the changing needs of their profession.

In pre-service teacher education and professional development, we have the opportunity to gain direct, personal student feedback on new teaching and learning strategies, without detracting from other subject material, since these strategies are of immediate relevance to the

students. The more they are exposed to different strategies, and asked to reflect on their response to these as a learner, the more chance they have of appreciating diverse student response to their teaching style. It takes time to adopt or alter a professional mantle. When we as lecturers are prepared to share our metacognitive knowledge of planning, monitoring and revising, pre-service teachers are able to begin to appreciate how a teacher may think. They have the opportunity to assist us in the ongoing design of subjects geared to meet their changing needs. Novel techniques developed specifically for small specialist subjects or groups are valued within a broad repertoire of strategies. A pre-service teacher or postgraduate student specializing in information technology can never have access to too many examples of strategies and management techniques, especially when their future workplace environment may vary dramatically in group size, subject specificity, class location, time frame and methods of communication.

University teaching experience managing face to face classes in an information technology rich environment can inform the practice of teaching in the preparation of teachers for our primary, secondary and tertiary education sectors, particularly with respect to information management techniques and the social dynamics of working with computers. Many of our new students arrive on campus with a broad range of computer skills. As mentioned in a recent paper analyzing trends in the use of communications and information technologies, particularly in the higher education sector, it was noted that our students are:

> …more likely to be literate in the use of computer software packages (both general and subject-specific), electronic information retrieval, electronic communication and presentation of work using multi-media; and they are also more likely to have computers at home. (DEETYA, 1998, p23)

Given the technological fluency of an increasing proportion of students, it is vital that we do not limit their forms of expression in tertiary education. Research into the use of information technology tools to improve the learning environment has been varied in its judgment of success. Reeves (1998) counters the necessary arguments of critics when he emphasizes the need to use computers as tools for learners to work with, rather than learn from. This approach does not ignore the value of electronic resources (such as those delivered online), but adds the requirement that students also need to sit in the electronic information construction seat. It moves the focus from simply how the *we the lecturers* use the technology to student-centered computer production, and prompts the question for us*: When you allow students to use computers as cognitive tools to assist knowledge construction, what impact does this have on our roles and responsibilities as a lecturer?*

With increasing student expectation that we as university educators will be as conversant with educational technologies as they are, we need to be skilled managers of electronic information. This means *both* what is offered as structured course material or unstructured resources (the delivery arm) and what is returned as the product of student work (student generated resources). Technology tools allow our students to engage in higher order thinking with greater ease than ever before. The decision is ours what freedom we give them to develop those skills.

Teaching at whatever level or in whatever environment remains a creative enterprise, which can be positively influenced by awareness of the instructional design process, irrespective of the teaching philosophy we espouse. For any lecturer at a subject level, this process is complex, ill structured and individual, despite the existence of common design elements. Kemp, Morrison & Ross (1998) suggest there are nine such design elements which do form a logical sequence, but which can be addressed in an iterative fashion beginning from a number of starting points. (The nine elements are instructional problems, learner characteristics, task analysis, instructional objectives, content sequencing, instructional strategies, designing the message, instructional delivery and evaluation instruments.)

They approach instructional design as:

> …the application of heuristics that one can apply to a variety of instructional problems. These heuristics are modified and embellished based on our own experiences, observations, and interpretations of the literature. This approach to instructional design allows the instructional designer to both modify and add to our list of heuristics. (Kemp, Morrison and Ross, 1998, p 'x')

It is in this spirit that my experience observations and interpretations are shared. Since I have drawn this material from a range of classes and refined strategies several times, some heuristics of value may emerge. If your field is Education, then you will understand the emphasis I have placed on a range of simple tools for formation of the management framework, since students are required to develop these skills as future teachers in a management role, and as facilitators who can support creative student use of these productivity tools. If your field of interest lies within another discipline, you may find that your management framework is or will soon be supplied on a faculty wide basis as an integrated system, into which you 'plug' your course components. Darbyshire and Wenn (1997) describe such a Web Based Learning Administration (WBLA) system. An understanding of the examples discussed here may assist you in providing feedback to the designers of your WBLA system.

Class management procedures for any lecturer, irrespective of the level of available technology, fall into three time slots – formation of the management framework prior to the start of classes, evolving and regular management procedures during the running of the subject, and the orchestration and archiving of student work and subject evaluation after the subject is complete. I would now like to discuss each of these as an education lecturer whose aim is to prepare teachers to conduct such procedures in a range of information technology rich learning environments. Table 1 summarises the key management strategies discussed, and also lists the relevant elements of instructional design (Kemp, Morrison & Ross, 1998).

2. PHASE ONE – FORMATION OF THE MANAGEMENT FRAMEWORK

This is the most intensive time, which requires you to carefully reflect on any previous subject experience then to plan extensively. From my experience, hours spent in this phase pay off in the smoothness of your subject flow. If presented with a new subject, you are more likely to follow the theoretical instructional design cycle sequentially. For example you would need to identify the instructional problems and key learner characteristics, analyse tasks for assignment design, state the instructional objectives in a subject outline, sequence content, choose instructional strategies and design your *initial* message. If your subject was geared for online presentation, perhaps accompanied by multimedia rich CD-ROM based resource materials, you would need to design the full range of resources for the CD-ROM production prior to subject commencement. You would need to consider formative and summative evaluation instruments for your subject and methods and conditions of student assessment.

In practice, I use simple technology tools to construct and frame a subject syllabus – such as a database, spreadsheets, a web site, chat space connection and a collection of past student work. Each of these tasks/tools provides me with unique information and capabilities.

Table 1

Phases of Class Mangement

Management Phase	Instructional Design Elements	Practical examples of management activities
One – Formation of the Management Framework	All of the following: • instructional problems • learner characteristics • task analysis • instructional objectives • content sequencing • instructional strategies • designing the message • instructional delivery • evaluation instruments	2.1 - Set up *Database* of whole group 2.2 -*Spreadsheet* for sub-groups 2.3 - *Web Site* for on-line framework 2.4 - *Chat Space* for asynchronous threaded discussion 2.5 - *Worked assignments* from previous classes as examples
Two – Delivery and Ongoing Management	May emphasise: • learner characteristics • content sequencing • instructional strategies • designing the message • instructional delivery • formative evaluation	3.1 - **COMMUNICATION** 3.1.1- regular updates for web *Notices* 3.1.2 - attachment of additional *resources*; 3.1.3 - addition of *lecture/reflective* notes; 3.1.4 - analysis of *chat space* activity; 3.1.5 - *email* responses **3.2 - ASSESSMENT** 3.2.1 – student number and diversity 3.2.2 – degree and nature of student support 3.2.3 – scope and depth of subject matter 3.2.4 – nature and duration of assignment task 3.2.5 – assignment collection 3.2.6 – assignment marking 3.2.7 – assignment archiving
Three – Analysis, Archiving and Subject Evaluation	Should include: • summative evaluation • return to Phase One and record recommendations for next class	4.1 – subject analysis – resource organisation 4.2 – subject archiving – CD production 4.3 – subject evaluation

2.1. THE CLASS DATABASE

The class database is the central aspect of what has now become my management 'system'. I use an integrated cross-platform package (ClarisWorks® Office 5.0) to produce a simple database with sufficient fields for student information and assessment tasks. Once the subject is running, this flexible software allows me to add layouts and fields as I need them, and to color or personalize the layouts as I wish. When students are learning to construct databases using the same software, I demonstrate the development and use of our subject database in lectures to help them link the skills they are acquiring with possible classroom application.

When students are given the use of alternative specialist database packages in subsequent electives, many initially return to the use of ClarisWorks, to reinforce skills and gain a clear understanding of the potential uses of a database. Then they are ready to try more specialist tools such as Access® or FileMaker Pro®.

A database is an excellent tool for qualitative media rich portfolio-style details as well as a reliable tool for quantitative analysis. If you are fluent with database and web site construction, it is likely that you will be happy to integrate the two in your web site, which allows you to maintain records from any web connection. Gilding (1997) suggests:

> Databases managed with a Web browser enable the lecturer to collect data from the students without the restrictions of time and space which apply to traditional courses. In addition, if students are provided with disk space on a HTTP server then the lecturer can monitor student work and the building of class resources away from the laboratory or local area network (Gilding, 1997, p 226).

2.2 SPREADSHEETS

Spreadsheets are ideal to store practical and often temporary lists of student sub-groups (such as tutorial, excursion or project groups) for printing. These lists can be annotated with observations and note attendance patterns. They are especially useful in the event of an outdoor activity or an unexpected computer malfunction. We stress to pre-service teachers that you should always try to have a fallback position. Print material is a solid alternative. Later you may wish to transfer any necessary information to your database.

Once again I use ClarisWorks to copy and paste student lists from a specific search in the database (list view) into a spreadsheet. Since all key student information resides in the database, it is always easy to generate current class lists.

Spreadsheets containing full student lists for the subject are ideal for the storage of fine assessment detail such as performance on assignment sub-sections. This information can be analyzed and visualized through charting options, which are an excellent way to convey performance data to parents or other interested parties (often the students). When you keep detailed records of student performance within each section, you can identify specific questions that were answered poorly, and individuals who performed very well in each section. Frequently, you may only record the student's total task mark in the database, along with a general comment about any notable performance pattern.

2.3 SUBJECT WEB SITE

A subject web site offers a *potentially* interactive framework for communication between the lecturer and students, and among students. Corderoy and Lefoe (1997) provide some starting points for guidelines and tools if you are beginning this venture. The web sites I create are supplements to face to face teaching, rather than online subjects run in distance education mode. As such, they can range from simple skeleton structures that support a lecture/tutorial style undergraduate subject, to large evolving bodies of information and student-generated resources in electives where students produce their own multimedia programs. The latter situation resembles the collective memory of a learning organization. Each year, students have access to an evolving body of resources relevant to the subject. This permits them to move rapidly into information processing and knowledge construction.

Godfrey (1996) described the use of a subject web site over two years as a supplement to traditional teaching methods and noted that although there was an initial increase in workload, it subsequently diminished. The concern was:

> I am protected for the moment from unfair comparisons with more glamorous sites by the fact that educational use of the WWW is seen by students as novel, and among my colleagues I am still in a minority. So I get points from the students for trying, but how long this will last is an open question (Godfrey, 1996, p229).

Arnold (1997) developed web sites as a supplement to face to face teaching in a range of subjects. He emphasized the positive value of this process for 'top down' syllabus development and presentation. While this could also be accomplished on numerous pieces of paper, the web-mediated syllabus was more flexible, and did not lock him into a specific plan of action prematurely.

I have used Claris HomePage® (version 2.0 then 3.0) as the tool for subject web site construction in three subjects over the last two years. Even though the nature or complexity of subjects vary (undergraduate, graduate diploma and postgraduate level), I have found it simple to construct several sites in parallel by adopting a standard site structure. Each subject home page contains links to the following seven elements – current notices, subject outline, week by week, assessment tasks, resources, chat space and old notices. This top-level structure is fixed, while additional materials (which may vary enormously) are connected and accumulated within other areas of the site throughout the course. Initially it was time shortage, which prompted the adoption of a similar top-level site structure. Although I was concerned that this might limit the creativity of subject design, this has not been my experience – the creativity lies within the teaching and learning strategies associated with the tasks designed for students.

Our students also use Claris HomePage in a range of electives, so strategies and principles can be modeled and shared among staff and students in a collaborative rather than competitive manner. Hence, as a co-learner, I no longer experience Godfrey's concern. As students begin to build their own web sites, they soon appreciate the flexible and evolving nature of web tools, the diversity of navigation options, and the ease of editing a site.

2.4 CHAT SPACE

A chat space facility can permit you to create a more learner-centered environment in which students collaborate to reflect on new material, discuss their tentative understandings, actively search for more information and build conceptual connections to an existing knowledge base. Brown and Thompson (1997) used an asynchronous discussion list, which automatically recorded threaded messages, and noted the following advantages:

- learners could respond at a time that suited them
- there was more reflection time to research the topic
- discussions often took on a life of their own so learners could gain even though they didn't initiate a discussion
- anonymity created a more egalitarian environment in which quiet students were free to contribute.

I link from the 'Chat Space' page in each subject web site to a centrally managed tool called 'DISCUS®', which can be used in a synchronous or asynchronous manner. Once given a password as a subject administrator, all I need to set up is a list of student names (from my database) and passwords.

2.5 WORKED EXAMPLES OF ASSIGNMENT TASKS

Electronic storage of past student work enables you to access examples in a flexible manner on a need basis. It is important to seek student permission to share/demonstrate their work, and also ask them whether they wish to remain 'anonymous'. The demonstration of assignment tasks can be beneficial both across and within subjects. Students in the early stages of a degree can find it motivating to see the work of students 'further down the track'. Alternately, within the same subject, when you introduce students to new material or techniques, many do not understand what you require in an assignment until they see a range of examples. Student learning styles are varied. Examples and demonstrations cater for a group of students you may not reach otherwise.

If you are concerned that you may be reducing the creative potential of the new student group, or allowing them to mimic an information structure rather than constructing their own, then it is wise to show a broad range of examples, set a creative task, and acknowledge both process and product in the assessment criteria. When you show the examples, try and allow the students time to ask questions and offer constructive criticism. Many will understand more clearly what you require of them if they have had the opportunity to build their own mental model of the task.

3. PHASE TWO – DELIVERY AND ONGOING MANAGEMENT TASKS

Once you have set up a management framework, then associated with content delivery are the ongoing management tasks of communication and assessment. From a theoretical perspective, the most vital element of instructional design is further understanding of your learners. You can achieve this by direct observation and discussion, analysis of task performance, involvement in the chat space activity and email. All these indicators provide you with formative evaluation, which you can potentially use to adjust your content sequencing, message design, instructional strategies and delivery style.

3.1 COMMUNICATION

Communication tasks can be small and regular, or time consuming. If you can try to be systematic about managing communication with your students, they will soon appreciate their range of options. Usually, to capitalize on the flexibility offered by the web, you would need to update the 'notices' on your subject sites, attach any additional resources, add lecture or reflective notes (depending on the nature of the classes you run), check the chat space and respond to student email.

3.1.1 New Notices on your web site

This may occur weekly, fortnightly, or whenever you need to transmit new information to the class. You can quickly reach all your students (WWW access assumed on or off campus) regarding specific modifications to attendance patterns and events. It is also a great place to remind students of tasks, if you wish to guide them in the distribution of their workload. Students get used to checking this feature, and are quick to transmit information among the group. It is important you copy your previous notice to an 'Old Notices' section of your site. This maintains a record of all specific details you have provided for students and assists those who may have missed classes due to illness or misadventure.

3.1.2 Attachment of additional resources

Often students and colleagues will inform you either directly, through email or the chat space of great information that could be of assistance to your students. How you structure your web site will determine where you choose to attach this additional resource material. In some subjects I attach it to the 'Week by Week' page, in a table with a 'Further Resources' column. In other subjects I may direct students via a link in the weekly notice to check out additional material on the 'Resources' page. Students will quickly tell you whether your attachment site is logical or not.

3.1.3 Addition of lecture or reflective notes.

With *large* classes, I try to attach lecture notes *prior* to the lecture. This enables students to print out the material to annotate in lecture, and frees them up to concept map, focus on the presentation of additional multimedia material, ask questions and tailor the lecture to a point where they are happy they *understand* the material. It facilitates comprehension, rather than recording of information. It also justifies the assumption that students should go further and explore the additional resources you link to your site, since you have alleviated their burden of accurate recording of lecture material. Certainly there is no shortage of information, and the focus should be on how students can manipulate, transform and construct understanding from the resources provided.

In subjects with *smaller* groups (such as electives) where there is an emphasis on group assignment work via computer-based construction, I usually attach reflective notes after each lab session/class. My role changes to more of a process recorder and facilitator. As I write these notes the next step is automatically the design of the next class. I have found this a powerful strategy to raise student awareness of metacognitive knowledge. At any point in a subject you can monitor and assess your progress. This may lead to group negotiation and a change in plans. Reflective notes also allow parallel class groups to compare their progress and share ideas.

3.1.4 Analysis of chat space activity

Student use of the chat space facility you have set up depends on a number of factors. Ruberg, Taylor and Moore (1996) found that the social conventions for participation and interaction in the Computer Mediated Communication (CMC) interactive writing activities they set up were influenced by the computer interface, the behavior exhibited by the teacher and fellow students in CMC discussions and nature of the topic being discussed.

On-line asynchronous chats were typically non-linear with ‘multiple threads’. The social situation, rather than the medium of communication, was a strong determinant of verbal behavior. Students reported:

> …through these discussions they learned from each other and that the discussions helped them move their initial thoughts to more confident statements of their personal views. …giving them a new perspective, a way to imagine another point of view, an ability to view things differently, and a deeper understanding of the material (Ruberg, Taylor and Moore, 1996, p87).

It is up to you how you use a chat space. Sometimes I have linked a subject web site to the chat facility so a large student cohort could exchange ideas across subjects driven by their needs. This works well with students who may be completing a second course of study and wish to tap into the broad group expertise.

In other subjects the link has been to allow students to experience CMC. Interestingly, where I have given students a task (to run a chat session and analyze the discussion) and offered them the choice between an asynchronous tool (like DISCUS) and a synchronous chat in face-to-face class time (using Co-Motion), most have chosen to use the latter. They enjoy the ability to set the social scene with stimulus material, participate in the electronic chat, and then follow up the on-line discussion with some final comments face to face.

3.1.5 Response to email

Usually my email address is part of the ‘footer’ on each page of the subject web site. Students are thus freely able to email me. It is your choice how much you foster this link and what expectation you give your students regarding your rate and depth of response. Email remains the ideal solution for a personal issue. When questions apply to the group as a whole, I usually include my answer in the ‘notices’ section of the web site the following week.

In summary, these activities have involved setting up a management framework, managing interaction with students, and using student feedback to customize the subsequent delivery of content. So far, we the lecturers have occupied the production seat. This electronic component of delivery and interaction with students is now familiar to an increasing number of our ranks. It is now necessary to look at the other side of the coin – the nature of student generated resources we request through the nature of our assessment tasks.

3.2 ASSESSMENT

Staff and student involvement with information technology need not run in parallel. It is from this point onwards that pedagogy, hardware resources and protocol for the management of electronic material determine the amount of freedom students are given to use their computers as knowledge construction and representation tools. We may therefore need to adjust our protocol for assignment layout/construction, storage, presentation and submission to allow for an electronic production environment, which encompasses a range of media.

To illustrate, imagine two possibilities on a continuum. Lecturer 'A' follows a directed teaching approach, uses the web as an efficient vehicle to plan the syllabus and deliver content, and has little experience teaching with computers due to hardware and software shortages. He or she is likely to inadvertently restrict student production potential by designing tasks that do not allow or require it. Lecturer 'A' therefore does not have the opportunity or need to develop skills in the management of student work in a range of media formats.

Lecturer 'B' supports the establishment of a constructivist learning environment, uses the web as an efficient vehicle to deliver and receive content tailored to student needs, and takes every opportunity to place students in contact with available hardware resources. Assignments require students to use computers as mindtools – knowledge construction and representation tools (Jonassen, 1996). For Lecturer 'B', protocol for the management of student assignments in 'multimedia' format is likely to evolve in a grounded fashion, due to the range of environmental variables. Consider, for example, the number and diversity of students, the degree and nature of student support, the scope and depth of subject matter, and the nature and duration of assignment tasks. I would like to comment on these aspects drawn from class experience.

3.2.1 Variable – student number and diversity

Small class groups (15–20) with plentiful access to a hardware rich environment can easily engage in sustained media construction in a collaborative fashion, as long as a critical threshold of students possess the production skills, or you allocate sufficient time and resources to adequately skill students to meet your expectations. Careful group selection, peer tutoring and access to technical support can maximize the learning gains from group diversity and use of technology. The more open the task you set, the more benefits you will gain from group diversity.

The larger the class, the less likely you are to manage and maintain this intensity of student production, unless more centralized support structures are in place. Once you allow students the creative freedom to construct assignments in multimedia format, you face such questions as:

- Where are students going to do the bulk of their work – in our labs or at home?
- Is there enough hard disk space on local machines or servers to support this level of student production?
- What influence does the platform (such as Mac OS or Windows) have on the availability of resource production and multimedia construction tools?
- Do students have equitable access to these resources?
- If students wish to produce work at home using their own equipment, to what extent do you support that endeavor with storage media to transport work from home to university?

Over time, it is probable that most student production will occur on home computers, and university based computer laboratories will be principally used for face to face group meetings which are focused on resource organization or collation of the final group project.

3.2.2 Variable – the degree and nature of student support

The provision of technical support is costly, but highly beneficial. Often, in a problem-based learning mode, students are engaged in a self-motivating task, and they require just-in-time help on a need basis. Once you allow task diversity, you can no longer standardize the support you offer. The more complex the array of possible media through which students can convey their ideas, the more they need guidance in the management of the resources they generate in this construction process. Practical issues such as choice or conversion of file formats, organization of folders, use of available storage space, file backup and the inevitable version control problems are technical process concerns, rather than lecturer specific content concerns.

Peers provide support through the sharing of newly acquired technical skills, and the peer review process. Students benefit as learners and producers when peer review is used for formative assessment, provided the setting is collaborative rather than competitive. The more you assess the work of others from the learner's perspective, the more insight you gain as a producer. Once students gain the confidence to constructively suggest improvements to the work of their peers, they realize the benefits of receiving such feedback. Learning to accept constructive criticism and realizing that there are many ways to tackle a problem take them a long way towards the ability to work effectively in a group.

3.2.3 Variable – the scope and depth of subject matter

How broad or focused is the message you are asking students to construct and convey? Multimedia construction has a habit of developing 'feature creep' – it expands in many directions. This results from a synergy between the tools and the content the user is able to represent in multiple ways. What may start out for the student as a simple plan on paper, takes on a life of its own once resources in a range of media are orchestrated in various ways on the screen. You need to be explicit with students about the nature of the assessment criteria, so they understand whether you value breadth or depth of content, and to what extent they need to polish the presentation format. Are you asking them to give an oral presentation that allows them to build in less user support and extend the content base? Are you expecting to grade the work without the student present, thus placing more value on the clarity of interface and navigation?

3.2.4 Variable – the nature and duration of assignment tasks

The assessment criteria you set for student computer construction largely determine student production behavior. If you fail to make the criteria explicit early on in the task, then you can expect considerable negative feedback later on. When a multimedia construction task is one of many alternatives, it may be more difficult to arrive at meaningful criteria across a range of production formats. The longer the duration of the assignment, the more polished students will assume you require the end product. Unless you specify that you require equal emphasis on the assessment of process and product, and request a process journal, students will skip what they consider 'unnecessary' steps in production to get the product there on time. The more you value the product, the less students can focus on the knowledge construction process, unless you offer them an explicit process framework.

It is obvious that Lecturer 'B' may have to deal with a multiplicity of variables to do with task design and resource provisions across a range of classes. Whatever the permutations and combinations of these variables, the practical issues which conclude the process remain the same – issues such as assignment collection, marking and archiving.

3.2.5 Practicality – assignment collection

When student assignments are collected in print/paper format, we lecturers adopt our own particular strategy for timing and protocol – the deadline may be very strict and uniform for all students, or it may present some flexibility based on topic variation and resource availability. Once you allow multiple media formats, you need to ask yourself:

- Who collects the student work and records its submission? As students become more self-regulated, they will be comfortable submitting their work into available electronic 'collection boxes' such as folders on subject server volumes.
- How much class time does this consume? If you set a rigid deadline, you potentially create a bottleneck, whether there are any technical problems (common) or not.
- Is there a simple way to organize folders before the class to clarify who has yet to submit work? If you establish pre-named individualized submission folders, it is clear to students where you want them to put their work, and very simple to check what is outstanding.
- Have you considered equipment failure? This may be unfortunate but it is always possible.

3.2.6 Practicality – assignment marking

Hours spent sitting reading and marking print material may be replaced or extended by the need to access and view assignments on screen. From personal experience, I can verify that the body is placed under different physical stress when a monitor, rather than paper, is the main source of information. To provide students with meaningful feedback, comments must be written or printed on paper, yet it is more difficult to link the comment to the screen context (the attachment of electronic 'stickies' would be ideal).

Other strategies for marking include peer review to compensate for the subjectivity of an individual marker, and student presentation of the assignment. If the presentation itself is to be assessed, students may fail to gain the benefits of relaxed, spontaneous verbal feedback from lecturer and peers.

3.2.7 Practicality – assignment archiving

The value of maintaining collections of student work becomes apparent when you present the next group of students with a similar task. Not only are you able to allay certain fears born of task misunderstanding or poor communication, but you are also able to engage students in productive work that builds on past student achievements much more quickly. I have found that the motivational aspect of the group challenge to exceed the standard of the previous group is strong.

An efficient method of archiving is to systematically organize student work as it is submitted. This simultaneously simplifies the marking task, and organizes the assignment collection for subsequent subject archiving. I usually press a CD-ROM of assignment work so I can mark it at the most convenient workstation (usually at home).

4. PHASE THREE: ANALYSIS, ARCHIVING AND SUBJECT EVALUATION

When a subject is complete, it is often tempting to dismiss any immediate processing of information in favor of other more pressing agendas, such as research, conferences, and publications. However, diligence in this third management phase will ease your load considerably when you next offer the subject, and it will also provide you with data for case-based research on teaching and learning. Subsequent subject design decisions can be derived from sound evidence and intuition.

4.1 SUBJECT ANALYSIS

Subject analysis requires clear structuring of what you set out to achieve, and what actually occurred, yet many people only store the former. The process of systematically collecting and organizing what you delivered and what students returned as a consequence of that interactive delivery is very enlightening. This simple juxtaposition of question (task) and answer (assignment product) allows you to reflect on how you may need to adjust the question next time, or what follow-up questions would provide a meaningful task flow for students in the future. In addition, the student products from one session may provide a source of material as a starting point for the next group.

4.2 SUBJECT ARCHIVING

Once you have organized the class material, the simplest form of archiving involves its transfer to CD-ROM. I usually include:

- the subject web site as a framework and access mechanism to resources I have provided;
- key chat themes I may wish to preserve;
- the database and spreadsheets for administrative information; and
- student work across the range of assignments I set.

4.3 SUBJECT EVALUATION

With the data before you, it is simple to assess whether your subject has achieved its goals. Now is the time to note down any necessary changes, to copy what you wish to re-use, to edit and append new material, and to re-design tasks. This may be necessary if you are to capitalize on improvements in hardware and software resources and any increase in the proportion of students who are technologically fluent.

The relatively cheap and transportable nature of a CD-ROM allows you to share your work with others. In addition, you can compile longitudinal or transverse sets of material – CDs of one particular assignment over several years, or one particular teaching/learning task performed across a range of subjects within the one session or year. Subject tasks can now be designed to integrate the material students are studying from other subjects run in the same session. If students have developed skills in web site or multimedia production within other subjects, you can allow them to build on these skills by diversifying the range of formats you will accept for particular assignments. The benefits of working with other lecturers in this manner can be considerable (Ferry and Brown, 1998).

5. BENEFITS TO THE LECTURER

For me, this management ‘system’ has emerged from a large investment of time and effort, even though this is supposed to be part of my subject specialty. I can vouch for the fact that there is a considerable gap between knowing about something, and the knowledge you gain from the experience of applying that knowledge. Heuristics emerge to support the implementation of ideas. Their aim is to pass on awareness at the grass roots level.

As a bricoleur, rather than a top down planner, I have found this set of management strategies meets my current needs, yet retains enough flexibility for future change. For instance, I am not locked in to the use of the specific software tools I have mentioned. Many were simply chosen because my students needed to develop skills in their use. I was trying to work ‘smarter’. No doubt there are many other software products which would perform certain tasks with equal or improved efficiency. In true constructivist fashion, it is my system, and it will keep changing. It is unlikely that it would map directly to your needs. You need to choose the tools and strategies, which suit your management style, technical expertise and level of technical support.

Whatever subject management strategies you use, once you have transferred most of your material into an electronic format, refinements are easier. It is my opinion that the ‘public’ still expect us as lecturers to be ‘content experts’. Is this additional electronic management load

reasonable? I think it is a matter of scaling. If you run a small group of students in a specialist subject, this is the perfect testing ground to develop your electronic management strategies. If you are running a large undergraduate class, then usually you are part of a team. Hopefully, that means delegation of responsibilities to individual team members – "a load shared is a load halved". One tutor may be responsible for the weekly notices; another for the addition of resource material based on analysis of the chat space discussion. Each lecturer should be responsible for the provision of lecture notes prior to the lecture presentation. If you scale the system up yet another level, and institutions require a strong measure of cross-faculty uniformity, then the responsibility shifts to a central technology group to design and manage a system, and in-service their academic staff.

6. BENEFITS TO THE LEARNERS

When students are presented with a well organized framework within which to access resources, and they are shown examples of completed tasks, they have every opportunity to demonstrate what they know and what they can do, provided you allow them to express their knowledge in an appropriate medium. The asynchronous chat space allows them to express concerns at varying stages of their work, and to engage in deep discussion through the benefits of 'think' or 'research' or 'cool off' time.

As students become highly proficient with the learning tools available to them, they are likely to automatically peer tutor, as long as you foster competition between groups rather than individuals. We need to carefully select when an individual should be assessed, and when the social construction of knowledge is more important. Self-regulated learning and lifelong learning are catch phrases that have become quite popular. Students don't develop these attitudes unless we give them opportunities to set some of their own goals, plan, monitor and assess their own learning. This metacognitive knowledge seems to be naturally acquired by some, but can certainly be supported in others through explicit modeling and a cognitive apprenticeship approach to learning.

7. CONCLUSIONS

Permit me to revisit the question: When you allow students to use computers as cognitive tools to assist knowledge construction, what impact does this have on our roles and responsibilities as a lecturer? One role is to provide a subject framework that utilizes the benefits of access to a global network of information. Here we have expanded our library from print to electronic resources. We need to expand our set of teaching and learning strategies accordingly. This challenges us to use the communication tools, which hook into that network effectively to help students construct their understanding and apply the knowledge they have gained to meaningful relevant tasks.

Another role is to model higher order thinking skills that are associated with content 'expertise'. With each cycle of subject development, you anticipate (depending on your discipline, of course) that there will be a natural evolution not only of subject specific content, but also the ways that content is applied to the solution of real world problems. Computer-based tools are often part of that equation. The more experience you gain working with electronic 'thinking' tools, the more comfortable you are likely to feel when your students request use of similar tools for assignment work. There are many benefits to be gained by allowing your students to use computers as mindtools. Some of the management issues which flow from this decision have been presented here in the context of overall subject management. It is hoped that by raising your awareness of these issues, you will be able to design similar classes more effectively. No doubt you will identify your own set of 'holes'. Please consider sharing your strategies for filling them.

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